2009 Southeast Decision Sciences Institute Annual Conference

Charleston, South Carolina

February 18-20, 2009
Doubletree Guest Suites

Program Chair
Wesley M. Jones, Jr.
The Citadel

Proceedings Editor
Albert E. Avery
Towson University

THE CORPORATE CHARACTER ETHICAL VALUE MATRIX: THEORY & MEASURE DEVELOPMENT

Edward D. Showalter, Department of Economics and Business, Randolph-Macon College, Ashland, VA 23005, (804) 752-3716, **eshowalt@rmc.edu**

ABSTRACT

An ethical value structure is presented as a two-type by three-target matrix entitled the Corporate Character Ethical Value Matrix. Labels for the six cells in the matrix come from work by Josephson and Schwartz. The six labels are Trustworthiness, Responsibility, Respect, Caring, Fairness and Citizenship. Development of the model, its relation to business ethics and other literature is presented as well as directions for future research.

INTRODUCTION

> *"Individuals act as they do because of their values. The value sets of individuals provide strong reasons for action, and the most dear values are ones we call "moral values" or "ethical values."* [6]

Freeman & Gilbert [6] among others make a strong case that ethics and ethical values should be a key component of the strategic process yet defining ethics and ethical values is a difficult task. Codes of ethics are commonplace and in fact many stock exchanges require codes of ethics with specific elements in order to list a company [28]. Codes however, are only a portion of the picture and many companies, including Enron, have had codes of ethics yet demonstrated behavior that was not ethical [28].

Kababoff, Waldersee & Cohen [12] pointed out several shortcomings in research on organizational values including a lack of theory development. "Although a variety of value dimensions have been identified via researchers intuition, surveys of the literature and factor analysis, there is an absence of well-specified theories of organizational values" [12, p. 1097]. While ethics has arguably received more attention in the literature and the classroom over the last decade, current economic conditions and business practices in the news continue to raise ethical concerns. Despite attempts to correct these shortcomings, well specified theories are still in short supply.

If values, especially ethical values, are important to business ethical conduct, researchers in this area must answer three immediate questions: (1) What is an ethical value? (2) How can ethical values be classified? and (3) How can ethical values be measured? This paper presents answers to the first two of these questions as well as suggestions toward answering the third.

Schwartz [21][22][23] draws upon ethical values suggested by Josephson [10][11] to suggest that there are six basic values that should be incorporated in a business's code of ethics. These values according to Schwartz et. al. are:

1. Trustworthiness (including notions of honesty, integrity, reliability, and loyalty);
2. Respect (including notions of respect for human rights);
3. Responsibility (including notions of accountability);
4. Fairness (including notions of process, impartiality and equity);
5. Caring (including notions of avoiding unnecessary harm);
6. Citizenship (including notions of obeying laws and protecting the environment). [21, pp. 29-30]

These six values or moral standards are argued to be "universal in nature, in that they can be considered of fundamental importance regardless of time, circumstance, cultural beliefs, or religious convictions." [21, p. 30]

Problem and Purpose

While there may be little argument that the values derived from the Josephson Institute and reinforced by Schwartz are good values for a business or a person in business to have, the claim that this is a universal list is more difficult to support. Does this list of six values adequately cover the domain of ethical values sufficiently to be used in future research and how can these values be more specifically classified and defined? Assuming that reasonable arguments can be made for the adequacy of domain coverage and for clear classifications and definitions, measurements must be established for these values to make them truly useful for research purposes.

The purpose of this research is to address these questions by presenting a classification structure for these ethical values known as the Corporate Character Ethical Value Matrix or CC-EVM which proposes an outline of the domain of ethical values and can be used to more clearly define and classify the values within that domain. From that point, this paper makes recommendations toward developing measures for these values.

Definition of an ethical value

This study draws on Rokeach's [20] work on values. "A value is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." [20, p. 5] Terminal values are those concerning end-states of existence or quantifiable goals. Instrumental values concern modes of conduct or behavior to reach goals. To value making a profit is a terminal value, while to value making that profit through superior performance is an instrumental value.

Rokeach [20] presented seven ways values serve as multifaceted standards guiding behavior. As presented by Rokeach [20], values:(1) influence positions on social issues, (2) influence predispositions toward political or religious ideologies, (3) guide self-presentations, (4) serve as standards for evaluations of self and others, (5) serve as a basis of comparisons of competence and morality, (6) serve as standards to persuade and influence others, and (7) serve as standards to rationalize otherwise unacceptable beliefs, attitudes, and actions to protect, maintain, and enhance self-esteem.

In short, values are guides to behavior, as well as standards by which to judge behavior. This study defines an **ethical value** as: **an instrumental value serving as a guide or standard for ethical behavior**. "Ethical values" in this definition are equivalent to "moral values." [20] "Moral values refer only to certain kinds of instrumental values, to those that have an interpersonal focus which, when violated, arouse pangs of conscience or feelings of guilt for wrongdoing" [20, p. 9]. Ethical values then function as a guide or standard for right or good interpersonal behavior.

Nicholson [18] presupposed that ethical behavior by companies and individuals exists due to one of three reasons: they can afford it, they are compelled to it, or they are inspired to it. Nicholson questioned the possibility of delineating behavior or goals with an ethical component from those which do not have an ethical component. If all actions have ethical components, no behavior of either an individual or an organization can be free from ethical analysis. [18]

This paper accepts Nicholson's argument and thus contends that any behavior by an organization or individual within an organization must fit within a given classification structure in order for that classification structure to be considered to cover the domain of business ethics values.

THEORY: THE CORPORATE CHARACTER ETHICAL VALUE MATRIX (CC-EVM)

From a behavioral standpoint, several streams of research define "good" or "right" behavior in an organizational context. In addition to the business ethics literature, the theory proposed in this research draws upon several areas of literature including trust and organizational citizenship behavior. Corporate character as defined here is a value structure that guides individual behavior in an organizational context. The corporate character value structure consists of instrumental ethical values or areas of behavior arranged in a two dimensional matrix we will refer to as the Corporate Character Ethical Value Matrix, or CC-EVM. The two dimensions of the CC-EVM are **types** of behaviors and **targets** of behaviors. The CC-EVM theory defines two ethical behavior types and three ethical behavior targets creating six areas for ethical behavior.

The Type Dimension – Continuance and Proactive Values

Trust, including consumer trust [5] continues to be a key element in business ethics research. Hosmer [7] defined trust as "the result of 'right,' 'just,' and 'fair' behavior -- that is, morally correct decisions and actions based upon the ethical principles of analysis -- that recognizes and protects the rights and interests of others within society" [7, p. 399]. This definition creates a direct link between trust and ethics in that both concern right, just, and fair behavior. Hosmer pointed out that trust was accompanied by an "expectation of generous or helpful or, at the very least, non-harmful behavior on the part of the trusted person, group, or firm" [7, p.392]. This distinction between helpful and non-harmful types of behavior forms the basis for the first dimension of the CC-EVM, ethical behavior **types**.

Based on the helpful/non-harmful distinction, the CC-EVM theory presented in this study categorizes ethical behaviors in two types: **proactive (helpful)**, seeking to improve the status quo; or **continuance (non-harmful)**, seeking only to maintain the status quo. If support exists

for the CC-EVM theory, the existence of a proactive behavior (doing the right thing) or the absence of a continuance behavior (avoiding improper behavior) would explain both positive and negative modifications in the status quo. A third type of behavior – harmful – would not meet the definition of an ethical behavior and thus does not warrant a separate category. A neutral behavior would by definition be non-harmful and would thus be categorized as continuance.

It is critical to note that the categorization of a specific behavior may be context or role specific. If an individual's job requires a behavior, the CC-EVM theory defines that behavior as continuance in that failure to perform that behavior has negative consequences. If the behavior is positive and not required by the individual's job, that behavior is proactive. This dichotomy between continuance and proactive behaviors is similar in nature to that discussed in organizational citizenship behavior (OCB) literature [13].

This theoretical classification categorizes not the individual behaviors and their consequences, but the values that guide those behaviors. A possible example might be a follow-up phone call after a service is rendered. If an individual's job requires that they make such a call and they fail to, that behavior could be considered un-ethical in that they violated their job requirements. If they were required to make the call and they did so, that would be a continuance behavior. If they are not required to make the call, and they do so then that could be considered a proactive behavior.

The Target Dimension – Task, Consideration-Specific and Consideration-General Values

The other dimension of the CC-EVM is behavior **targets**. Ethical behavior-types classify behavior as preventing harm or doing good, ethical behavior-targets classify behavior as preventing harm or doing good **to what or whom**. The CC-EVM first divides targets of behavior into two major categories along the lines of the task vs. relationship dichotomy established by the Michigan and Ohio State studies [30]. **Task** targets concern behaviors toward achieving the formal goals of the organization. Behaviors which target tasks are generally measurable and clearly defined. The ethical element of task-targeted behaviors comes from the indirect effect of the task-behavior on relationships, and not a direct consequence of the task.

All business ethics deal with relationships [1]. To avoid confusion in terminology, the term "**consideration**" replaces the use of the term "relationship" as a category of behavior-targets. The multidimensional nature of trust found throughout the trust literature supports the expectation of the target dimension of consideration. Consideration behaviors are those that affect relationships directly rather than through the performance of a task. Mayer, Davis & Schoorman [15] defined trust in terms of ability, benevolence and integrity; Butler and Cantrell [4] listed integrity, competence, consistency, loyalty, and openness; Rempel, Holmes and Zanna [19] listed predictability, dependability and faith. Implicit in all these lists of trust factors are elements of task behavior (e.g., ability, competence, predictability) and consideration behavior (e.g., benevolence, openness and faith).

The organizational citizenship literature provides an additional distinction along the target dimension between local and distant consideration. Becker & Vance [3] referred to local and distant altruism: (1) local-altruism is citizenship behavior directed at individuals with whom the

acting individual has direct or face-to-face interaction, (2) distant-altruism is citizenship behavior directed at more general groups of individuals outside direct interaction. By similar logic, consideration behaviors act upon either specific or general relationships. Specific relationships involve identifiable parties. Examples of specific relationships include: leader-subordinate, employee-workgroup (if all members of the workgroup are known), coworker-coworker, and salesperson-customer. Generalized relationships involve one or more parties classified as categories of people rather than as individuals. These categories of people can be either large or small, but within which there are unidentifiable parties. Examples of general relationships include: company-stockholders, company-customer base and, individual-society. Targets of behavior divide into three categories: **task**, **consideration-specific**, and **consideration-general**. The final result of this categorization then, is a 2 x 3 matrix of values serving as types of, or guides to, ethical behaviors. The matrix contains six values organized as a value structure.

Labels for the Cells of the Corporate Character Ethical Value Matrix
The Josephson Institute of Ethics uses six labels that they refer to as the "Pillars" of ethics [9] [10]: Trustworthiness, Responsibility, Respect, Caring, Fairness and Justice, and Citizenship and Civic Virtue. Empirical research has largely ignored these six values as unique constructs, although they are adopted as values by Schwartz et.al. [21][22][23]. Despite the lack of empirical research evidence several organizations have accepted these six values as reasonable expressions of ethical values including: Big Brothers/Big Sisters of America, 4-H, Boys and Girls Club and the United Way. [9]

The wide public acceptance of these "pillars" as reasonable ethical values combined with Schwartz's work indicates that the six words may serve as a plausible set of labels for the cells of the CC-EVM. Figure 1 shows the CC-EVM with the six labels in place. The following section will outline the reasoning behind the placement of the labels.

Figure 1: The Corporate Character Ethical Values Matrix (CC-EVM)

Targets Types	Task	Consideration-specific	Consideration-general
Continuance (Non-Harmful)	*Trustworthiness*	*Respect*	*Justice & Fairness*
Proactive (Helpful)	*Responsibility*	*Caring*	*Citizenship & Civic Virtue*

VARIABLES WITHIN THE CC-EVM

Trustworthiness: Continuance type -- Task target
Trustworthiness, as defined here, concerns primarily ability and competence. McAllister [16] drew a distinction between affect-based trust and cognition-based trust, affect-based trust rooted in "reciprocal interpersonal care and concern" [16, p.25] and cognition-based trust in "individual beliefs about peer reliability and dependability." [16, p.25] Central elements of cognition based-trust include competence and dependability which are the primary elements considered in the CC-EVM definition of trustworthiness. Elements of trust that might be more affective would be categorized in the "responsibility" and "caring" areas of the CC-EVM.

If an individual cannot (by lack of ability) do something, he or she is not trustworthy in that capacity. As a value or guide to behavior, trustworthiness deals with behaviors that are expected and demonstrate relevant competence at handling tasks or dealing with information, as required by the individual's occupation. Again, this is context specific – in general one may consider either a brain surgeon or auto mechanic to be "trustworthy" but we might not "trust" the surgeon to work on our car or vice versa.   This label then refers to having the ability, competence and meeting the organizational and stakeholder expectations in relation to a task.

Responsibility: Proactive type –- Task target

Responsibility is task behavior taken on by the individual with the end of improving relationships as a consequence of the task, and thus improving the status quo. Part of the CC-EVM"s definition of responsibility is explained by the distinction between getting the job done (as in the definition of trustworthiness) and getting the job done well. The CC-EVM theory asserts that an individual who highly values responsibility will seek to do the job well – that is to exceed expectations. The CC-EVM's definition of responsibility also includes task behaviors that are beyond the individual's job description, but benefit the organization. This second element of the definition is similar to the conceptualization of extra-role behaviors [2].

Respect: Continuance type -- Consideration-Specific target

The respect value dimension guides behaviors preventing the deterioration of existing relationships. Many of these behaviors equate with social etiquette (e.g., acknowledging someone's entrance into a room, a cordial greeting, shaking hands). Only in the absence of these behaviors do individuals feel others are not showing respect. In the CC-EVM definition, respect is a granted rather than an earned concept. The CC-EVM theory predicts that individuals high on the respect dimension would exhibit these behaviors to new specific relationships as well as to long-term colleagues.

Two important issues should be noted at this point. First, for a consideration target to be specific rather than general the critical factor is the ability to **identify** the parties of the relationship rather than the depth of the relationship. The value of respect (continuance/consideration specific) is static whereas the behaviors that the value may engender may change based on the depth of the relationship. For instance one shows respect for a new acquaintance in typically more formal ways whereas respect may be demonstrated more casually with an individual one knows well. Second, it is important to note that the behaviors that demonstrate this value are going to be culturally bound.

Caring: Proactive type -- Consideration-Specific target
McAllister's affective based trust "reciprocal interpersonal care and concern" [16, p.25] coincides with the CC-EVM's definition of caring. The caring value is characterized by behaviors toward a specific relationship intended to improve the relationship. This concept is similar to the "caring" ethical climate dimension found by Victor and Cullen [27]. Wimbush and Shepard [29] defined that dimension as follows: "In an ethical climate dominated by the "caring" dimension, employees would have a sincere interest for the well-being of each other, as well as

others within and outside of the organization, who might be affected by their ethical decisions"
[29, p. 638].

The concept narrows here to include only those with whom the individual has a specific
relationship. Interest in general others would align with the citizenship dimension. Caring
behaviors go beyond social etiquette, extending into honest concern for improving relationships.

Fairness: Continuance type -- Consideration-General target
Fairness has been connected to management theories and business ethics throughout the last
century, although the conceptualization of fairness has evolved over time. [25] Fairness
embodies concepts of procedural and distributive justice. Behaviors linked to fairness seek
equitable distribution of opportunities and/or outcomes. Unlike respect, fairness does not require
that all the parties be identifiable – one can demonstrate fairness to a group of people without
knowing them directly. As with trustworthiness and respect, it is the absence of fairness that
causes the status quo to deteriorate.

Citizenship: Proactive type -- Consideration-General target
Van Dyne, Graham, and Dienesch [26] divided citizenship into civic citizenship and
organizational citizenship. Both civic and organizational citizenship fit within the citizenship
value definition presented here. Citizenship functions as caring extended to generalized others.
Citizenship, of the six CC-EVM constructs, is the value most concerned with the overall greatest
good, or utilitarian ethic. A key element of citizenship is participation [26].

These six variables, their interactions, and conflicts, combine to form the Corporate Character
Ethical Value Matrix (CC-EVM). To facilitate relevant research on the CC-EVM, this study
moved toward creating measures of the six constructs making up the CC-EVM, and establishing
the validity of those measures.

MEASUREMENT DEVELOPMENT

Earlier research tested the proposed CC-EVM theory by (1) testing the uniqueness of the
constructs in the CC-EVM, (2) developing a set of measures, and (3) testing these measures
against dependent variables of interest, in this case affective organizational commitment. This
research predicted the six components of the Corporate Character Construct to be measurable
and distinct. The measures used in the earlier study supported the distinction between the ethical
behavior targets (task/relationship specific/relationship general) but did not clearly factor into the
six cells that would fully support the proposed CC-EVM theory [24].

As an initial step in developing an improved measurement method for current and future
research, and to help establish face validity for the CC-EVM theory, the researcher conducted a
series of phone and face-to-face interviews business people in various industries. Interview
subjects included corporate ethics and compliance officers for several Fortune 500 companies, a
multi-national corporation CEO, several representatives of the banking/finance industry and
others. The interview subjects were asked separately about the task and target dimensions of the
CC-EVM, and then presented with the CC-EVM as a whole. This interview process to date
(ongoing as part of a continuing research program) has shed light on some methodological

challenges in creating measurements for the CC-EVM, but has also reinforced the value of the CC-EVM as a valid research endeavor.

Findings from Interviews

With only one exception, each of the interview participants found that the dimensions and the matrix structure of the CC-EVM made cognitive sense and were understandable.   The one exception contended that values were too individually based to be categorized, and thus dismissed the possibility that any research in this area could be of value.

A consistent question raised in the interviews dealt with how to measure these values. No consensus emerged, however in general most agreed that research would have to look at either very specific behaviors guided by the values and/or at general opinions on the values as a whole. Even though there was no consensus on how to measure the values, there was a repeated expression that the attempt to measure the values (and to measure ethics in general) had a value to organizations.   Many of the subjects, especially those at higher levels in the organizations, stated that the act of measurement in itself and regardless of results had a positive impact on behavior. This was true in their experience for surveys related to ethics as well as other areas.

Interviews and discussions indicated that one problem with the earlier study may be related to the context or role specific nature of maintenance vs. proactive behaviors which creates a difficulty in measuring the values that underlie the specific behaviors. Survey items describing behaviors then need to be quite generic so that they avoid context specific factors, or the sample needs to be sufficiently homogeneous in terms of context and role to allow responses to be meaningfully categorized and interpreted. Methodological issues such as these are common in business ethics research [14].

An additional problem in creating a measurement for each of these areas is that a given behavior may be guided by multiple areas of the value structure. The same type of extra-role behaviors that improve a relationship may in turn improve the ability to complete a task depending on context.

A future study is planned with the intent to further refine the measures by eliminating items from the first study that failed to distinctly load on a single factor, and by adding items intended to more fully explore the full domain. These developed measures in conjunction with other validated measures will be administered to a non-student sample. Other measures to be used include the Shared Ethical Values Questionnaire [8] and the Organizational Commitment Questionnaire [17]. Scales for the CC-EVM measures will be analyzed for reliability, and correlation with the SEV and OCQ, as well as correlation among the measures themselves. The items in the CC-EVM will be factor analyzed. The theory would predict a six-factor solution.

Conclusion:

This paper proposed three key questions for researchers in the area of ethical values: (1) What is an ethical value? (2) How can ethical values be classified? and (3) How can ethical values be

measured? The problems then are definition and description, organization and taxonomy, depth and dimension.

The answer to the first question drew from Rokeach [20] in defining an ethical value as **an instrumental value serving as a guide or standard for ethical behavior** and recognizing that all behavior may have an ethical component, thus ethical values are in short guides and standards for all behavior. The most significant contribution of this paper is the described CC-EVM which seeks to answer the second question, that of classification, organization and taxonomy.

The CC-EVM matrix defines a structure by which ethical values can be classified, and provides an important argument in favor of a six-value structure as proposed by Josephson and supported by Schwartz et.al. While the labels as used may not exactly fit the Josephson or Schwartz definitions, the CC-EVM taxonomy structure should provide a more discrete classification structure than the simple lists they use.

A given behavior may be guided by multiple areas of the value structure, and context and role differences between organizations and cultures may cause behaviors to be motivated by different values. These problems raise methodological issues making depth and dimension measurements difficult. While this research has yet to answer the third question, the future is promising for continuing development of the CC-EVM theory.

REFERENCES

[1]   Arthur, H. B. (1984). Making Business Ethics Useful. *Strategic Management Journal , 5* (4), 319-333.

[2]   Bateman, T. S., & Organ, D. W. (1983). Job Satisfaction and the Good Soldier: The relationship Between Affect and employee "Citizenship". *Academy of Management Journa , 26* (4), 587-595.

[3]   Becker, T. E., & Vance, R. J. (1993). Construct Validity of Three Types of Organizational Citizenship Behavior. *Journal of Management , 19* (3), 663-682.

[4]   Butler, J. K., & Cantrell, C. R. (1984). A Behavioral Decision Theory Approach to Modeling Dyadic Trust in Superiors and Subordinates. *Psychological Reports , 55*, 19-28.

[5]   Castaldo, S., Perrini, F., Misani, N., & Tencati, A. (2009). The Missing Link Between Corporate Social Responsibility and Consumer Trust: The Case of Fair Trade Products. *Journal of Business Ethics* (84), 1-15.

[6]   Freeman, R., & Gilbert, D. (1988). *Corporate Strategy and the Search for Ethics.* Englewood Cliffs: Prentice Hall.

[7]   Hosmer, L. T. (1995). Trust: the Connecting Link Between Organizational Theory and Philosophical Ethics. *Academy of Management Review , 20*, 379-403.

[8]   Hunt, S. D., Wood, V. R., & Chonko, L. B. (1989, July). Corporate Ethical Values and Organizational Commitment in Marketing. *Journal of Marketing* , 79-90.

[9]   Josephson Institute of Ethics. (2008, 12 30). *Character Counts Coalition Members* . Retrieved 12 30, 2008, from Character Counts Coalition: http://charactercounts.org/overview/members.php

[10]   Josephson Institute of Ethics. (2008). Josephson Institute of Ethics – Six Pillars of Character. Retrieved 10 9, 2008, from Josephson Institute of Ethics : http://josephsoninstitute.org/sixpillars.html

[11]   Josephson, M. (1997). *Ethics in the Workplace: Resourse Reading Materials.* Marina del Rey, CA: Josephson Institute of Ethics.

[12]   Kabanoff, B., Waldersee, R., & Cohen, M. (1995). Espoused Values and Organizational Change Themes. *Academy of Management Journal , 38* (4), 1075-1104.

[13]   LePine, J. A., Erez, A., & Johnson, D. E. (2002). The Nature and Dimensionality of Organizational Citizenship Behavior: A Critical Review and Meta-Analysis. *Journal of Applied Psychology , 87* (1), 52-65.

[14]   Loe, T. W., Ferrell, L., & Mansfield, P. (2000). A Review of Empirical Studies Assessing Ethical Decision Making in Business. *Journal of Business Ethics , 25*, 185-204.

[15]   Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An Integrative Model of Organizational Trust. *Academy of Management Review , 20*, 709-734.

[16]   McAllister, D. J. (1995). Affect-and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations. *Academy of Management Journal , 38* (1), 24-59.

[17]   Mowday, R. T., Steers, R. M., & Porter, L. W. (1979). The Measurement of Organizational Commitment. *Journal of Vocational Behavior , 14*, 224-247.

[18]   Nicholson, N. (1994). Ethics in Organizations: A Framework for Theory and Research. *Journal of Business Ethics , 13*, 581-596.

[19]   Rempel, J. K., Holmes, J. G., & & Zanna, M. P. (1985). Trust in Close Relationships. *Journal of Personality and Social Psychology , 49*, 95-112.

[20]   Rokeach, M. (1973). *The nature of human values.* New York: Free Press.

[21]   Schwartz, M. S. (2002). A Code of Ethics for Corporate Ethics. *Journal of Business Ethics , 41*, 27-43.

[22]   Schwartz, M. S. (2005). Universal Moral Values for Corporate Codes of Ethics. *Journal of Business Ethics , 59*, 27-44.

[23]   Schwartz, M. S., Dunfee, T. W., & Kline, M. J. (2005). Tone at the Top: An Ethics Code for Directors? *Journal of Business Ethics , 58*, 79-100.

[24]   Showalter, E. D. (1997). The Corporate Character Ethical Value Structure: Construct Definition, Measurement, Validation and Relationship to Organizational Commitment . *Doctoral Dissertation, Virginia Commonwealth University, 1997 , 58 , 03A*. Dissertation Abstracts International.

[25]   Van Buren III, H. J. (2008). Fairness and the Main Management Theories of the Twentieth Century: A Historical Review. *Journal of Business Ethics , 82*, 633-644.

[26]   Van Dyne, L., Graham, J. W., & Dienesch, R. M. (1994). Organizational Citizenship Behavior: Construct Redefinition, Measurement and Validation. *Academy of Management Journal , 37* (4), 765-802.

[27]   Victor, B., & Cullen, J. B. (1988). The Organizational Bases of Ethical Work Climates. *Administrative Science Quarterly , 33*, 101-125.

[28]   Webley, S., & Werner, A. (2008). Corporate Codes of Ethics: Necessary But Not Sufficient. *Business Ethics: A European Review , 17* (4), 405-415.

[29]   Wimbush, J. C., & Shepard, J. M. (1994). Toward an Understanding of Ethical Climate: Its Relationship to Ethical Behavior and Supervisory Influence. *Journal of Business Ethics , 13*, 637-647.

[30]   Yukl, G. (2005). *Leadership In Organizations.* New York: Prentice Hall.

Funds Flow along the Supply Chain

Richard E. Crandall, Professor
Appalachian State University
College of Business, Raley Hall
Boone, NC 28608
TEL: 704-262-4093
FAX: 704-262-6190
E-mail: crandllre@appstate.edu

Abstract

There are three major flows in a supply chain – the physical flow of goods and services, information, and funds. All are necessary if a supply chain is to function and flourish. The most visible flow is that of the goods and services. In manufactured products, they originate in the extraction (mining) industries and farms, and flow toward the consumer through fabricators, assemblers, distributors, and retailers. Although not yet perfect, this flow is improving rapidly. For the most part, it receives major management attention and resource commitment. Of the three supply chain flows, this one is in the most advanced state of development.   However, information and funds flow are equally important and in need of extensive refinement before supply chains will be completely effective.

Funds Flow along the Supply Chain

Introduction

Many companies, especially those growing rapidly, are discovering, or rediscovering, that profits are different from cash flow. Does participation in a supply chain help or hinder cash flow? Sometimes, it depends on where your company fits in the supply chain. Would companies like to improve their flow of funds? Almost universally, especially small companies, who are often the most pressed for funds to pay their bills.

What do we mean by cash flow? One definition is that "the financial supply chain is the flow and uses of cash throughout the physical supply chain. Where products, services, and/or information are transferred, there is an accompanying flow of cash." (Roberts 2002)

We will use "funds" to describe the flow of money along the supply chain because most companies do not use actual cash to satisfy their obligations. While the use of cash has decreased in business-to-business transactions, it is still a significant factor with consumers. Rajamani, Geismar and Sriskandarajah (2006) provide a comprehensive study of the supply chain used to keep cash flowing in the United States from the U. S. mint through banks to ATMs to consumers. Some believe that cash has its disadvantages and advocate programs to eliminate the use of cash. (Warwick 2004)

Flows in a supply chain

There are three major flows in a supply chain – the physical flow of goods and services, information, and funds. All are necessary if a supply chain is to function and flourish.

The most visible flow is that of the goods and services. In manufactured products, they originate in the extraction (mining) industries and farms, and flow toward the consumer through fabricators, assemblers, distributors, and retailers. Although not yet perfect, this flow is improving rapidly. For the most part, it receives major management attention and resource commitment. Of the three supply chain flows, this one is in the most advanced state of development. Much has been written about this flow; we will not add to its discussion in this article.

Information flow is also receiving a great deal of attention. A supply chain requires only a minimal amount of required information, such as customer purchase orders, shipping notices, and invoices, to keep it operating. Most companies provide this information willingly and promptly. This minimal information is necessary to create the flow of funds along the supply chain. Additional information flows on a voluntary basis among supply chain participants. This includes sales results, demand forecasts, and plans for special events, such as sales or product promotions. This additional information makes it possible for goods and services to flow faster and more smoothly. It also helps funds to flow more smoothly. Information flows in both directions – toward the consumer and from the consumer up the supply chain toward the suppliers. New technologies, and advances in collaboration among supply chain participants, is making information flow better, although it still encounters some turbulence in most supply chains.

Funds flow, or the flow of money, is required in a supply chain. The money flows from the consumer upstream in a supply chain until all suppliers have received payment for the goods and services they provided. Although there are other funds flow in a company, such as for equipment purchases and payroll, we will only be concerned with the flow along the supply chain, which affects the working capital of a company – its accounts receivable, inventory and accounts payable. While the flow of funds is mandatory if a supply chain is to exist, it is still an uncoordinated and sub-optimized flow in most supply chains. Grealish (2005) reports that most mid-size and large corporations agree that shuffling paper invoices and checks will be gone in ten years, but adds, "Today, however, the paper shuffle is common." Krishnan and Shulman (2007) studied the level of supply chain risks – cash flow included – and found

that approximately 40% of the executives felt their companies were, at best, "somewhat capable" of mitigating the risks or were spending enough time on risk management.

Different performance measures

One of the problems affecting funds flow is the performance measures used by different functions. The financial accounting part of a business and its creditors look at working capital and current ratios. Total working capital is the sum of accounts receivable and inventory minus accounts payable. The current ratio is calculated by dividing the sum of accounts receivable and inventory by accounts payables (in dollars). From this perspective, high accounts receivable, high inventory and low accounts payable are desirable because it indicates a greater capability to repay loans issued by the creditors. The higher the current ratio, the better. The general rule in many accounting books has been that the current ratio should be about 2.0 or better. Investopedia (2008) suggests that a ratio of 1.2 – 2.0 may be reasonable because some companies have reduced their excess inventory.

Management accounting is more concerned with how well the company is using its resources. From this perspective, low accounts receivable, low inventory and high accounts payable are desirable. The performance measures include days of receivables, days of inventory, and days of payables. While appropriate, the measures are looked at from a local viewpoint, or in silos. The credit department is responsible for accounts receivable, the inventory managers for inventory, and the accounts payable department for extracting extended terms from their suppliers. In recent reports, Wal-Mart reported a current ratio of 0.8, Lowe's reported 1.1, Dell 1.2, and Hewlett-Packard 1.3. These results pose a contradiction to the generally accepted norms.

A more contemporary approach is to look at cash-to-cash cycle time, which is an integrated approach. It is calculated by adding the days of accounts receivable and days of inventory, and subtracting the days of accounts payable. The lower the better, because it means that the company is using less cash to manage its business. See Crandall and Main (2002) for a fuller description of cash flow. Farris and Hutchison (2002) describe the cash-to-cash cycle and offer a number of examples of its effect in such companies as Dell and J.C. Penney.

In summary, goods and services flow relatively well and information flow is erratic but improving. Funds flow lags, because it depends on the flow of products and information. Funds flow is also disconnected and biased, sometimes for reasons unrelated to the flow of goods and information.

Benefits of improved funds flow

The primary benefit of improved funds flow would be to reduce the cash-to-cash cycle time. Most of the large retail companies operate with cash-to-cash cycle times in the 15-20 day range. Dell is quite unique with a negative cash-to-cash cycle time – they have minimal receivables and inventory and get extended payables terms from their suppliers (Farris and Hutchison 2002).

Improved funds flow would improve customer-supplier relationships and, conversely, improved customer-supplier relationships would improve funds flow. As the flow of goods and services improve and information sharing advances, funds flow will improve. If payments were made more promptly and consistently, relationships would improve. The result would be a win-win situation throughout the supply chain.

Improved funds flow would also tend to reduce the imbalances among supply chain participants. Large retailers tend to demand more liberal payables terms from manufacturers. In turn, large manufacturing companies tend to demand more liberal payables terms from their smaller suppliers. If funds flow were aligned with product and information flows, and integrated along the supply chain, it would tend to reduce the inequities resulting from company size or creditworthiness. (Grealish 2005)

Obstacles

If improved funds flow is so desirable, what is keeping companies, and their supply chain partners, from doing it? Researchers have found several reasons that appear to be the biggest obstacles.

Technology. Companies are not using the latest technology available. While few companies use cash anymore, many are still using checks. Checks are slower and less secure than electronic funds transfer (EFT) methods (Warwick 2002). In addition, companies have not adequately integrated funds flow with goods and information flows. Other companies have moved aggressively into web-based systems. Gentry (2006) describes how Rite-Aid deployed a Web-based platform to economize international payments.

Administrative processes. Many companies have not yet streamlined their internal procedures. Although lean methodology is making great progress in manufacturing and distribution to create flow of physical goods, it is still waiting in the wings to make its entrance into most paperwork processes. As mentioned earlier, many administrative processes are still functionally separated into silo-like stations. Accordingly, batch processing of purchase orders, invoices and checks is still more the norm than the exception.

Errors. Errors in the physical flow of goods and services, such as partial shipments or defective goods, cause funds flow to be delayed. Customers will not complete payment until their orders have been satisfied. Even if the physical flow is correct, there may be errors in the paperwork. Satisfactory reconciliation of purchase order, receiving report and invoice is a prerequisite to payment. Even small discrepancies can cause delays and expenditures of employee time to resolve. Roberts (2002) lists 24 different invoice errors that delay funds flow.

Adversarial attitude. Many companies have not yet made the transition from an adversarial attitude toward their customers and suppliers to a collaborative one. It almost seems natural or inbred to say to customers "Pay up or else." Credit managers develop an aura of being unyielding and unsympathetic. On the other hand, it is equally natural to push suppliers for extended credit terms because of "all the business we do with you." This is especially true if the supplier is smaller and heavily dependent on "our business." In addition, money is not something most companies want to talk about in mixed company (customers and suppliers). It is among the most confidential of topics. Companies may be willing to reveal their sales information or planned promotions, but they are not about to reveal their bad debt ratio or how well they are pressuring their suppliers for extended terms.

Ways to Improve

What can companies do to improve the flow of funds along the supply chain? First, companies should work to improve the physical flow of goods and services, and information flows, because funds flow depends on their proper and complete flow. They should align the funds flow more closely with the first two flows. As Bernabucci (2008) puts it, "Fixing a cash-flow problem requires companies to examine and improve the three key flows of commerce: goods, information and funds." Roberts (2002) warns, "If a method for optimizing the physical supply chain hinders the financial supply chain, it is not an optimal method for the overall supply chain."

Companies should try to integrate more closely the processes dealing with funds flow. Eliminating the batch processing and the functional silos would be desirable. However, if this is not feasible or appropriate, at least they should view the process as continuous and try to create a semblance of flow for funds.

A number of researchers herald the move to E-Financial Supply Chains. Grealish (2005) provides a good overview of this topic and insists that it can be a win-win solution for both buyer and seller. She points out

that E-Financial supply chains have come a long way toward acceptance in just a few years, and lists a number of companies that are using these systems, such as Dell, Honeywell, Payless and Verizon.

Supply Chain Finance (SCF)

Supply chain finance (SCF) is a new concept that is beginning to get closer attention. "Pressure to release capital and work collaboratively with sourcing and distribution partners make supply chain finance (SCF) an idea whose time has come. While controversy still rages over SCF's ability to get inventory off balance sheets in an GAAP/IAS/IFRS-compliant manner, there is little dispute that invoice-based financing techniques like so-called 'reverse factoring' are gaining traction rapidly – particularly in the US, but also increasingly in Europe and elsewhere internationally." (Lewis 2008) Banks and large retailers are adding SCF departments, technology providers are promoting SCF platforms, and e-procurement companies are trying to decide how best to add an SCF add-on to their software.

Banks are interested because it offers them an opportunity to get additional business. The customer – the buyer – gets extended payment terms from the lender – a bank or some other financing organization. The lender pays the supplier after discounting the payment, but at terms they would extend to the larger buyer, which are lower than the terms for the smaller supplier. "The result is that the supplier's working capital costs are reduced, even though its payment terms have been extended. It is then in a position to convert this cost reduction into price reductions to satisfy the buyer; the buyer gets the benefit of extended terms, lower prices, reduced capital costs and alignment of its procurement and finance interests; and the lender gets the benefit of a higher margin on the exposure to the buyer company." (Kerle 2007)

The Aberdeen Group published several Supply Chain Finance reports recently. In one, they build the case for use of Supply Chain Finance (SCF). They indicate that the use of SCF practices will make the entire supply chain more competitive with other supply chains. Companies have been able to achieve significant benefits, including 10%-35% savings on the cost of goods purchased. Their study found most companies are still leaving money on the table because they fail to take into account the SCF opportunity when undertaking low-cost country sourcing (LCCS). They conclude that SCF can help a buying organization optimize its working capital, reduce product unit costs and reduce supply base risk "by enabling faster and more predictable payments to emerging market suppliers." (Sadlovski and Enslow 2006)

In another report, the authors report "Supply Chain Finance (SCF) is strongly appealing to companies that seek to create a cost-advantaged supply chain. Finance, supply chain, and procurement groups need to ensure their companies are actively exploring how to use SCF or risk missing the next wave of cost improvement. More than two-thirds of companies report that they are investigating or putting in place SCF programs to lower end-to-end costs." (Sadlovski and Enslow 2006a)

In an even more recent study, the authors compared the level of activity in SCF in 2007 versus 2006. They found a slight increase in the percentage of companies with firm plans to enhance SCF (18% versus 15%) and those actively using SCF techniques (15% versus 13%). Even so, the total for the two groups was only 33% of the total companies surveyed. The conclusion is that, while there is considerable interest, less than half of the companies are seriously pursuing SCF initiatives. The key pressures for buyers to consider SCF is the desire to lower cost of goods sold and to work closer with strategic suppliers to reduce costs and improve processes. The key drivers for suppliers are to lower the cost of goods sold and to shorten Days Sales Outstanding (DSO). The primary solution/service providers are financial institutions, information technology providers, and consulting companies. (Sadlovska 2008).

Automation of the information is an important step in the SCF implementation process. One of the most important considerations when selecting SCF technology is the ease of interaction among the parties involved – buyers, suppliers, and third-party financial institution. Some of the processes that leading SCF users are automation include:
- Electronic invoice presentment

- Trade-related document preparation and management
- Invoice matching/reconciliation (internal)
- Invoice approval process (internal)
- Purchase order management
- Electronic payment process
- Collaborative invoice discrepancy management
- Invoice discount management
- Charge-back management (e.g. invoice deductions

The top challenges encountered by study participants during their deployment and implementation of their SCF technology included:
- Internal integration issues
- Need to redesign business processes to fit the new solution
- Staff resistance
- Training time and costs
- Lack of internal IT resources (Aberdeen 2007)

Collaboration is an active concept in the physical flow of supply chains. Collaboration is gaining greater acceptance in information flows. It follows that collaboration among supply chain participants will improve funds flow. Knechtges and Watts (2000) say this is especially important for the small business. They believe "If the entire channel and the entire chain is working together to serve the customer's expectations to the highest levels, it can truly be a win-win partnership. The common goals go back to being able to have a positive impact on customer service, profit, cash flow, and transportation costs. Long-term, well-managed partnerships can help everyone in the supply chain achieve their goals."

Summary

Successful supply chains manage three areas. First, they manage the physical flow of goods and services that provide value to the consumer. Second, they manage the information flow that documents and supports the physical flow. Finally, the information flow becomes an essential input to the funds flow from the consumer upstream in the supply chain until all suppliers receive compensation for their efforts. New technologies are making it easier for companies to improve the funds flow. As competition increases and supply chain lengthen around the world, the time required for reimbursement also grows longer. To maintain effective supply changes, and to assure the effective flow of funds, the large companies and third-party providers will become important links in keeping the small, struggling suppliers alive and well.

<div align="center">

References

</div>

1. Anonymous. 2007. Technology platforms for supply chain finance. Aberdeen Group.

2. Anonymous. 2006. Supply chain finance: The next cost-improvement battleground. *Business Finance.* Vol. 12, No. 11, p. 12, 2 pgs.

3. Bernabucci, Robert J. 2008. *Financial Executive.* Vol. 24, No. 3, pp. 46-48.

4. Bielski, Lauren, E-commerce gets real, ***American Bankers Association. ABA Banking Journal**,* 2001. Vol. 93, No. 10, p. 60, 3 pgs.

5. Chandler, Jr., Alfred D. 1977. *The Visible Hand, The Managerial Revolution in American Business*, The Belknap Press of Harvard University Press, Cambridge, Massachusetts.

6. Crandall, Richard E. and Karen Main. 2002. Cash is King, *APICS – The Performance Advantage*. Vol. 12, No. 1.

7. Farris, M Theodore II, Hutchison, Paul D, Cash-to-cash: The new supply chain management metric, *International Journal of Physical Distribution & Logistics Management*, 2002. Vol. 32, No. 3/4, p. 288,

8. Gentry, Connie Robbins. 2006. Moving money. *Chain Store Age*. Vol. 82, No. 2, p. 59, 2 pgs.

9. Grealish, Alenka, Making the business case for the E-financial supply chain, *Commercial Lending Review,* 2005. Vol. 20, No. 3, p. 40, 4 pgs.

10. Guerrisi, Joe, A capital idea, *World Trade*, 2001. Vol. 14, No. 8, p. 44, 2 pgs.

11. Kerle, Philip. 2007. Steady supply. *Supply Chain Europe.* Vol. 16, No. 4, p. 18, 4 pgs.

12. Knechtges, James P, Watts, Charles A, Supply chain management for small business – how to avoid being part of the food chain, *Hospital Materiel Management Quarterly*, 2000. Vol. 22, No. 1, p. 29, 7 pgs.

13. Krishnan, Muthu, Shulman, Jeff, Reducing supply chain risk, *The McKinsey Quarterly*, 2007. Iss. 1, p. 10.

14. Lewis, Julian. 2008. Demand drives supply chain finance. *Treasury Perspectives*. www.eurofinance.com.

15. Rajamani, Divakar, Geismar, H Neil, Sriskandarajah, Chelliah, A framework to analyze cash supply chains, *Production and Operations Management,* 2006. Vol. 15, No. 4, p. 544, 9 pgs.

16. Roberts, Julie S. 2002. The supply chain of dollars and cents. *Inside Supply Management*. Vol. 13, No. 6, p. 38.

17. Sadlovski, Viktoriya. 2008. The state of the market in supply chain finance: Drivers and strategies in 2007-2008. Aberdeen Group. www.aberdeen.com.

18. Sadlovski, Viktoriya, Beth Enslow. 2006. New Strategies for Financial Supply Chain Optimization. Aberdeen Group.

19. Sadlovski, Viktoriya, Beth Enslow. 2006a. Supply Chain Finance Benchmark Report, The New Opportunity to Improve Financial Metrics and Create a Cost-Advantaged Supply Chain. Aberdeen Group.

20. Warwick, David R. 2004. Toward a cashless society. *The Futurist.* Vol. 38, No. 4, p. 38, 5 pgs.

21. http://www.investopedia.com/university/ratios/workingcapital.asp.

Flexible Working Arrangements and Their Impact Upon Job Satisfaction in an Accounting Firm

Joseph Gilmore, CPA, CFE

Frostburg State University

Frostburg, MD 21532

301-687-4063

jgilmore@frostburg.edu

Dr. Richard Johnson, CPA

Frostburg State University

Frostburg, MD 21532

301-687-4452

rjohnson@frostburg.edu

Table of Contents

I.   Executive Summary

Huber, Michaels & Co. (HM), a regional public accounting firm located in Maryland and West Virginia, is looking to maintain a culture of flexibility that enables its employees to continually grow and develop as individuals and professionals, while at the same time improving performance and service to customers. Flexibility is a critical tool for recruitment and retention, as it enables the company's employees to realize their full potential by creating an environment that values productivity and results, as well as the opportunity to get the job done while balancing their other commitments.   Demand for new accountants continues to exceed supply. Employers need to be able to determine and offer attractive compensation and fringe benefit packages. Furthermore, many employers have no idea of the astronomical cost of employee turnover. On average, it costs anywhere from $4,000-$15,000 to recruit, hire and train a new employee, depending on his/her skill level. (Smith, 1999) New employees just aren't as productive, and it is easy to understand why HM has targeted employee retention as a key expense reduction opportunity.

Our literature review found that the popularity of flex-time is increasing due to employees' escalating demand for more of a balance between work and personal life commitments. Also important is that the recent strong demand for entry-level accountants has made jobs plentiful and employee turnover high. The review also pointed to age factors that may determine the attractiveness of flexible work arrangements with employees.

Based on the literature review, our belief is that offering flexible work arrangements to one's employees will increase employee satisfaction and also enhance employee retention. Furthermore, the extent of this increase is dependent upon on the age of the employee. Therefore, we will separate the employees' responses into two groups---Group A for employees 30 and older, and Group B for younger employees.

Data, via anonymous surveys, will be collected from both groups. We will also examine secondary company records regarding employees who voluntarily leave the firm. To measure employee satisfaction levels, we will distribute the HM Opinion Poll Surveys in November, 2008. To measure company retention rates, we will collect data from the Human Resources Department for the period beginning in January 2005 and ending in December, 2008. We will also mine these records and, with permission, contact former employees in order to try to determine the effect, if any, that flexible working arrangements or lack thereof had on the former employee's decision to leave the firm.

Since all other factors are held constant, we will determine the effect of flexible work arrangements by comparing the pre-test and post-test data from both the experimental and control groups. If there is a statistically significant difference in the results, we will consider offering flexible work arrangements to all HM employees.

We expect that workplace flexibility will prove to be a win-win arrangement for both the firm and its professionals. If this is so, HM will develop tools and guidelines to assist managers in exploring alternative staffing models through the creative use of flexible work

arrangements. HM's ultimate goal is to create a culture where flexibility is accepted as necessary to getting the work done, serving the clients and maximizing the potential of HM's employees.

BECAUSE OF ISSUES THAT APPEARED WHEN WE COLLECTED THE SURVEYS, THIS PAPER IS NOT COMPLETE YET (AND MAY BE SIGNIFICANTLY MODIFIED…)

I.   Introduction

A) An Overview

We decided to study what effect, if any, the initiation of flexible work arrangements has had upon both employee satisfaction and employee retention rates. Our objective is to determine whether or not a group of HM's employees have higher levels of satisfaction and higher retention rates after implementing flexible work arrangements when compared to not having the privilege.

This study is especially relevant because of the tight labor market and because of the increased emphasis on work/life balance. Furthermore, since gasoline prices (and, consequently, the expense of commuting) have fluctuated quite a bit in 2008, we believe that this concern has also affected employee's perception of flexible working arrangements. Employers want to enhance employee retention, and studies have shown that satisfied employees are more likely to stay with their current employer. Furthermore, quality-of-life

issues (of which a flexible work arrangement is one) also factor into an employee's decision

to remain with or leave an employer.

Our study also incorporated the age of the employee as a moderating variable. We believe

that employees value specific elements of an overall compensation package differently,

depending upon the employee's age. Work/life balance versus material rewards may make

the flexible work arrangements alternative more or less valuable, depending upon an

employee's age. Our research hopes to test the validity of this hypothesis.

The research questions are: "Has the introduction of flexible work arrangements affected

employee satisfaction and retention rates? If so, how? Does the employee's age make a

significant difference?"

B. Definitions of Key Terms

1. Five Basic Flexible Work Arrangements

The goal of flexible work arrangements is to assist companies in sharpening their focus on

work practices and processes that enhance or hinder effectiveness. They can serve as a

catalyst for finding new and more creative ways of helping employees work together, while

at the same time meeting client needs.

a) Flex-Time

Flex-time occurs when an employee is able to change his or her working hours from a

standard schedule to something that differs from others in the work group or shift. This can

be a variable day where the employee works a different number of hours each day, but the

total adds up to a regular 40 hour workweek. Or it can be a schedule with new starting and

ending times that vary from employee to employee, but remain the same every day.

b) Compressed Work Week

A compressed work week occurs when an employee works full time, but in only four, instead

of five, working days per week. This can be accomplished by working four ten-hour days, a

full-time work schedule of three days, or a scheduling in two weeks cycles where 80 hours of

work are completed in nine days instead of ten.

c) Telecommuting

In the case of telecommuting, work is done from home on a regular basis, with reduced days

in the office, or from another satellite location that is operated by the organization. The

number of days present in the office or telecommuting can vary. It can be arranged

according to necessity or with regular scheduling.

d) Part-Time

A part-time employee works less than full-time, usually 20 hours or more per week. Such

workers still remain eligible for benefits coverage. Compensation and time-off are adjusted

accordingly.

e) Job Sharing

Job sharing is a form of part-time work, where two employees share the responsibilities and duties of one full-time job. Typically, job share partners work at least 20 hours per week, so that they can remain eligible for benefits and paid time off. The split of the workload can be either 50/50 without overlap, a 60/40 split, or a 60/60 split where each employee works three days with a one day overlap.

2. Employee Satisfaction

Employee satisfaction can be defined as the amount of perceived contentment with one's work situation. This can be improved when employees feel they are being assisted by their employer to reconcile life and family needs with work demands, while at the same time being given the opportunity to contribute effectively to the goals of the organization.

3. Retention

Retention is the efforts of an organization to preserve the number of its human capital body for an extended period of time. It can be measured by comparing the number of employers at the start of a time period to the number of employees at the end of a time period. For a firm of HM's size, we will examine turnover.

III.   Literature Review

With the advent of the Internet, cell phone technology, notebook computers and high-speed communication, home life and business life have become more and more integrated. Due to this integration, employees are demanding more control over what they do when. This explains the growing demand for flexible work arrangements in businesses today.

A. Flex-Time Emergence

Flex-time has become a major business issue during the past decade as evidenced by a U.S. government report ("GAO Report To Congressional," 1991), wherein a review was done as part of a continuing assessment of the effectiveness of federal employment policies in helping government agencies recruit and retain quality employees now and in the future. Flex-time is very important ("Flexibility as a Management Tool," 1994). This article specified a road map that is the basis for implementing flexibility in a changing workplace.

Regarding management ("Flexible Work Arrangements:" 1995), the author emphasized that supervisors need to gather data, sift through the business objectives and set a course for flexibility as a management tool. Many companies ("The Joy of Flex Strategy", 1996) such as Hewlett Packard, as well as many banks and insurance companies, pioneered the implementation of flex-time strategies and practices. The literature cites many advantages of implementing flex-time, implying that it is an important management priority ("Using Flex-time To Create," 1993). Further, many major corporations began to implement and study the effects of flex-time in the early 1990's. This is exemplified by two case studies: Fleet

Financial Group (a global financial holding company) and BMA Company (a large insurance company). Both companies' flex-time programs were evaluated ("Flexible Time Off:" 1995).

B. Implementation Of Flex-Time

As the 1990's progressed, the flex-time concept became more prevalent in the business world, as cited in the article ("Change Comes Slowly," 1994). This article illustrated a glossary of flexible work terminology and flexible ways to work. The article stated that many companies find flexible work options effective. Some literature ("Employee Benefits: Tick Tock," 1996) contained a discussion on how specific companies are implementing flex-time programs within their organizations. Firms across all business disciplines have made strong efforts to implement flex-time initiatives ("Myth and Realities," 2000). One article ("Cultural Change Is The Work," 1998) states that changing values of the workforce have created an unprecedented demand for flexible diverse benefits and policies, but that flex-time initiatives must have a strong commitment from management and a culture that supports it. Another article ("The Perks: Employee Benefits," 2000) indicated that businesses today are rethinking their benefit packages in order to attract and retain the best workers, and flexibility in scheduling, more time off and family-friendly policies are being considered.

This movement towards flex-time initiatives has continued to get stronger in the late 1990's ("Trends: As Hours Lengthen" 1999), and it has been stated that Americans are putting in more hours than ever, but at least now they have more say than in years past about when they work them. Specifically cited are three forms of flex-time: gliding schedules, variable

schedules and compensatory time arrangements. Another article ("Making It Work," 1999)

emphasized that flexible work practices are increasing in Canada. Furthermore, an article

concluded that work-life options from telecommuting to compressed work weeks to job

sharing can help employers attract and retain employees as well as keep them happy and

productive. ("Comforts Of Home," 1999)   Flex-time has even caught on internationally, as

cited in "The Shift To Flexibility" (1999), which stated that United Kingdom productivity

will not improve without the adoption of working patterns that match employee demands

more closely.

C. Prior Studies

There have been many studies conducted in the past decade on the benefits of flex-time,

which highlights this concept's importance. First, according to one study

(Catalystwomen.org, 2000) by a nonprofit research and advisory organization that has a

mission to advance women in business, 24 women (mostly married and between the ages of

38 to 52 with two or three children) comprised a group that first began utilizing flexible work

arrangements over 10 years ago. Most of these women now hold middle and upper-level

management positions today. The study found that most of these women credit the

availability of part-time work schedules during their critical child-rearing years as the key to

maintaining their career momentum. The study concluded that flexible work arrangements

increased employee retention and satisfaction with flexible work arrangements as the

independent variable and employee retention and satisfaction as the dependent variables.

Further, another study by the same group (Catalyst-women.org, 1998) found that without the

ability to set their own pace and create individual career paths, companies are at risk of

losing valuable employees. Fifty-one percent of the women surveyed indicated that a desire

for flexibility was the top reason why they had left their employers. In a related study by this

group, 83% of the men and 83% of the women surveyed reported that they had taken

advantage of flexible work arrangements offered by their employers. The high response rate

by men indicates that men are taking a greater role in family life and, therefore, flexible work

arrangements are not just a woman's issue. All the studies concluded that flexible work

arrangements, the independent variable, is a key factor in helping people achieve their life

goals, while at the same time allowing businesses to hold on to talented and valuable

employees.

In a study cited in the literature ("Entrepreneurs, Flex-time," 1999), which surveyed 3,500

full-time workers, researchers found that flex-time increases employee productivity and also

discovered that there is increased employee retention when a firm offers family benefits.

This in turn allows for retention of valuable employees. In Canada, a study (Human

Resources Development Canada, 1995) found that the availability of flex-time arrangements

is increasing and that, especially with dual-income families with children under six, such a

benefit was very important. This study highlighted the moderating variable, age of

employee, which may be determinative on the relationship between flex-time and retention.

A report prepared for Congress (House Appropriations Subcommittee on Treasury, 1994)

contained updated information on a pilot telecommuting center program it initiated in 1993

and 1994. This study and report indicated that it was expected that flex-time arrangements

would improve productivity and improve customer service. An article ("Job Swaps Work

Well," 1996) cited WearGuard Corp., a manufacturer of uniforms and rugged work clothes,

which was able to control its annual attrition to well-below industry standards through flex-

time shifts. The article stated that this result was extremely impressive given that

WearGuard primarily offers minimum wage jobs (telephone clerks, order packers and

sewing-machine operators), which are not usually viewed as lifelong career opportunities.

This emphasizes the impact of flex-time, as independent variable, on retention, the dependent

variable. Another article ("Skip the Flex-time," 2000") cited a study showing that money is

the prime motivator for employees, followed by perks like flex-time. This BridgeGate

survey of 660 Americans was conducted December 28-30, 1998 by Market Facts, and found

that 46% of respondents said a raise would entice them to stay, while 50.5% of respondents

cited non-monetary issues. The survey also found that women are slightly more likely than

men to value flex-time (12% to 11.6%), and that older workers place more value on flex-time

than do other groups (13.55% of 45 to 54 year olds and 16.5% of 55 to 64 year olds,

compared to 12% of all other respondents). This study highlights the impact of age, a

moderating variable in the relationship between flex-time and retention. We found this

surprising as much of the other literature we reviewed indicated that younger employees

were more likely to place a premium value on flexible work privileges.

Social, political, economic, technological and other conditions affect the values of people in a

society and therefore, it is also useful to look at recent studies in an effort to confirm which

variables appears most relevant today to a study of flex-time. A study by the Nielsen-

Wurster Group ("Adjust Work Arrangements", 2000) found that productivity levels increase

when employees can blend work, home and personal interests. So, in order to entice and

retain the brightest employees, companies offer flex-time, home/office work share and

sabbatical programs. The study maintains that, on average, employees are satisfied with their

flexible work arrangement programs and rarely leave to go to competing firms, thereby

saving their company the costs associated with hiring new employees. In another article

("Flex-time Balances Life," 1999), the author cited a group called New Ways To Work,

which was founded to promote an understanding of flexible work arrangements over 27 years

ago. This group found that in the San Francisco Bay area, traffic jams and the increasing

number of two-income families have prompted firms to adopt flex-time programs. The

group also found that flex-time's popularity waned during the early 1990's recession, but has

bounced back since then. During strong economies, many companies have retention

problems due to the abundance of available jobs. Flex-time tends to give employees a sense

of control over their work environment and therefore reduces turnover, affecting retention

rates. As an aside, we are writing this in late September, 2008. The markets are in a turmoil

and words such as "recession" and "Another depression" are being bounced around. We

wonder what the situation will be when we present this paper in late February, 2009??? An

article ("Motivating the Troops," 1999) cited a nationwide survey of 500 business owners

polled by Arthur Anderson's Enterprise Group and National Small Business United. The

survey found that "…***retaining and motivating workers is the biggest challenge for small***

and mid-sized businesses." !!! The survey concluded that a company's commitment to their

employees' work/life issues is essential to maintaining a competitive advantage in hiring and

retaining qualified people.

Also strongly supporting the flex-time initiative, an article ("Tight Job Market Forces," 1999) states that due to the lowest unemployment rate in 30 years (at that time) (4.2%), U.S. companies are going to extraordinary lengths to retain employees. The article cites a survey that found that 66% of employees would give up part of their salaries if they had flexibility in their work hours and for them flex-time ranks higher in importance than health benefits. More recently ("Connelly," 2000) a company called Larsen Architects strongly implemented flex-time initiatives, in addition to other related activities such as an hour-long kick-boxing class, casual Fridays and summer company barbecues and trips. Specifically on the flex-time initiative, this company allowed employees to work four nine-hour days and then leave at noon on Fridays. Most of Larsen's employees have been with the firm since shortly after its founding in 1981, evidencing a strong retention rate. Connelly also cites a study conducted by the employment agency, Robert Half International Inc., 1999, which found that of the companies surveyed about workplace attitudes, 33% cited a positive work environment as the top factor in keeping employees satisfied, up from 9% in 1993.

E. Discussion

Since this topic has been studied and discussed extensively over the past two decades, any literature survey on this topic would require one to pick and choose amongst the most relevant literature. Based upon our literature survey, it is apparent that relationships appear to have been established between flexible work arrangements and increased employee satisfaction and retention. These relationships will be the basis of our study at HM company.

Numerous writings indicate that flex-time issues are more relevant today than ever, based on the strong demand for and the subsequent low levels of unemployment in the accounting profession. This causes employee recruitment and retention to be major issues for accounting firms; issues that could affect long-term profitability. An article ("Perks That Work," 1999) confirms this trend stating that the U.S. jobless rate has been less than 5% for over two years, causing some companies to become very concerned about retention. As a result, companies have focused their efforts on increasing the attractiveness of their benefits (including flex-time) and compensation packages in order to retain and attract employees. Also, another article ("Companies Stretch the Perks," 2000) states that to decrease employee turnover, many information technology firms are providing more and more employee benefits, including flex-time arrangements. These benefits recognize that, especially for younger workers, it takes more than a large salary to reduce employee turnover. Therefore, companies now realize that employees need to maintain a balance between life and work. This article stated that studies show that workers in their 50's and 60's are more motivated by compensation and recognition than free time, while workers between 20 and 50 demand more free time and a chance to improve their professional skills.

Our literature review clearly states the issues under consideration and emphasizes the importance of its conclusions for application within HM.

IV.   Theoretical Framework and Hypotheses

A. Research Question

Will the introduction of flexible work arrangements effect employee satisfaction and retention rates?

B. Theoretical Framework

We hope to show that the variance in the dependent variables, "Employee Retention Rate" and "Employee Satisfaction," can be explained, at least in part, by the presence or absence of the independent variable "Flexible Work Arrangements." This statement is based upon the presumption that some employees will not be able to adhere to a rigid work schedule because of responsibilities outside of the workplace. Although these employees are willing to work a full-time schedule, their need for flexibility prevents them from being able to follow the workplace norm for start and quit times. This deviation from the norm may cause friction between them and their colleagues and/or superiors, leading to lower morale and the intention to resign. We believe that both the lack of scheduling flexibility and conflict with co-workers will impair employee satisfaction, leading to "intention to quit" considerations. A satisfied employee is much more likely to remain with an employer and, just as importantly in this time of a tight labor market for accounting professionals, be less receptive to overtures from competitors or recruiters. We believe the ability to control one's work hours is one of the factors that positively impact employee satisfaction and we will perform a field experiment to test this hypothesis.

We also considered the moderating variable "Age of Employee" and designed our research accordingly. The relative importance of the components of a package of compensation and perquisites will vary according to an employee's individual needs. We hope to determine that the *importance* of the flexible work option will change depending upon the age of the employee. Specifically, do younger employees place less value upon this perquisite when compared to older employees? The older employee, having reached a position of means and comfort, may value perks (such as flexible work arrangements) as an enhancement to their work/family life. The younger employee may be more concerned with compensation and other material rewards, rather than those of a "quality of life" nature.
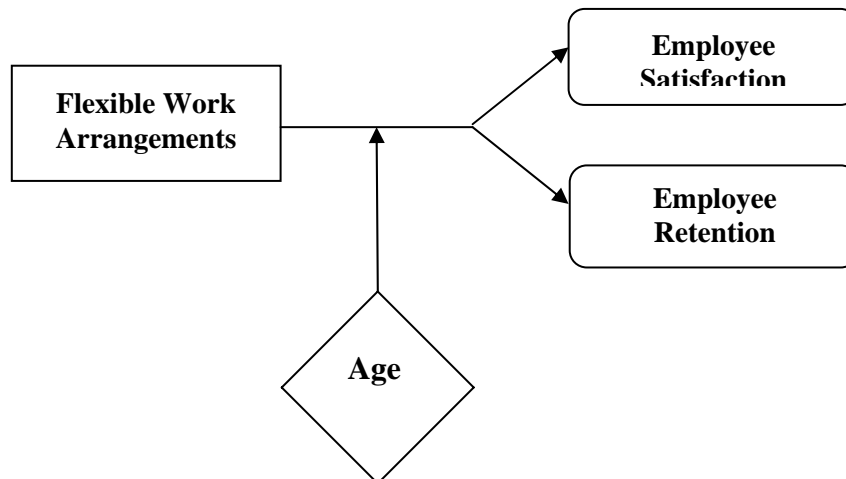
C. Hypotheses

1. *The initiation of flexible work arrangements has affected employee retention rates and levels of satisfaction depending upon the age of the employee.*

    This non-directional hypothesis addresses the presence of the moderating variable, "Age of Employee."

2. *The initiation of flexible work arrangements will have no effect upon either employee retention rates or employee satisfaction.*

    This is our null hypothesis.

V.   Study Design

Experimental designs allow us to manipulate or change the level of the independent variable under study (flexible work arrangements) and to assess its effect on the dependent variables (employee retention and satisfaction).

While it is extremely difficult to achieve a random sample in a non-contrived field experiment at a real-world company, we believe we have come up with a research design that provides the desired level of randomization. We intend to survey 100% of current employees, eliminating any problems with randomization. This goal will be more difficult to achieve regarding prior employees, but we hope to survey 100% of them going back to January of 2005 (almost four years).

It is important to note that this is a field experiment (treatment is given to one or more groups in a natural setting) to test a hypothesis ("Will flexible work arrangements effect employee satisfaction and retention?"). The units of analysis are HM's employees.

This is a causal study. We want to prove that flexible work arrangements lead to increased employee satisfaction and retention.

VI.   Methodology

We are using an anonymous survey to test our hypothesis that the adoption of a flexible work arrangements program will lead to increased levels of employee retention and satisfaction. This design calls for the collection of pre-test and post-test data from two groups (current---Group X and former---Group Y) of HM employees. We will also be analyzing by age (Group A--30 and over and Group B-- under 30

Since we are measuring the effect of the independent variable (flexible work arrangements) on two dependent variables (employee retention and satisfaction), we will be collecting data in two ways: survey questionnaires (see Appendix A) and company records. These two instruments will also collect moderating variable (age) data associated with employee retention and satisfaction to further prove our hypothesis statement.

A. Determining Employee Retention Rates

To measure retention rates, we will use secondary data readily available from the HM Human Resources Department to determine what percentage of employees has remained with HM over a time period of a year.

Retention rates within both groups can be analyzed using the following variables that are readily available from company records:

- Age
- Gender
- Tenure with the company
- Job function and job title

B. Determining Employee Satisfaction Levels

Employee satisfaction data will be collected from Group X and Group Y via a survey

questionnaire administered to all HM employees.

See Appendix A for a discussion of why these specific questions were used.

In late 2008, after the data has been collected and analyzed, we will compare responses from

all of the groups and use the survey responses as a benchmark to determine if flexible work

arrangements have had a positive effect on employee satisfaction for Group X versus Group

Y and also Group A vs. Group B.

C. Research Timetable

Period	Activity	Groups
October 2008	• Collect current number of HM employees	All
November 2008	• Current & former employees asked to complete the HM Opinion Poll	All
	•	
Jan 2008	• Complete research and prepare paper	All
	•	
Feb 2002	• Employee retention and satisfaction data are analyzed in order to identify impact of the flexible work arrangement program.	All

The number of employees in all groups/combinations will also be collected in November,

2008 from Human Resources.

D. Method of Analysis
The following are the various data analysis methods we will perform on our research

findings.

1. Frequency Distribution

The frequency distribution is a summary of the frequency of individual values or ranges of

values for a variable. The simplest distribution would list every value of a variable and the

number of persons who had each value.

2. T-Test

The T-Test assesses whether the means of two groups X & Y and also A & B are *statistically*

different from each other. This analysis is appropriate whenever a researcher wants to

compare the means of two groups. We will use the T-Test for evaluating our hypotheses

regarding the effect of flexible work arrangements on employee satisfaction. We will test the

null and alternate hypotheses as follows:

a) The Null Hypothesis: *The initiation of flexible work arrangements will have no effect*
   upon either employee retention rates or employee satisfaction.

b) The Alternative Hypothesis: *The initiation of flexible work arrangements will affect*
   employee retention rates and levels of satisfaction depending upon the age of the
   employee.

3. One Way ANOVA

The One Way ANOVA looks at the ratio of between-sample variance to within-sample

variance. We will use the One Way ANOVA to test the hypothesis that employee

satisfaction in a flexible work arrangement environment will vary significantly based on the

age of the employee. We will use the various age groups from our survey as the independent variables.

VII Research Results

The date is now Jan. 12, 2009 and we have completed the tabulation of the survey results.

Unfortunately, we have discovered two problems at this late stage. We believe that our sample size---14---is too small to be statistically valid. Furthermore, we were unable to contact prior employees---many had simply left the area. Others weren't willing to participate.

Please see the "Suggestions for further research" text in Section VIII for how we plan to address these problems.

For the present, we would like to discuss the results of the survey questions, acknowledging that the small sample size makes these results subject to error…

HM Opinion Poll Questionnaire

OUR COMMENTS ARE IN CAPITAL LETTERS & ARE INTERSPERSED
THROUGHOUT THIS SECTION.

> Welcome to the 2008 HM Opinion Poll Employee Survey. Your feedback is essential to building a winning HM – both in the workplace and in the marketplace. **Your responses are completely anonymous and will be held in strictest confidence.** After you have completed the survey please use the self-addressed stamped envelope to send your survey to Joe Gilmore at Frostburg State University. **Now, let's get started…**

1) Overall, how would you rate your satisfaction with HM? 5→1 (ANSWERS TO THE LEFT START AT "5" AND END WITH A "1" FOR THE ANSWER ON THE RIGHT) 4.36 HIGH SATISFACTION

❑ Very satisfied   ❑ Satisfied   ❑ Neither satisfied nor   ❑ Dissatisfied   ❑ Very dissatisfied

dissatisfied

_____

Please indicate how strongly you agree or disagree with the following statements:

2) I feel proud to work for HM. 4.50 GOOD RESULT

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

3) I like the kind of work that I do at HM. 4.14 CORRELATES WITH #1

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

4) My supervisor gives me feedback that helps me improve my performance. 4.00

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

5) My manager is sensitive to the relationship between my work life and personal life. 3.93 THIS IS WHERE FLEXIBLE WORK ARRANGEMENTS (FWA) ARE MORE OF A FACTOR IN THE RESPONSES

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

6) I am satisfied with the way my department is managed. 3.71

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

7) There is enough flexibility in the way we work in my area to allow the best possible performance. 4.29

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

8) HM provides the support I need to manage my personal life. 4.00 THE FACT THAT HM Co. OFFERS FWA HELPS HERE.

☐ Strongly agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree   ☐ Strongly disagree

9) The work environment in my area allows me to get the job done as quickly as possible. 3.93

❏ Strongly agree   ❏ Agree   ❏ Neither agree nor disagree   ❏ Disagree   ❏ Strongly disagree

10) I am provided with the necessary resources to perform my job. 4.50

❏ Strongly agree   ❏ Agree   ❏ Neither agree nor disagree   ❏ Disagree   ❏ Strongly disagree

11) I am able to complete my job responsibilities in a timely manner. 4.07

❏ Strongly agree   ❏ Agree   ❏ Neither agree nor disagree   ❏ Disagree   ❏ Strongly disagree

12) I am making an important contribution to the goals of the firm. 4.29

❏ Strongly agree   ❏ Agree   ❏ Neither agree nor disagree   ❏ Disagree   ❏ Strongly disagree

13) How often do your work and personal responsibilities conflict? 2.43 DESPITE THE PRESENCE OF SOME FWA AT HM Co., EMPLOYEES STILL EXPERIENCED CONFLICTS IN THIS AREA. AN INTERESTING FOLLOW-UP QUESTION ADDRESSING THE IMPACT OF WORKLOAD COMPRESSION (i.e. TAX/AUDIT SEASONS) MIGHT BE REVEALING…

❏ Very often   ❏ Fairly often   ❏ Sometimes   ❏ Once in a while   ❏ Never

14) I can put my skills to their optimal use in my current position. 4.14

❏ Strongly agree   ❏ Agree   ❏ Neither   ❏ Occasionally   ❏ Never

15) How often are you satisfied with your job? 3.86

❏ Always   ❏ Often   ❏ Sometimes   ❏ Rarely   ❏ Never

16) Do you plan to be working for HM one (1) year from now? 4.07 PERUSING THE EXCEL FILE WHERE THE SURVEY RESULTS WERE COMPILED MADE IT EASY TO PREDICT AN EMPLOYEE'S RESPONSE TO THIS QUESTION…

❑ Certainly   ❑ Probably   ❑ Not sure   ❑ Probably not   ❑ Certainly Not

Please take a moment to answer the following questions. These questions will not be used to identify specific individuals, rather they will help HM better understand how different groups feel about important issues. If, however, any of these questions make you feel uncomfortable for any reason, you may certainly choose not to answer them.

THESE 4 QUESTIONS WERE OPTIONAL---NOT ENOUGH RESPONSES TO BE VALID

17) Are you:

❑ Male

❑ Female

18) Your current marital status:

❑ Married/cohabitating

❑ Single/divorced/widowed/separated

19) Your Age:

❑ 18 to 24

❑ 25-29

❑ 30-44

❑ 45-54

❑ 55 or older

20) Do you have children under the age of eighteen living in your household?

❑ There are **no** children in my household under the age of eighteen.

❑ **Yes**, there are children in my household under the age of eighteen.

Recent research shows that the following 5 criteria are the most important when a potential employee considers accepting an offer from an accounting firm.

They are listed here in **_random_** order. Please rank them 1 through 5 ("1" being the most important to you & "5" being the least important to _you_)

Challenging work responsibilities   3.00

Respect for the firm's mission 3.15

Salary 2.31

Paid time off 3.54

Career growth possibilities 3.00

THE ACTUAL RANKINGS (FROM A MUCH LARGER SURVEY CONDUCTED BY THE AICPA IN 2008) WERE:
CAREER GROWTH POSSIBILITIES (MOST IMPORTANT)
PAID TIME OFF
SALARY
RESPECT FOR THE FIRM'S MISSION
CHALLENGING WORK RESPONSIBILITIES

WHEN CONSIDERING A JOB OFFER, HM'S EMPLOYEES APPEAR TO VALUE PAID TIME OFF THE MOST AND SALARY THE LEAST.

If you have any other criteria that were very important to you regarding your choice of employer, please list them here.

Other research reveals that the following areas represent the top 5 reasons employees stay at a firm. They are presented here in _random_ order. Please rank them 1 thru 5 in order of importance to _you_.

Challenging work 3.50

Management style 2.14

Salary 2.29

Career growth 3.43

Respect for the firm's mission 3.64

THE ACTUAL RANKINGS (FROM A MUCH LARGER SURVEY CONDUCTED BY
THE AICPA IN 2008) WERE:
RESPECT FOR THE FIRM'S MISSION
CAREER GROWTH
SALARY
MANAGEMENT STYLE
CHALLENGING WORK

THIS IS GOOD. HM'S EMPLOYEES RESPECT THE FIRM'S MISSION,
ENJOY/APPRECIATE CHALLENGING WORK AND WANT CAREER GROWTH.

If you have any other criteria that were very important to you regarding your decision to stay with your employer, please list them here.

"Flexible working arrangements" generally fall into 5 categories. Please indicate for each whether or not you participate in this type of an arrangement AND how important this benefit was to your decision to join the firm and also to your decision to stay.

Flextime---you can vary the start and finish time(s) each day, rather than always having to start & finish your workday at specific times.
Do you take advantage of "flextime"?
Yes   No 10/14 REPLIED "YES"

The availability of a flextime schedule was important for my decision to join the firm. 3.58
❑ Strongly agree   ❑ Agree   ❑ Neither agree   ❑ Disagree   ❑ Strongly
                                       nor disagree   disagree

The availability of a flextime schedule is important for my decision to remain with the firm.
3.93 THIS SPECIFIC FWA IS IMPORTANT TO HM'S EMPLOYEES

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
　　　　　　　　　　　　　　　　　　nor disagree　　　　　　　　　　disagree

Compressed work week---you can complete the number of hours that you are required to work in less than 5 days (for example---4 10-hour days)
Do you take advantage of a "compressed work week"?
Yes　　No 2/14 SAID "YES"

The availability of a compressed work week schedule was important for my decision to join the firm. 2.86

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
　　　　　　　　　　　　　　　　　　nor disagree　　　　　　　　　　disagree

The availability of a compressed work week schedule is important for my decision to remain with the firm. 2.86 RATHER INDIFFERENT TO THIS FWA

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
　　　　　　　　　　　　　　　　　　nor disagree　　　　　　　　　　disagree

Telecommuting---you can complete some or all of your tasks & responsibilities working from your home.
Do you telecommute?
Yes　　No 7/14 SAID "YES"
If you answered "Yes", approximately what percentage of your work is completed via telecommuting?
100%　　　　More than 75%　　　　About 50%　　　　25% or less
The availability of a telecommuting schedule was important for my decision to join the firm.
3.07

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
　　　　　　　　　　　　　　　　　　nor disagree　　　　　　　　　　disagree

The availability of a telecommuting schedule is important for my decision to remain with the firm. 3.36

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
　　　　　　　　　　　　　　　　　　nor disagree　　　　　　　　　　disagree

Part-time---you voluntarily work less than 40 hours per week.
Do you work part-time at the firm?
Yes   No 2/14 SAID "YES"

The availability of a part-time schedule was important for my decision to join the firm. 2.64

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

The availability of a part-time schedule is important for my decision to remain with the firm.
3.00

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

Job-sharing---you "share" one job's tasks & responsibilities with a co-worker. Both of you work less than 40 hours per week performing a job that would normally belong to just one full-time employee.
Do you "job share"?
Yes   No 1/14 SAID "YES" (The other job-sharer
                    must not have completed the survey…)

The availability of a "job share" schedule was important for my decision to join the firm.
2.43

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

The availability of a "job share" schedule is important for my decision to remain with the
firm. 2.43

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

You have completed the survey. THANK YOU!

VIII.   Limitations of Study & Suggestions for Future Research

As with any research study, there are several possible limitations of our research design and study. As discussed earlier, we will need to choose a different subject firm (much larger) in order to acquire a sample size that is sufficiently large to be statistically valid.

First, while the selection of the groups was 100%, participation in the flexible work arrangements program is not mandatory. This brings in the possible limitation of self-selection. Volunteers may be much different than the overall employee population in their reaction to flexible work arrangements, but are most likely representative of others in the company that may use this program. Therefore, we feel this should not seriously compromise the integrity of our results.

We acknowledge that the internal validity of our study could be threatened if the former employees left HM on less than excellent terms. Their resentment could cloud or skew their responses. These disgruntled employees would probably skew the satisfaction and retention results toward lower numbers than expected. Since participation from former employees was lacking, we need to explore this issue over a longer term and have employees, as part of the exit process, complete a similar survey tailored to their perceptions. Another exception could be those employees who, despite being satisfied and appreciative of the flexible work arrangements option, leave the company for unrelated reasons.

There is always the possibility that participants may not answer the surveys truthfully. This would give us information that is misleading and from which we could draw flawed conclusions.

Another possible limitation is a low response rate. Participation in completing the surveys is voluntary on the part of HM employees. This was certainly the case in our survey.

Finally, we freely acknowledge that there are other moderating variables that we could have considered instead of, or in addition to, age. Gender, presence of young children, marital status and family income all could have affected the importance of flexible work arrangements and its subsequent impact on employee satisfaction and retention. However, our topic of interest was age, as we were interested in whether or not this was a factor when an employee evaluated the attractiveness of the flexible work arrangements alternative.

So what is our solution to these problems? We feel that we need to choose a much-larger firm that has two locations that are geographically and operationally remote from each other. This firm should not have initiated any of the flexible work arrangements described in our paper. As an alternative, 1 or 2 arrangements could be in place at both locations---with only one location receiving additional alternatives at the beginning of the test period. At one location---unbeknownst to the other, initiate a program of flexible working arrangements. Since each location will _enter_ the test period on the same footing, subsequent changes in hiring results and especially achieved retention rates should be indicative of the value of these arrangements re: hiring & retention.

VIII. References

1. GAO Report To Congressional Committees, March 1991.

2. Flexibility As A Management Tool, Part 1 (December 1994). Employment Relations Today, Vol. 24, No. 4, Pg. 393.

3. Flexible Work Arrangements: From Policy To Implementation, Part 2 (September, 1995). Supervision, No. 56, No. 9, Pg. 10.

4. The Joy Of Flex Strategy (March, 1996). Management Review, Vol. 85, No. 3, Pg. 12.

5. Using Flex-time To Create A Competitive Workplace (January, 1993). Industrial Management, Vol. 35, No. 1, Pg. 29.

6. Flexible Time Off: Pragmatic Approaches (May, 1995). Compensation And Benefits Review, Pg. 57-62.

7. Change Comes Slowly (February, 1994). HR Magazine, Vol. 39, No. 2, Pg. 46.

8. Employee Benefits: Tick Tock (May, 1996). Corporate Report Minnesota, Vol. 27, No. 5, Pg. 60.

9. Myth And Realities Of Flexible Work Arrangements (April, 2000). CPA Journal, Vol. 70, No. 4, Pg. 14-19.

10. Cultural Change Is The Work/Life Solution (October, 1998). Workforce, No. 10, Vol. 77, Pg. 29.

11. The Perks: Employee Benefits (May, 2000). Indiana Business Magazine, No. 5, Vol. 44, Pg. 29.

12. Trends: As Hours Lengthen, Workers Gain Freedom To Set Them (November 3, 1999). The New York Times, Section G, Pg. 1, Column 5.

13. Making It Work: Shifting Towards Flexible Jobs For Parents (April, 1999). Today's Parent, Vol. 16(3), Pg. 64-66.

14. Comforts Of Home: Small firms that have added work-life benefits say they've boosted productivity and done better in hiring and retaining employees (September 13, 1999). Crain's Chicago Business, Pg. SB1

15. The Shift To Flexibility (October, 1999). Works Management, Vol. 52, No. 10, Pg. 20-23.

16. Flexible Work Arrangements III (July, 2000). Catalystwomen.org.

17. Women Entrepreneurs (1998). Catalystwomen.org.

18. Two Careers, One Marriage (1998). Catalystwomen.org.

19. Entrepreneurs, Flex-time Gives Edge In Hiring (1999). Enquirer.com.

20. 1995 Survey Of Work Arrangements (1995). Human Resources Development Canada.

21. Interim Report Through December 1994 (1994). Federal Interagency Telecommuting Centers, House Appropriations Subcommittee On Treasury, Postal Service and General Government

22. Job Swaps Work Well For Two Firms (7/7/96). Thomas Petzinger, Jr., SouthCoast Today.

23. Skip The Flex-Time, Boss And Gimme A Raise (July, 2000_. Ben Sullivan, The Zone News.

24. Adjust Work Arrangements To Entice, Retain Professionals (1/10/00). Patricia Galloway, Engineering Management

25. Flex-time Balances Life and Work… And Traffic (12/13/99). David Goll, bizjournals.com/eastbay.

26. Motivating the Troops (March, 1999). Tom Macon, Specialty Coffee Retailer.

27. Tight Job Market Forces Companies To Coddle Workers (9/15/99). David R. Francis, The Christian Science Monitor.

28. Perk-olater (June, 2000). Karin Connelly, Responsive Database Services, Inc., Business and Management Practices.

29. Perks That Work (10/11/99). Lynn Brenner, Business Week.

30. Companies Stretch The Perks To Pacify Precious Employees (2/21/00). Calli Schmidt, Washington Technology.

31. Easing Workers' Fears On Work-Family Programs (11/25/97). Diane E. Lewis, The Boston Globe.

32. Staff Retention: Hot To Attract, Keep And Motivate Your Employees (January, 1999). Gregory P. Smith, Construction Equipment Distribution.

33. Families Are Their Business (6/14/98). Denene Millner, Daily News.

34. The Other Elements Of A "Best Place To Work" (9/29/97). Bob Bellinger, Electronic Engineering Times.

35. Career News And Hot Tools (11/12/98). Healthcare PR & Marketing News.

36. The Business Argument For Flexibility (May, 1996). Baxter W. Graham, HR Magazine.

37. Work-Life Programs Reap Business Benefits (June, 1997). Michelle Martinez, HR Magazine.

38. Measuring Flex-Time Results (May, 1998). Partners Report the Monthly Update For CPA Firm Owners.

39. Retaining Employees In A Tight Labor Market; Practical, Cost-Effective Tips To Keep Your Top Performers (8/8/00). Samantha Cummins, AOC, PR Newswire.

40. The Business Argument For Flexibility (May, 1996). Baxter W. Graham, HR Magazine.

41. Work-Life Programs Reap Business Benefits (June, 1997). Michelle Martinez, HR Magazine.

APPENDIX A

HM Poll – Your Opinion Counts!

This year, Huber, Michaels & Co. is distributing an employee survey questionnaire to help determine employee satisfaction levels and areas that need overall improvement (if any). The HM Poll is a great opportunity for you to express your thoughts on how we're doing at HM overall, as well as giving you an opportunity to express your opinion on flexible working arrangements. This survey is anonymous---please do NOT enter your name anywhere and use the envelopes provided to mail the surveys back to Joe Gilmore at Frostburg State University.

Please return your completed survey no later than *January 5th, 2009. Thanks!*

Who participates?
The survey is distributed to all HM colleagues.

What happens to your responses?
Your responses are completely anonymous. Professors Gilmore & Johnson at Frostburg State University will use the data that they collect to analyze the flexible work arrangements' effects on recruitment, retention & job satisfaction and will report these findings to the firm.

Is it difficult to fill out?
No. The survey is not difficult or time consuming to complete.

Why participate?
Not only will your feedback help build a better firm, but you will also be helping us determine what benefits enhance your job satisfaction.

If you have any questions or concerns about this survey, its benefits or procedures, please do not hesitate to contact Joe Gilmore at jgilmore@frostburg.edu or call him at 301-687-4063.   Th**ank you!** Your feedback is essential for building a better HM – in the workplace and in the marketplace!

Sincerely,

_____   _____

Ed Huber   Tim Michaels

HM Opinion Poll Questionnaire

Welcome to the 2008 HM Opinion Poll Employee Survey. Your feedback is essential to building a winning HM – both in the workplace and in the marketplace. **Your responses are completely anonymous and will be held in strictest confidence.** After you have completed the survey please use the self-addressed stamped envelope to send your survey to Joe Gilmore at Frostburg State University. **Now, let's get started…**

1)Overall, how would you rate your satisfaction with HM?

❑ Very satisfied   ❑ Satisfied   ❑ Neither satisfied nor dissatisfied   ❑ Dissatisfied   ❑ Very dissatisfied

Please indicate how strongly you agree or disagree with the following statements:

2) I feel proud to work for HM.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

3) I like the kind of work that I do at HM.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

4) My supervisor gives me feedback that helps me improve my performance.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

5) My manager is sensitive to the relationship between my work life and personal life.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

6) I am satisfied with the way my department is managed.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

7) There is enough flexibility in the way we work in my area to allow the best possible performance.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

8) HM provides the support I need to manage my personal life.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

9) The work environment in my area allows me to get the job done as quickly as possible.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

10) I am provided with the necessary resources to perform my job.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

11) I am able to complete my job responsibilities in a timely manner.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

12) I am making an important contribution to the goals of the firm.

❑ Strongly agree ❑ Agree ❑ Neither agree nor disagree ❑ Disagree ❑ Strongly disagree

13) How often do your work and personal responsibilities conflict?

❑ Very often ❑ Fairly often ❑ Sometimes ❑ Once in a while ❑ Never

14) I can put my skills to their optimal use in my current position.

❑ Strongly agree ❑ Agree ❑ Neither ❑ Occasionally ❑ Never

15) How often are you satisfied with your job?

❑ Always   ❑ Often   ❑ Sometimes   ❑ Rarely   ❑ Never

16) Do you plan to be working for HM one (1) year from now?

❑ Certainly   ❑ Probably   ❑ Not sure   ❑ Probably not   ❑ Certainly Not

Please take a moment to answer the following questions. These questions will not be used to identify specific individuals, rather they will help HM better understand how different groups feel about important issues. If, however, any of these questions make you feel uncomfortable for any reason, you may certainly choose not to answer them.

17) Are you:

❑ Male

❑ Female

18) Your current marital status:

❑ Married/cohabitating

❑ Single/divorced/widowed/separated

19) Your Age:

❑ 18 to 24

❑ 25-29

❑ 30-44

❑ 45-54

❑ 55 or older

20) Do you have children under the age of eighteen living in your household?

❑ There are **no** children in my household under the age of eighteen.

❑ **Yes**, there are children in my household under the age of eighteen.

Recent research shows that the following 5 criteria are the most important when a potential employee considers accepting an offer from an accounting firm.

They are listed here in ***random*** order. Please rank them 1 through 5 ("1" being the most important to you & "5" being the least important to *you*)

Challenging work responsibilities

Respect for the firm's mission

Salary

Paid time off

Career growth possibilities

If you have any other criteria that were very important to you regarding your choice of employer, please list them here.

Other research reveals that the following areas represent the top 5 reasons employees stay at a firm. They are presented here in *random* order. Please rank them 1 thru 5 in order of importance to *you*.

Challenging work

Management style

Salary

Career growth

Respect for the firm's mission

If you have any other criteria that were very important to you regarding your decision to stay with your employer, please list them here.

"Flexible working arrangements" generally fall into 5 categories. Please indicate for each whether or not you participate in this type of an arrangement AND how important this benefit was to your decision to join the firm and also to your decision to stay.

Flextime---you can vary the start and finish time(s) each day, rather than always having to start & finish your workday at specific times.

Do you take advantage of "flextime"?

Yes   No

The availability of a flextime schedule was important for my decision to join the firm.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

The availability of a flextime schedule is important for my decision to remain with the firm.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

Compressed work week---you can complete the number of hours that you are required to work in less than 5 days (for example---4 10-hour days)

Do you take advantage of a "compressed work week"?

Yes   No

The availability of a compressed work week schedule was important for my decision to join the firm.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

The availability of a compressed work week schedule is important for my decision to remain with the firm.

❑ Strongly agree   ❑ Agree   ❑ Neither agree nor disagree   ❑ Disagree   ❑ Strongly disagree

Telecommuting---you can complete some or all of your tasks & responsibilities working from your home.

Do you telecommute?

Yes   No

If you answered "Yes", approximately what percentage of your work is completed via telecommuting?

100%   More than 75%   About 50%   25% or less

The availability of a telecommuting schedule was important for my decision to join the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

The availability of a telecommuting schedule is important for my decision to remain with the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

Part-time---you voluntarily work less than 40 hours per week.
Do you work part-time at the firm?
Yes   No

The availability of a part-time schedule was important for my decision to join the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

The availability of a part-time schedule is important for my decision to remain with the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

Job-sharing---you "share" one job's tasks & responsibilities with a co-worker. Both of you work less than 40 hours per week performing a job that would normally belong to just one full-time employee.
Do you "job share"?
Yes   No

The availability of a "job share" schedule was important for my decision to join the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

The availability of a "job share" schedule is important for my decision to remain with the firm.

❏ Strongly agree   ❏ Agree   ❏ Neither agree   ❏ Disagree   ❏ Strongly
                                        nor disagree   disagree

You have completed the survey. THANK YOU!

Questionnaire Defense

The following is a list of explanations why we have chosen each particular question for inclusion in the HM Opinion Poll survey.

1) Overall, how would you rate your satisfaction with HM?

This question relates to the variable of employee satisfaction. A person who agrees or strongly agrees with this statement is likely to satisfied with his or her work situation and will be proud to be working for HM

2) I feel proud to work for HM.

This question relates to the variable of employee satisfaction. A person who agrees or strongly agrees with this statement is likely to be a satisfied employee.

3) I like the kind of work that I do at HM.

This question relates to the variable of employee satisfaction and also to retention. A person who agrees or strongly agrees with this statement is likely to be a satisfied employee, and is therefore more likely to stay rather than leave the company.

4) My supervisor gives me feedback that helps me improve my performance.

This question relates to the variable of employee satisfaction. A person who agrees or strongly agrees with this statement is likely to be a satisfied employee.

5) My manager is sensitive to the relationship between my work life and my personal

   life.

This question relates to the variable of employee retention. A person who agrees or strongly

agrees with this statement is likely to intend to stay with HM, and is also less likely to be

looking for other employment. It also subtly brings in the concept of flex-time.

6) I am satisfied with the way my department is managed.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

7) There is enough flexibility in the way we work in my area to allow the best possible

performance.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

8) HM provides the support I need to manage my personal life.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be a satisfied employee.

 9) The work environment in my area allows me to get the job done as quickly as possible.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

10) *I am provided with the necessary resources to perform my job.*

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

Also, the question relates to the variable of employee retention. A person who agrees or

strongly agrees with this statement is likely to intend to stay with HM, and is also less likely

to be looking for other employment.

11) I am able to complete my job responsibilities in a timely manner.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

12) I am making an important contribution to the goals of the firm.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

 13) How often do your work and personal responsibilities conflict?

This question relates to the variable of employee retention. A person who agrees or strongly

agrees with this statement is likely to intend to stay with HM, and is also less likely to be

looking for other employment. It also subtly brings up the concept of flex-time.

  14) I can put my skills to their optimal use in my current position.

This question relates to the variable of employee satisfaction. A person who agrees or

strongly agrees with this statement is likely to be satisfied with his or her work situation.

Also, the question relates to the variable of employee retention. A person who agrees or strongly agrees with this statement is likely to intend to stay with HM, and is also less likely to be looking for other employment.

15) How often are you satisfied with your job?

This question relates to the variable of employee satisfaction. A person who agrees or strongly agrees with this statement is likely to be satisfied with his or her work situation. Also, the question relates to the variable of employee retention. A person who agrees or strongly agrees with this statement is likely to intend to stay with HM, and is also less likely to be looking for other employment.

16) Do you plan to work for HM one (1) year from now?

This question relates to the variable of employee retention. A person who agrees or strongly agrees with this statement is likely to intend to stay with HM, and is also less likely to be looking for other employment.

We included four demographic questions to help determine if any of these factors affected the retention of employees. By asking for the gender and marital status of the respondents, we wanted to ensure that we presented a well-rounded sample size for our survey. We included a question on the age of the participant, because that is, according to our theoretical framework, the moderating variable in the study. Finally, the question regarding children in the household will help us to determine if turnover, especially among female employees, can be reduced and work satisfaction can be increased by offering flexible work arrangements.

Ranking of the criteria associated with an employee's decision to join a firm and also his/her

reasons for staying at a firm helps to identify general influences upon the employee's

decisions.

Asking employees to evaluate the importance of various flexible working arrangements and

whether they are participating (given the opportunity) furthers our understanding regarding

which benefits, if any, are critical to attracting & retaining employees.

QUALITY CONTROL REVISIONS FOR CPA FIRMS:
BARRIERS OR OPPORTUNITIES?

Gregory S. Kordecki, School of Business, Clayton State University, Morrow, GA 30260
(678) 466-4507, gregkordecki@clayton.edu

ABSTRACT

The internal conduct and compliance with standards within public accounting firms has historically been accomplished on a self-regulatory basis. Additional monitoring of quality control standards has been accomplished through a peer review process. Recent changes in standards over professional services as they apply to how work is performed within the firm will soon be effective for CPA firms beginning January 1, 2009.   While these standards offer work practices which may lead to firm efficiency and effectiveness, they also present the challenges inherent in coping with cost increases and in warding off both encroaching internal industry and external regulation.

INTRODUCTION

In 2007, The American Institute of Certified Public Accountants (AICPA) issued two sweeping revisions impacting the quality control and peer review processes within and among CPA firms. Standards on Quality Control Standards No. 7, *A Firm's System of Quality Control,* was issued on October 10, 2007. *AICPA Standards for Performing and Reporting on Peer Reviews"* was issued in 2008. Both of these pronouncements carry an effective date of January 1, 2009. The Quality Control Standard (SQCS No. 7) permits earlier implementation.   The Peer Review Standard (PRS) does not allow for early implementation, and essentially requires all CPA firms with any type of client attestation work to fall under its umbrella for the firm's next peer review to be scheduled in 2009, 2010, or 2011. This paper describes the substantive pieces of these pronouncements emphasizing the quality control standard, and analyzes selected implementation problems, and concludes with suggestions on how to turn perceived barriers into opportunities.

A FIRM'S SYSTEM OF QUALITY CONTROL

A firm's system of quality control consists of policies designed to achieve select objectives, and the procedures necessary to implement and monitor compliance with those procedures. A system of quality control should, meaning "must" include the six elements of quality control. See figure 1.   The major changes in SQCS No 7 are the requirements for a written Quality Control Document (QCD), the additional emphasis for the new element of "Leadership Responsibilities," and the requirement for firms to establish criteria for which engagements will have an engagement quality review.

The first four elements are necessary for the last two to occur. Engagement performance and monitoring can only be successful if the first four are successful. In fact, the

distinction in how to separate the general nature from specific engagement aspects creates one of the key dilemmas for a firm in designing an upgraded quality control system.

Figure 1—Required Elements of a Quality Control System
• Leadership responsibilities
• Relevant ethical requirements
• Acceptance and continuance of clients
• Human resources
• Engagement performance
• Monitoring

INFRASTRUCTURE ELEMENTS

Leadership responsibilities include the objective of promoting a culture of quality. The "Tone at the Top" is the underlying objective. Management responsibilities should be assigned so that commercial considerations do not override the quality of work performed. Compensation and advancement practices should demonstrate a Firm's commitment to quality. The firm should further assign responsibility for quality control to personnel with sufficient and appropriate experience and ability, and must devote sufficient and appropriate resources to the development, communication, and support of the quality control system.

The second element of quality control is ethics. This is a recodification of the earlier standards on quality control for independence, objectivity and integrity. Compliance with relevant ethical requirements, and the understanding and communication of code(s) of conduct are essential. There is a new focus on procedures to identify and evaluate possible threats to independence and objectivity, and requires confirmation of independence with all attest engagements at leas annually.

The third element of quality control is client acceptance and continuance. The objective is to insure consideration of client integrity and the firm's competency and capacity to serve them. This element further requires a process that will recognize a lack of integrity in clients, and also the evaluation of capability and capacity. The emphasis on the engagement letter is solidified with the new requirement to obtain an understanding, preferably in writing, regarding the services to be performed.

Human resources is the fourth element of quality control. The main objective is to insure firm personnel have the competence, capabilities, and commitment to perform the firm's engagements. Human resources element covers recruiting and hiring, assignments, continuing professional education policies, performance evaluations, compensation and promotions. There is a specific requirement to provide adequate and appropriate continuing professional education for all professionals within the firm. The element of human resources also calls for responsibility for each engagement to be assigned to a

responsible party, usually an engagement "partner", who has the authority to bind the firm with respect to the performance of the professional services to be performed.

ENGAGEMENT ELEMENTS

These first four elements provide the inertia for the remaining two—engagement performance and monitoring. For firms properly addressing the first four elements with the design of appropriate policies and procedures, the final two analytical elements are more easily established and validated with firm policies and procedures that can address both the general operating nature of the firm as well as review of specific engagements.

The fifth element is engagement performance, which holds the objective to insure that engagements are performed in accordance with applicable standards, and includes how engagements will be planned, performed, supervised, reviewed, documented, and communicated. Reference and guidance materials, practice aids, software tools must be provided to staff conduct the engagement, and a policy for consultation both inside and outside the firm must exist. Of major significance is the establishment of the new requirement for the firm to have procedures addressing the nature, timing, and extent and documentation of the "engagement quality control review," which is designed to be a "cold" review of financials and selected workpapers, and include discussion with the engagement partner and supervisory personnel. Engagement performance also requires the completion of assembly of engagement files on timely basis to insure security of all documentation, and also provide the opportunity for differences of opinion with the firm to be resolved.

The final element is monitoring whose objective is to insure the firm's policies and procedures are relevant, adequate, operating effectively, and being complied with in practice. Monitoring procedures may be either continuous or at a point in time. Firms may Electing to conduct monitoring procedures at a point in time, may provided the opportunity of a block or cluster of reviews, in which common firm actions may be traced, and ways to improve work quality may surface. This approach to inspection makes sense in view of the peer review requirement for inspection to occur in each of the two years beyond each formal external peer review. In essence, monitoring captures all the other elements of quality control, as it insures compliance with policies and procedures established for meeting the objectives of leadership, ethics, client acceptance, human resources, engagement performance, as well as monitoring. Review of engagements is only one aspect. Monitoring further requires documentation of the procedures and findings, and the communication of those findings. The monitoring element also requires firms to establish policies and procedures for dealing with complaints and allegations of non-compliance with professional standards and firm policies.

EXTERNAL REVIEW AND HIGH RISK AREAS

The new requirements for peer review parallel the process of auditing in setting the risk of material misstatement. The combination of inherent risk and control risk is used by

peer reviewers, and a new "peer review risk" and undergoes the engagement with consideration of "detection risk." The new standards are more principles-based, make for a clear separation of "system" review" from other types of peer reviews, and provides for shorter and more concise peer review reports , which enhance the clarity, comparability, and understandability.   The new approach also makes clear whether a firm has deficiencies in the system of quality control or whether it has no system at all.

When comparing the new peer review document with the SCCS No. 7, several critical interfaces emerge. It becomes powerfully clear that firm's must have a written quality control document on file, in hand, and fully accessible. The QCD must contain the six required elements, and must also include both policies and procedures to satisfy the elements. Checklists are implied as being the key approach to satisfy these conditions. The peer reviewer will be interested in reviewing the firm's process of its engagement quality control reviews and monitoring, all with sufficient documentation, including the criteria for assigning reviewer(s), engagements selected, and the types of attest engagements selected.

<h2 style="text-align:center">PATHS TOWARD RESOLUTION</h2>

There are several approaches firms can take on minimizing the cost of implementing a revised system of internal control. If properly implemented, firms may actually realize a financial savings through reduced overhead.   A well-thought out plan of organizing a working QCD would be an ideal first step. Specific criteria for engagements selected and who performs reviews and how and when are they done would necessarily follow.

The practitioner has the ability to hand-craft and tailor suggested policies on the last two elements, especially engagement performance, where the "engagement quality control review" is required. For example, on the one hand, policy could be framed that calls for the firm establishing and maintaining criteria for how, what, when, and why engagements are used for the separate dimension of the engagement quality control review over what work may have been done in a workpaper review or technical review.

The practitioner is also better off evaluating specific engagements with separate policies and specific procedures for sign-off by the reviewer in each engagement. The former situation, a one-time, annual selection policy is a different type of policy from those policies needed in assessing the performance of the specific engagements once they have been selected! Consider the following information in Figure 2 for general policies:

<h3 style="text-align:center">Figure 2 – General Policy Controls over Engagement Performance</h3>

G1	The engagement teams assure the assembly of final engagement files on a timely basis;
G2	The Firm maintains the confidentiality, safe custody, integrity, accessibility, and retrievability of engagement documentation;
G3	The Firm retains engagement documentation for a period of time sufficient to meet the needs of the firm, professional standards, laws, and regulations;
G4	The Firm has criteria for determining whether an engagement quality control

	review should be performed, which period(s) should be covered per client, and that review is timely completely before any report on audit, attestation, or other assurance is released;
G5	The Firm establishes criteria for the eligibility of engagement quality control reviewers;
G6	The Firm establishes and maintains specific engagement performance standards, including specific checklists for application to each engagement, for the engagement quality control reviewers.

The reviewers can clearly consider these general policies (G1 through G6) separately from the more specific types of policies needed in evaluating the actual on-going performance of the specific attest engagement. See Figure 3 for examples of policies that are best considered on an engagement-by-engagement basis.

Figure 3 – Specific Policy Controls over Engagement Performance

S1	Planning for the engagement meets professional, regulatory, and the Firm's requirements;
S2	The engagement is performed, supervised, documented, and reported (or communicated) in accordance with the requirements of professional standards, applicable regulators, and the firm;
S3	The engagement team performs according to charges, and the process of any internal team work review, independent workpaper review, independent technical review, and this engagement quality control review, all lead toward finalization of the client's financial statements and the firm's report;
S4	The Firm requires that consultation take place when appropriate; that sufficient and appropriate resources are available to enable appropriate consultation to take place; that all the relevant facts known to the engagement team are provided to those consulted; that the nature, scope, and conclusions of such consultations are documented; and that conclusions resulting from such consultations are implemented;
S5	The Firm deals with and resolved differences of opinion, documents and implements conclusions reached, and does not release the engagement report until the matter is resolved;
S6	The Firm establishes and implements procedures addressing the nature, timing, extent, and documentation of the engagement quality control review;
S7	The Firm establishes and implements procedures resolving engagement conflict issues and other documentation.

The quality control team within the firm can then use this second set of specific engagement policies (S1 through S7) separately in the engagement quality control review for *each* engagement. This makes for advantages in both establishing and implementing these policies, but also makes for easier subsequent implementation in monitoring, where either the firm itself by inspection, or an outside peer review team has to plow through documents and try to unfold issues that apply to a specific engagement as opposed to the overall firm's system of quality control.

IMPLICATIONS FOR OPPORTUNITIES

Will clarity prevail in having separate checklists? With separate policies for general engagement performance assessment v. specific engagement quality control review, the firm can be develop better procedures, and the firm's staff wins in having a clearer checklist system (and saving administrative time).   This separation also works well in developing the policies for monitoring, and the firm may again tailor the procedures needed to address various policy items.

Finally, the entire firm also wins in having the "approach" to the system of quality control well documented. This makes for a working plan that can reduce staff time during both pre-issuance (engagement quality control review) and post-issuance (inspection and monitoring) review considerations of attest reports.   The firm management is then able to make easy modifications to the quality control system over time. Both efficiency and effectiveness can be maximized.

REFERENCES

[1] American Institute of Certified Public Accountants (AICPA). (2007). Audit and Accounting Practice Aid Series, Establishing and maintaining a system of quality control for a CPA firm's accounting and auditing practice. Retrieved August 15, 2008 from the Institute's web site via access:
http://www.aicpa.org/download/members/div/auditstd/System_of_Quality_Control_Practice_Aid.pdf

[2] American Institute of Certified Public Accountants (AICPA). (2007, October 10). Standards on Quality Control Standards No. 7, (SQCS No. 7), A Firm's System of Quality Control, AICPA *Professional Standards QC Section 10.*   Retrieved August 15, 2008 from the Institute's web site via access:
http://www.aicpa.org/Professional+Resources/Accounting+and+Auditing/Audit+and+Attest+Standards/Authoritative+Standards+and+Related+Guidance+for+Non-Issuers/quality_control_standards.htm

[3] American Institute of Certified Public Accountants (AICPA). (2008). Standards for Peer Review Services, (PR), A*ICPA* Standards for performing and reporting on peer reviews. Retrieved August 15, 2008 from the Institute's we site via access:
http://www.aicpa.org/centerprp/peerreviewstandards.htm

[4] American Institute of Certified Public Accountants (AICPA). (2008, June 16). White Paper*:* Navigating through the revised AICPA standards for performing and reporting on peer reviews and related interpretations--Effective for peer reviews commencing on or after January 1, 2009.
http://www.aicpa.org/download/centerprp/White_Paper_final_6_23_08.pdf

[5] Birch, S. M. (2008). A firm's system of quality control, *AICPA National Advanced Accounting and Auditing Technical Symposium* (NAAATS).

[6] Brackens, J. W. (2008). Peer review update, *AICPA National Advanced Accounting and Auditing Technical Symposium* (NAAATS).

[7] Hein, M.J. (2008). A little help from your friends. *California CPA,* October 2008, 14-16.

[8] Hein, M. J. (2008). Devil's in the details -- SQCS No. 7: A firm's system of quality control. *California CPA,* September 2008, 18-19.

[9] Kordecki, G. (2008). Quality control & peer review for 2009. *Firm-wide continuing professional education presentation (Kirschner & Associates),* September 23, 2008.

[10] Loscalzo, M. (2008). The new world of quality control. *New Jersey CPA,* July-August 2008, 16-17.

[11] McCrone, L. (2007). Auditor tips: Peer review findings point to areas to watch. *California CPA,* June 2007, 29-31.

[12] Monk, H.L. (2008). Auditing and attest standards update, *AICPA National Advanced Accounting and Auditing Technical Symposium* (NAAATS).

[13] Moran, P. (2008). The revised standards – A primer. *Current Accounts (Georgia Society of CPAs),* November/December 2008, 6. Also, available for retrieval November 15, 2008 from the Society's web site via access:
https://www.gscpa.org/Content/Files/Pdfs/NovDec08%20CA.pdf

[14] Rouse, C., Kordecki, G., & Birtz, J. (2008). The new quality control and peer review standards – Preparing for a successful peer review. *Assurance Services Section Webcast, Georgia Society of CPAs,* December 9, 2008.

[15] Schmutte, J. & Thieling, J. R. (2008). Peer review: An emerging niche market. *The CPA Journal,* July 2008, 56-60.

Biometric Data Security

James A. Pope
College of Business Administration
University of Toledo
2801 Bancroft St.
Toledo, OH 43606
419-530-2380
jpope@utoledo.edu

Dieter Bartmann
Universität Regensburg
Institut für Bankinformatik und Bankstrategie
93040 Regensburg
Germany
+49 0941 9 43 1881
dieter.bartmann@wiwi.uni-regensburg.de

Biometric Data Security

Abstract

Traditionally, the primary method of securing access to an IT system and its data bases has been passwords. More sophisticated methods have been developed. Among them are voice recognition, fingerprint identification, and typing recognition methods. We shall describe and discuss several of these methods and their relative advantages and disadvantages.

Biometric Data Security

With stories of data theft appearing almost daily in the press (e.g. Pereira, 2008), the issue of keeping data secure has become a critical issue with most organizations. Traditionally, the primary method of securing access to an IT system and its data bases has been passwords. For reasons we will discuss below, passwords have become increasingly deficient as a primary protection scheme. More sophisticated methods have been developed. Among them are voice recognition, fingerprint identification, and typing recognition methods. In this paper, we shall describe and discuss several of these methods and their relative advantages and disadvantages.

KNOWLEDGE BASED METHODS

Knowledge based methods include passwords and PINs. For a number of reasons, password protection, and PINs (which are the same thing) are no longer sufficient in modern information systems. Password secrecy cannot be guaranteed. With the increasing number of passwords the user has to remember, people resort to increasingly insecure methods of re-membering them. Some people keep a written list of their passwords, often in plain view in their work areas. Or, users may use the same password or close variations for all applications. Or, users may choose a password which is easy to guess, such as names of children or birth-dates. There is no way to prevent the unauthorized passing on of passwords. In downtown San Francisco poll, two-thirds of the workers asked exchanged their passwords for a $3 coffee coupon. In another poll, 80 percent of workers said they would disclose their passwords to someone in the company if asked. (Bjorn 2007) Often these shared passwords are kept in lists since the secondary user does not use them often enough to commit them to memory. This is especially critical against the background of constantly increasing damage potentials and stricter requirements in controlling risk. Computer viruses known as 'key loggers' can be

inserted onto a hard disk and record the key strokes which will include passwords or PINs. Beside the risk factor, passwords cause high costs in companies. Many employees forget their passwords. The reset is costly. For example, forty percent of all calls to help desks are for forgotten passwords. Each year, companies spend up to $150 per user trying to maintain secure passwords. (Bjorn 2007)

A form of passwords used in German banks is the transaction number, or, TAN. All on-line transactions must be accompanied by a TAN. The bank periodically sends the user a computer generated list of 120 or so TANs. One method is to ask the user to type in any TAN from the list (each one may be used only once). The computer authenticates it and allows the transaction if there is a match. This means the user needs only a sample of the TAN list available at any given time and the rest of the list may be kept secure. It would be easier, however, for an unauthorized user to guess the number. Another method is for the application to specify the sequence number of the TAN and then authenticate it. This reduces the probability of a guess, but means the user must have the entire TAN list available anytime there is a transaction. Neither method is particularly secure from a skilled and determined attacker. In addition, the TAN list method costs approximately €3 per year per customer.

TOKEN BASED METHODS

Token based methods include smart cards and other devices such as USB identifiers. Although the user cannot transmit the security code as with a password, the token can be loaned, lost or stolen. Tokens can also be expensive. Smart cards, for example, must be manufactured, personalized, and delivered to the customer. The German banking industry has estimated that smart cards will cost €50 per customer. This includes the three items we mentioned plus the security infrastructure and the cost of the misdelivered or misdirected cards. Tokens with imbedded RFID chips can be read without the owner's knowledge. For example, a cyber-intruder could sit in a busy mall with a reader in a briefcase and read the cards of peo-

ple walking past him. This has even spawned a secondary industry of protective shielding for personal cards. (Shepard, 2008)

BIOMETRIC METHODS

Biometric methods are those which use a personal characteristic of the user for authentication. The three most common are voice recognition, fingerprinting, and typing recognition (Welcome, 2008). A fourth which has received notice in the press, but which has limited usefulness is eye (retina/iris) identification. Each has its advantages and disadvantages, but, as we shall see, all are not equal neither in their range of applications nor in their usefulness or security levels.

Biometric methods have become a key technology for person authentication. A project survey (Graevenitz, 2007) yielded the following results:

The vast majority of those responding think that biometrics will be successful in the future, 40 percent predicted strong growth rates ranging up to over 60 percent per year. The International Biometric Group estimates that the yearly revenues of biometrics will increase from €3 billion in 2007 up to almost €6 billion in 2010. Experts think that *in the future, biometric methods will dominate the security market and replace passwords*. Nevertheless, important issues of practicability remain.

In Germany, the industry association Bitkom has estimated that the turnover revenue of biometrics will grow from €120 million in 2006 to €300 million in 2010. Government demand is very important here, up to 45 percent according to Soreon Research.

Success Factors and Problems

For a biometric method to be successful initially, it must provide additional security, be simple and fast and be comfortable to use. As it is put into widespread use, the costs and the error rates become increasingly important. With large numbers of users and transactions, the

error rates can yield intolerable numbers of errors. For example, a system which is 99.9 percent accurate will still yield 100 errors per million transactions. This is in contrast to Six Sigma which specifies 3.4 errors per million as a maximum. Two key measures of quality in any system are 1) the false rejection rate (FRR) or false non-match rate (FNMR) or, more generically, false negatives; and 2) the false accept rate (FAR) or false match rate (FMR), or, more generically, false positives. (Basics 2008)

Eye Identification

This method involves scanning either the retina or the iris of the eye of the user and either comparing it to a pattern in the user's file or to a pattern on an ID carried by the user. The iris is preferred since it is possible to damage the retina by scanning it with a laser beam. The method is highly accurate since each individual's iris pattern seems to be unique.

The primary drawbacks are size and cost. This method requires expensive, bulky equipment, so is useful only when the user comes to the system. Examples are security checkpoints (such as at airports) or fixed terminals (such as cash machines). (Lichanska, 2008) A user may also be forced to verify his or her identification by intruders. In the case of large scale operations such as airport security, it is unlikely that all passengers will have their patterns on file, so they much carry special cards. Unless the identity pattern is encrypted in a highly secure manner, the system can be easily fooled. Age and disease (cataracts, for example) can also alter the eye patterns, so the file pattern would have to be updated periodically.

A final problem is scalability. A given system, under ideal circumstances, will yield a fixed level of security. The system cannot be changed easily to adapt to the required security need of the application. On the other hand, the system cannot be fooled with a representation of the retina or iris. (Lichanska, 2008)

Voice Recognition

One of the largest companies providing voice recognition technology for security purposes is Voice.Trust, AG in Germany. Their system is used primarily to reset forgotten passwords. Founded in 2000, they have approximately 250,000 licenses installed.

The principle advantage of voice recognition is simplicity and ease of use. Within an enterprise with an internal phone system, minimal additional equipment is needed. The user is prompted to speak a phrase, and the system matches the speech pattern to a file on that individual. It does require the individual to 'train' the system.

There are a number of problems with a voice recognition system. The system can be fooled if the user's voice is recorded and played back by an intruder. (Biometric Authentication 2008) The user can be forced to use the system, although stress may alter the speech patterns to the point where they do not match the file. A user may also 'give away' sample recordings of their speech patterns in collaboration with an outside intruder. Even in normal use, the password is given to the user in a non-encrypted manner which may be intercepted. Furthermore, employees have shown a reluctance to use the system knowing that their voices are recorded. At one large German bank, 80 percent of the employees still preferred using the help desk for password reset rather than the voice recognition system. Voices may change with age or illness, but the system may be 'retrained' to adapt to these changes.

More serious is the limitation on accessing the system from outside the enterprise. Although voice systems are available through the internet, the quality of the system and, thus, transmission can vary widely. This may make it difficult for off-site users to access the home system. Because of the low level or lack of encryption, the system is more susceptible to interception or attack when used remotely.

Voice recognition is scalable. To increase security at any given time, the user can be asked to speak longer sentences.

Fingerprint Recognition

Fingerprint recognition is similar to eye recognition in terms of advantages, disadvantages and scalability. The required equipment tends to be smaller and less expensive. A fingerprint scanner imbedded in a mouse, for example, can be purchased for as little as $50. (APC, 2008) This makes it possible for a user to carry the equipment while travelling; but, on the other hand, requires the user to carry special equipment. This means the user must have his or her own computer, or the computer being used must be equipped with the hardware and software interface to use the equipment. A common use is to use a fingerprint scanner to protect a file containing the user's passwords. (Groom 2007; Harris 2008) Fingerprints are easier to gather on a large scale (and are often done so as with people in the military), so loading the database of patterns would be less onerous than with eye scanning when they are used for identification. A drawback, however, is that some types of scanner can be fooled by pictures or molds of fingerprints. (Harris 2008)

Typing Recognition

Typing recognition analyzes the pattern of a user's typing and grants or denies access bases upon a match on file. Early methods, such as BioPassword, are similar to the eye, voice and fingerprint systems. A sample is on file, and the system directly compares the way the user types the sequence with the file sample using features such as speed and rhythm.

The other approach, used by a system called Psylock (Bartmann, 2007a, 2007b), analyses the user's typing with a statistical model which measures thirteen characteristics of a person's typing such as right- and left-handedness, general features of typing (ten-finger system, typing with two fingers, ...) and the precision of typing (overlaps: a second key is pressed while the first key was not yet released, and so on). The process records the basic observation

data 'key holding time' and 'time of transition'. The program then generates and calculates the parameter for a complex stochastic model. The method analyses beside the typing speed and rhythm also precision, typical typing mistakes and correction behaviour, right- and left-handedness, typical interruptions -- up to thirteen (13) features of typing behavior. The various features are individually weighted using a simulated neural network.

In other words, the user may type any sequence, using a different one each time, and the system analyzes the typing characteristics and either grants or denies access. In practice, the system gives the user a sentence to type when prompted.

Typing recognition, in general, has the advantage that no additional equipment is necessary. The system in the home server analyzes what is typed from any keyboard. Systems such as BioPassword are more sensitive to different keyboards since they much match a given pattern. Since Psylock uses a statistical model, it is keyboard independent. Both require the user to 'train' the system to recognize their typing patterns. No additional equipment means there is no cost for equipment, distribution, installation, maintenance or replacement.
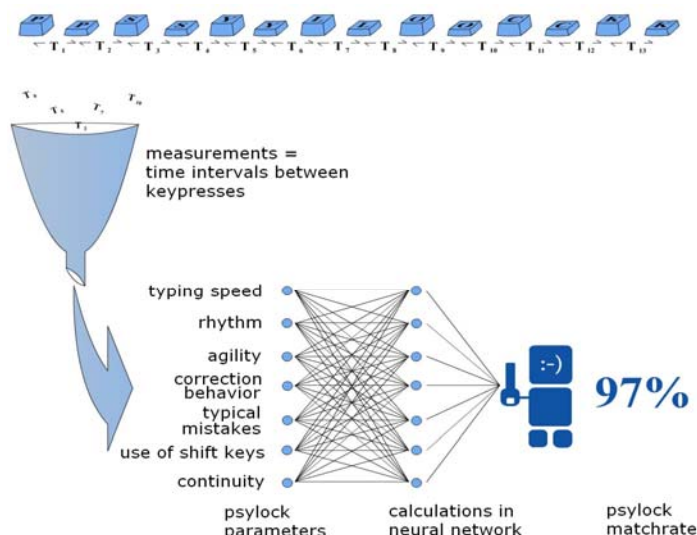
Figure 1. Illustration of the Psylock methodology

An additional advantage of Psylock is scalability. Since it does not try to match a pattern, the system can generate a sentence of any length or complexity. The longer and more complex the sentence, the more secure the system. The system can automatically determine the required security level and give the user a longer or shorter sentence to type.

Finally, the user cannot share the Psylock 'key' as one can a password or PIN. Even if one knew all the parameters used in the statistical model, one could not describe his or her typing technique in a manner which could be used to gain unauthorized access. The user generally could not be forced to enter the system since the stress would cause the typing characteristics to change. There is no secrecy in Psylock. Anyone can see the sentence the user is asked to type; only the correct user can type it correctly.

As with all biometric methods, something could happen to the 'biology.' A broken or sprained finger, for example, would change the typing characteristics, although it would affect the early systems more than Psylock. In the case of a permanent change (arthritis, missing digit, etc.) the system could be 'retrained.'

Something that the other methods do not have that Psylock does is the ability to run in the background. Without the user's explicit knowledge, the system could determine if given users are who they say they are. In e-mail applications, the system could determine if the person typing the message is the one identified as the sender. Or, it could sound an alarm in a security area if an unauthorized user is typing on a terminal. Or, in distance learning, it could determine if the person taking the exam is the one who signed up for the course (but, alas, it cannot tell if someone else is sitting there giving the answers, or if someone is a surrogate course taker).

Areas of Application for Psylock

Since it is a pure software solution based on a stochastic model, Psylock has a great deal of flexibility compared to the other methods. The most interesting application is for web

access. All web authentications that have been using passwords so far (e-Bay, PayPal, Amazon, on-line banking, etc.) can be secured with Psylock. Worldwide remote access to the company network through the internet is possible as well. With Psylock age recognition for the legal protection of children and youth is possible. Registration has to be done only once to be used as a secure gate to gain access to the internet. The application which should find the most popularity among consumers is the authentication of individuals in Web 2.0. The security and comfort of online banking applications can be significantly increased. Typing behaviour shown while filling out a transfer form is analysed and the result added to the transfer as a fraud resistant signature. This makes TANs (transaction numbers) obsolete and prevents phishing. It is possible to offer a virtual USB stick secured with Psylock as a web service.

Psylock can be used for login at computer workstation instead of or, if necessary, in addition to a password. If the customer definitely wants to keep the password, he can at least simplify the reset procedure with Psylock. This saves time and costs. Psylock can be used as a digital signature on a typed document or as a proof of authorship, e.g. in secure emailing. This use would be appropriate for government sectors. It can be used to improve the security of access to common data bases in supply chains involving firms in several countries.

Comparative analysis (conducted by Wincor Nixdorf AG)

The Wincor Nixdorf AG conducted a comparison of Psyock, its own product Pro Tect/Work Enterprise (Fingerprint) and the voice recognition software VoiceTrust.

Comparison of biometric methods

Characteristics	ProTect/Work Enterprise	Voice Trust	Psylock
Description	Authentication by fingerprint	authentication by voice	authentication by keyboard
necessary devices	fingerprint sensor	telephone	computer keyboard
authentication variants	identification/verification	verification	identification
Enrollment			
procedure	authenticate 1-10 fingers 3 times and verify once	speak 3-10 given name pairs 3-7 times	type a given sample 20 times
time consume	3-5 minutes per user	5-10 minuter per user	5-10 minutes per user
dependencies	quality of the sensor	speech channel (mobile, VOIP, fixed telephone)	none (wireless keyboards still problematic
authetication			
procedure	place a given finger on the sensor	speak the necessary name pairs	type a given typing sentence
time consume	1-2 seconds	2-3 minutes	10-30 seconds depending on the length of the typing sentence
use cases			
login to PC	yes	limited, if at all	yes
activations/ password reset	not necessary	yes	yes
legitimation processes	mostly not, because of the necessary hardware	yes	yes

Table 1. Comparison of Biometric Methods

Possible use cases

Integration	ProTect/Work Enterprise	Voice Trust	Psylock
Individual use cases	yes	yes	Yes
Access systems	yes	yes	yes
Email / Document signature	limited	limited	yes
Legitimations like online banking	limited	yes	Yes
Online Authentication service	no	limited	yes

Table 2. Uses of Three Biometric Methods

Conclusion

Data security is an important problem now, and will continue to increase in importance. The US Air Force is currently (April, 2008) running recruiting commercials on TV showing Airmen whose sole job is defending Department of Defense computers against intruders. Given the significant weaknesses of knowledge and token based security methods, biometric methods will become ever more important. As with many applications in the IT area, the crux of the matter may hinge upon whether the protectors or the hackers advance most rapidly technologically.

References

APC Biometric Mouse (2008) Retrieved June, 2008, from
http://www.cnet/review/mice/APCBiometricMouse.htm

Bartmann, Dieter and Wimmer, Martin, (2007a) "Kein Problem mehr mit vergessenen Passwörtern," *Datenschutz und Datenversicherheit*, 3, 1-5.

Bartmann, Dieter, Bakdi, Idir, and Achatz, Michael, (2007b) "On the Design of an Authentification System Based on Keystroke Dynamics Using a Predefined Input Text," *International Journal of Information Security and Privacy*, 1 (2), April/June, 1-12.

"Basics of Biometrics", retrieved May 30, 2008 from
http://www.biometricinnovations.com/BiometricTechnology_Overview.html

"Biometric Authentication: Which Method Works Best?" retrieved from
www.technovelgy.com, 2 April 2008.

Bjorn, V. (2007) "Solving the Weakest Link in Network Security: Passwords" retrieved 2 June 2008 from http:///www.digitalpersona.com

Graevenitz, G. (2007) *Erfolgskriterien und Absatzchancen biometrischer Identifikationsverfahren*, Münster – Hamburg.

Groom, R. (2007) "Fingerprint Scanner: Help Remembering Passwords with Your Finger" retrieved from www.espionageinfo.com, 2 April 2008.

Harris, T. (2008) "How Fingerprint Scanners Work" retrieved from http://www.about.com, 17 May 2008.

Lichanska, Agnieszka (2008) "Retina and Iris Scans", retrieved from
http://www.espionageinfo.com, 2 April 2008.

Pereira, Joseph (2008). "Chains Report Stolen Card Data," Wall Street *Journal*, 18 March, p. B4.

Shepard Envelope Company (2008), Auburn, MA. See: www.shepardenvelope.com

"Welcome to Biometrics Australia", retrieved May 30, 2008 from
http://www.biometricsaustralia.com/

HUMAN RESOURCE ACCOUNTING AND THE BALANCED SCORECARD

Maria L. Bullen, Clayton State University, 2000 Clayton State Boulevard
Morrow, Georgia 30260, 678-466-4516, MariaBullen@Clayton.edu

Adel M. Novin, Clayton State University, 2000 Clayton State Boulevard
Morrow, GA, 30260, 678-466-4508, AdelNovin@Clayton.edu

ABSTRACT

This paper investigates how Human Resource Accounting (HRA) measures may be useful as a component of the Balanced Scorecard. Human Resource Accounting (HRA) involves accounting for the company's management and employees as "human capital" or assets that provide future benefits. The Balanced Scorecard is a performance measurement process that focuses on multiple dimensions of Financial, Internal Process, Customer, and Learning and Growth. The authors believe that Human Resource Accounting measures incorporated in a Balanced Scorecard performance measurement system can help an organization define and orchestrate its strategy for success.

INTRODUCTION

Human Resource Accounting (HRA) involves accounting for the company's management and employees as "human capital" or assets that provide future benefits. Traditional accounting treats costs related to a company's human resources as expenses on the income statement that reduce profit, rather than as assets on the balance sheet that have future value for the company. On the other hand, Human Resource Accounting (HRA) involves accounting for the company's management and employees as "human capital" or assets that provide future benefits. HRA suggests that the process of measurement, as well as the measures themselves, have relevance in decision-making. The Balanced Scorecard developed by Robert Kaplan, a professor at Harvard University, and David Norton, a consultant [10] [11] [12] is a framework to organize the process of measuring groupings of financial and nonfinancial performance measures that support the strategies particular to an organization. The Balanced Scorecard includes the performance areas in the multiple dimensions of Financial, Internal Process, Customer, and Learning and Growth. It facilitates linking company goals to these key performance indicators in order to measure critical factors that have a significant impact on the future success of the company. Both HRA and the Balanced Scorecard facilitate the importance of a long-term rather than short-term perspective in management decision-making and performance evaluation.

THE STUDY

The Balanced Scorecard is a powerful tool for performance measurement. In addition to the historical financial measures often considered lagging or backward looking, the Balanced Scorecard performance approach scores additional leading or forward looking measures which

predict performance and success over the long-term. Although HRA measures may have relevance for the "Financial" component, probably the most practical HRA application is in the forward looking "Learning and Growth" component which provides measures to assess how the company will be able to continue to improve and create value as a result of skilled and innovative employees, positive corporate culture, and technological development, all factors which impact the development of other areas. HRA measures can assist in measuring Learning and Growth component key performance indicators related to employee training and management development, employee retention, and employee value in the organization.

Both HRA and the Balanced Scorecard have adapted to changes in the economic environment, and both recognize the importance of human capital in innovation and technology, crucial factors for the long-term success of organizations. The origins of HRA came about from the shift in an industry based economy with a focus on physical assets such as factory, machines and equipment, to a high technology, information, innovation based environment with a focus on the expertise, talents, creativity, skills, and experience of people—the company's human capital. With the recognition of this human capital intensive economy, starting in the 1960s a growing body of theoretical, empirical and field research ensued in order to develop accounting for human assets, referred to for the first as Human Resource Accounting by Brummet, Flamholtz and Pyle [3].

HRA has implications for both external financial reporting and internal managerial reporting. As some authors have recently discussed [1], although the importance of human capital in firm value creation is firmly established in the literature, the level of emphasis placed on human capital disclosure by preparers of financial statements in minimal. External financial reporting is utilized in financial statements in organizations' annual reports distributed to external users such as stockholders, bankers, and potential investors and lenders.

External reports for public companies, and often for private companies seeking financing, must follow "generally accepted accounting principles" (GAAP) in order to encourage objective, reliable and verifiable measurement to facilitate assessment of the company's financial standing and comparability among organizations. It is recognized that there are problems with reporting human assets on the balance sheet for external financial reporting in that there is subjectivity in measuring human assets. The same problems holds true for reporting intangible assets such as goodwill and patents that have been internally generated rather than paid for through a corporate acquisition. Just as GAAP does not allow reporting of human resources as assets, accounting rules do not allow for these intangible assets to be reported as assets.

Whereas there are difficulties in external financial reporting of HRA measures, HRA may best be used as a managerial tool to aid in making decisions that will benefit the long-run strategic goals and profitability of the company. As opposed to external financial reporting, managerial reporting does not require adherence to a strict set of GAAP in specific financial statements in acceptable format reported to the public. However even if human assets are not reported on the face of external financial statements, HRA can play a crucial role in internal managerial decision-making, and HRA measures can be used to show that investments in a company's human resources may result in long-term profit for the company. Over the years of its

development, HRA has been shown to be a useful tool in measurement and management in organizations [4] [6] [8] [7] [13].

As much as the measures themselves are relevant in managerial decisions, it is also useful to recognize that when managers go through the process of HRA measurement treating human resources as capital assets, they are more likely to make decisions that treat the company's employees as long-term investments of the company. Flamholtz [5] describes the HRA paradigm in terms of the "psycho-technical systems" (PTS) approach to organizational measurement. According to the PTS approach, the two functions of measurement are: 1) process functions in the process of measurement and 2) numerical information from the numbers themselves. Whereas one role of HRA is to provide numerical measures, an even more important role is the measurement process itself. The HRA measurement process as a dual function attempts to increase recognition that human capital is paramount to the organization's short and long-term productivity and growth. When managers go through the process of measuring human resources, they are more likely to focus on the human side of the organization and are more likely to consider human resources as valuable organizational resources who should be managed as such.

The Balanced Scorecard also recognizes the importance of the process of measurement in getting management to pay attention to strategic areas that will improve the long-term success. For example a strategy for success includes management's consideration of attention to leading or forward looking performance measures based on learning and growth, which are relevant in improving the company's ability to innovate. Factors such as amount spent on employee training, employee satisfaction and employee retention are measured, and performance graded as part of the Balanced Scorecard approach. Although management does need to know the results of past decisions through the financial information, management also needs to know the future impact of current decisions, and the Balanced Scorecard accommodates this need. As reported in Atkinson, et al. [2] surveys indicate that 60% to 70% of companies worldwide use some version of the Balanced Scorecard approach; and that the Balanced Scorecard has been adapted in public sector and nonprofit organizations as well.

In a potential layoff decision with use of HRA measures included in the Learning and Growth component of an organization's Balanced Scorecard, rather than only traditional accounting measures, management is better likely to see the hidden costs to the company's human resources and the long-term implications to the human assets. This is because HRA views human resources as assets or investments which must be maintained for long-run productivity. Layoffs may affect future long-term decreases in profits from lost productivity, costs of rehiring and retraining when business returns, and costs of lower morale of existing workforce. If management quantified the actually costs of layoffs, management might be less inclined to use layoffs as a way to cut costs and boost short-term profits at the expense of long-run productivity and profits.

CONCLUSION

Just as the field of HRA has grown globally, significant interest in HRA has expanded and crossed over into fields other than accounting—including economics, organizational management, and organizational culture— and inspired related research. This paper has explored how Human Resource Accounting measures incorporated in a Balanced Scorecard performance measurement system can help an organization define and orchestrate its strategy for success. The Balanced Scorecard approach to performance measurement which has gained substantial attention and use in recent years provides further opportunities for utilization of Human Resource Accounting measures.

REFERENCES

[1] Abhayawansa, S. and I. Abeysekera. (2008) An explanation of human capital disclosure from the resource-based perspective." *Journal of Human Resource Costing and Accounting, 12* (1).

[2] Atkinson, A., Kaplan, R. Matsumura, E. and Young, S. (2007). *Management Accounting*. New Jersey, Pearson, Prentice Hall.

[3] Brummet, R.L., Flamholtz, E.G. and Pyle, W.C. (1968, April). Human resource measurement: A challenge for accountants. *The Accounting Review*, 217- 224.

[4] Brummet, R.L., Flamholtz, E.G. and Pyle, W.C. (1969, August). Human Resource Accounting: A tool to increase managerial effectiveness. *Management Accounting*, 12-15.

[5] Flamholtz, E.G. (1979, January). Towards a psycho-technical systems paradigm of organizational measurement. *Decision Sciences*, 71-84.

[6] Flamholtz, E. G. (1985). *Human Resource Accounting,* San Francisco, CA: Jossey-Bass Publishers

[7] Flamholtz, E. G. (2005). Conceptualizing and measuring the economic value of human capital of the third kind. *Journal of Human Resource Costing and Accounting*, *9* (2), 2005, 79-9

[8] Flamholtz, E.G., Bullen, M.L., and Hua, W. (2002). Human Resource Accounting: A historical perspective and future implications. *Management Decision*, *40* (10), 947-954.

[9] Flamholtz, E.G., Bullen, M.L., and Hua, W. (2003). Measuring the ROI of management development: An application of the stochastic rewards valuation model. *Journal of Human Resource Costing and Accounting*, *7* (1-2), 21-40.

[10] Kaplan, R.S. and Norton, D. (1992, January-February). The Balanced Scorecard—measures that drive performance." *Harvard Business Review.*

[11] Kaplan, R.S. and Norton, D. (1993, September/October). Putting the Balanced Scorecard to work." *Harvard Business Review.*

[12] Kaplan, R. and Norton, D. (1996). *Translating Strategy into Action: The Balanced Scorecard.* Boston, MA*:* Harvard Business School Press.

[13] Tang, T. (2005). Human Resource Replacement Cost Measures and Usefulness. *Cost engineering*, *47*(8), 70.

Using the Analytic Hierarchy Process to Look at the Tradeoffs among Stakeholders in the Case of Surrogacy, When the Initial Intention of the Parties Involved Change After the Pregnancy Has Ensued

Cynthia L. Knott, Ph.D.
Marymount University

Susanne Ninassi, J.D.
Marymount University

Alyson Eisenhardt, DHSc
Marymount University

Abstract

This paper proposes a new methodology for analyzing cases involving stakeholders in a disputed surrogacy arrangement in which the stakeholders do not agree and as result tradeoffs occur. This methodology is the Analytic Hierarchy Process, which allows users to weight different criteria based on their own judgments and background with respect to the three stakeholders and outcomes. Three case studies are proposed in which the criteria for decision making are different from each stakeholder's point of view. The criteria that are considered are legal, health and ethical. The stakeholders considered will be the biological mother, the biological father, and the surrogate mother. The base for the model is that all three parties have entered into an agreement, and that after the agreement has been made, a situation changes, such that a decision about who has the parental rights over the fetus or child becomes an issue.

Introduction

Now, due to legal and technological changes, the path to parenthood has created many options for those wanting to have children. But, with these options, there has arisen many complications in terms of legal, ethical and medical concerns with respect to all of the parties involved. Parents can now choose adoption, technological intervention to become pregnant and surrogacy. These options have increased the complications when it comes to all of the stakeholders involved when all parties are not in agreement. This paper specifically looks at the option of surrogacy and what complications arise as the pregnancy progresses and the wishes of the stakeholders change. The stakeholders that are considered in this paper are; the biological mother, the surrogate mother and the biological father. The cases are further explained below. When the tradeoffs among these stakeholders change, what should the best outcome be? The outcomes considered here are: pregnancy to term, abortion, or adoption. In order to analyze these tradeoffs the analytic hierarchy process is used to weigh the three areas of consideration; legal, ethical and health, with respect to the three stakeholders.

This paper does not aim to solve or answer the question of what is the "right" decision, but more to consider the use of technology in the decision making process, where all parties involved have a "valid" stake in the outcome. Three case studies were

developed to explicate how when the situation changes, the weights of the criteria and stakeholders change. This paper looks to consider the following questions. Can technology aid in this process of determining the best course of action? Can technology help to disseminate some of the emotional charge that inevitably goes into these decisions, to help determine what truly is the "best" decision, even if all parties do not agree? This is a heated topic, and all parties have valid feelings and concerns. Finally, can technology help in this process, so that all parties can see the trade-offs and believe that although they may not have had their choice chosen, that the best decision was made in the case of all parties involved?

Legal and Case Studies Background

Historically, when the custody of a child is contested, the courts will look to the standard of what is in the "best interest of the child" in reaching its decision.* However, with the advancement is reproductive technology, such as in vitro fertilization, the courts must grapple with the issue of who is the legal parent. Three California state cases are discussed in this paper to illustrate how courts are dealing with this issue.

The first case is *Johnson v. Calvert*, 851 P.2d 776 (Cal. 1993), cert. dismissed, 510 U.S. 938 (1993). This is case, the Calverts, a married couple, entered into a gestational surrogacy arrangement with Ms. Anna Johnson. Under this type of surrogacy arrangement, the wife's egg inseminated with the husband's sperm was transferred into the uterus of another woman, the surrogate, for gestation and birth. As part of the contract, Ms. Johnson agreed to relinquish all parental rights. During the pregnancy, the relationship between the Ms. Johnson and the Culverts deteriorated. The Calverts sued for a declaration that they were the legal parents of the unborn child. Ms. Johnson sued to be declared the legal mother.

The California Supreme Court held that although the state statute "recognizes both genetic consanguinity and giving birth as means of establishing a mother-child relation, when the two means do not coincide in one woman, she who intended to procreate the child-that is, she who intended to bring about the birth of a child that she intended to raise as her own-is the natural mother." *Id.* at 782. The court held that the gestational mother had no parental rights, and the agreement was not inconsistent with public policy nor was the termination of the surrogate's claims to the child was not unconstitutional.

*Hames, J. & Ekern, Y. (2006). *Introduction to Law (3rd ed.).* New Jersey: Pearson Prentice Hall

The next case is *In re Marriage of Moschetta*, 30 Cal. Rptr. 2d (Ct. App. 1994)

The husband and wife, Robert and Cynthia Moschetta, entered into a traditional surrogacy arrangement in which Ms. Elvira Johnson, the surrogate, was impregnated with Mr. Moschetta sperm with the prior understanding that the resulting child would legally be the child of Mr. Moschetta. Ms. Johnson also agreed to terminate her parental rights, and Mrs. Moschetta would then adopt the child. After the baby was born, the marriage deteriorated, and Mr. Moschetta filed for divorce. The court was asked to determine the

parental rights of the wife and the surrogate. The trial court held that Mr. Moschetta and Ms. Johnson were the legal parents of the child and should have joint custody. Mr. Moschetta appealed stating that contends that his wife is the legal mother.

The California Court of Appeals held that according to the state statute, the surrogate is the legal and natural mother genetically and by giving birth. The court noted that this case differed from the *Johnson* case since the wife, Ms. Moschetta, was not the child's genetic or biological mother. The court reasoned that since the state statue was clear there was no further need to look to the ruling in *Johnson,* and therefore held that the surrogate, Ms. Johnson, was the legal mother.

The third case is *In re Marriage of Buzzanca*, 72 Cal. Rptr. 2d 280 (Ct. App. 1998), reviewed denied, (June 10, 1998).

In this case, the Buzzancas, a married couple, agreed to have an embryo genetically unrelated to them implanted in a woman, the surrogate, who would carry and give birth to the child for the couple. Before the birth, the Buzzancas split up, and the question before the trial court was who were the lawful parents. The trial court determined that the child had no lawful parents. The parties appealed.

The California Court of Appeals held that Mr. Buzzanca was the lawful father because "…there are times when *fatherhood* can be established by conduct apart from giving birth or being genetically related to a child'. *Id.* at 282. The court relied on the finding in *Johnson* and found that Ms. Buzzanca was the lawful mother. The court held that

> …just as a husband is deemed to be the lawful father unrelated to him when his wife gives birth after artificial insemination, so should a husband *and* wife be deemed the lawful parent of a child after a surrogate bears a biologically unrelated child a their behalf. "In each instant, a child is procreated because of a medical procedure was initiated and consented to by intended parents. *Id.*

Summary of the Three Cases

In the three California cases, the courts first looked to the California state statue to help determine the legal status of parties. The courts also looked at the intention of the parties at the time they entered into a surrogacy arrangement to help determine who the legal parent(s) of the child are.

In *Johnson*, although the surrogate was the birth mother, she had no genetic connection to the child. Relying on the statue and the intentions of the parties, the California Supreme court held that the husband and wife were the legal parents.

In *Moschetta*, the surrogate was the birth mother and was genetically connected to the child. The court, relying on the statute, held that the husband and the surrogate were the legal parents. The court did not follow *Johnson*, since the surrogate in this case had the genetic connection.

In *In re Marriage of Buzzanca*, a genetic connection did not exist for any of the parties to the surrogate arrangement. The court, relying on *Johnson,* looked at the intent of the parties and held that the husband and wife were the lawful parents.

Application of Existing Law to Hypothetical Cases

Hypothetical Case 1

The Facts:
Husband and wife cannot conceive. They enter into a traditional surrogacy arrangement with a woman who has agreed to be artificially inseminated with the husband's sperm and to terminate her parental rights upon delivery. However, after delivery, the surrogate decides that she wants to keep the child.

Analysis based upon the three legal cases:
> Based upon the existing case law, it would appear that the *Moschetta* case would be followed since the facts in the hypothetical and the actual case are the same. The surrogate in the birth mother and is genetically connected to the child.

Hypothetical Case 2
The Facts:
Husband and wife cannot conceive. They enter into a traditional surrogacy arrangement with a woman who has agreed to be artificially inseminated with the husband's sperm and to terminate her parental rights. When the surrogate is seven months pregnant, the marital relations between the husband and wife deteriorates. The wife decides she does not want the child, and she files for divorce.

Analysis based upon the three legal cases:
> Based upon the existing case law, it would appear that the *Moschetta* case would be followed since the facts in that case mirror the facts in hypothetical case 1. Therefore, applying the case law to this hypothetical, the legal parents would be the father and the surrogate.

Hypothetical Case 3

Husband and wife cannot conceive. They enter into a traditional surrogacy arrangement with a woman who has agreed to be artificially inseminated with the husband's sperm. The surrogate carries the baby for two months, during a routine examination it is determined that the fetus has a medical issue. The surrogate wants to abort the fetus.

Analysis based upon the three legal cases:
> The California courts have not addressed this issue. However, the California Court of Appeals discussed that enforcing a surrogate contract could lead to many legal problems and questioned:

> What if a surrogate mother took drugs or alcohol during her pregnancy in violation of her contract? Or wanted and abortion? Could the contract be enforced by court order and subsequent contempt? Would there be a "surrogate mother's tank" in the local jail. *In re Marriage of Moschetta*, 30 Cal. Rptr. 2d 893, 903 & n.23 (Ct. App.1994).

The Analytic Hierarchy Process Methodology

The Analytic Hierarchy Process (AHP) methodology was developed by Thomas Saaty in the 1970s; in the six volume set *Fundamentals of Decision Making and Priority Theory with The Analytic Hierarchy Process, Volume I-VI of the Analytic Hierarchy Process Series* (Saaty 1994), the mathematics and research are fully detailed. The AHP methodology uses matrix algebra, eigen vectors and pairwise comparisons to help decision makers in the decision making process. This involves structuring problems into a hierarchical form by decomposing the problem into its parts and sub-parts. Once the model is constructed, the decision maker or expert enters judgments using a pairwise process. This process creates the prioritization of the parts and sub-parts. In this paper, we create a criteria-rating model where these are the three main areas for consideration when making a decision about how to proceed with the pregnancy; legal, health and ethical. The model, which utilized hypothetical case 3, aims to create a set of weights that considers the trade-offs among the three stakeholders.

The overall attributes will be weighted based upon the judgment of each person assigned a certain role as a stakeholder. The questions will be framed as follows: "Is the view of one stakeholder more important than another stakeholder's view with respect to a specific issue." and, "With respect to the specific issue, how much more important are they with respect to the others." The scales for this judgment range from *extremely important* to *not very important*. This pairwise process will be repeated for each criterion and for each stakeholder.

One of the key strengths of AHP is that it uses ratio scale measurements. This allows us to make direct comparisons among the different criterion. For example, if a criteria receives an overall rating of .90 and another a rating of .30, we can state that the first criteria is three times as important as the second criteria with respect to all stakeholders involved.

An example of the proposed model results for hypothetical case 3 are below in Table 1 and 2:

Table 1: Overall Criteria Weights in the AHP Model

Criteria	Overall Criteria Weights
Ethical	.597
Legal	.157
Health	.246

In this case scenario, the ethical issue is overwhelmingly the most important issue; more than twice as important as the health issues. The legal issue does not weigh heavily in the decision making process for this case.

Table 2: Overall Weight of Each Alternative Outcome

Decision Outcome	Weight of each Outcome
Abort	.078
Adopt	.291
Carry to Term	.631

This is an example of the overall synthesis of a model. In this case, the surrogate mother is healthy, the biological father is supportive and the biological mother wants to have the baby carried to term, but the surrogate mother wants to abort because there are health issues with the baby, similar to hypothetical case 3. In this case scenario, the best option was to carry the baby to term. The numbers are ratio level numbers, so we can state that the option to carry the baby to term is roughly twice as preferable as adopt. So we are pretty confident in the outcome.

Possible Health Issues

Detection of severe fetal birth defects, such as: 1.) Tay Sachs, 2.) Trisomal 18, 3.) and other genetic disorders may cause question about whether or not to terminate a pregnancy. Further question may arise if the mother's health is at risk to carry the fetus to term. Below is a list of possible health risks to the woman (Planned Parenthood Affiliates of California Inc., 2004). Health risks should be considered when looking at the trade-offs among the three stakeholders. Depending on the specific case study, the health criteria will be weighted differently with respect to each stakeholder.

1. malignant hypertension (to include preeclampsia)
2. brittle diabetes
3. severe clinical depression
4. suicidal tendencies
5. serious renal disease
6. specific types of infection

Questions to consider with respect to the Heath criteria:
1. Are test results reliable? and, What are the chances for error?
2. Does the heath care provider have ethical and/or medical obligation to discuss medical concerns about the baby's quality of life (or survival rates) with all concerned parties? *(I think this can be asked as both a health question and an ethical question, do you?)*
3. If the surrogate's health is at risk, should anyone else be involved in the decision to carry to term? *(Again, this may be more of a bioethical issue)*

4. Do you discuss these issues privately with each invested person? Parents may wish to have the surrogate carry to term, but surrogate may not want to carry this baby to term if there is a serious birth defect (may also be visa versa).
5. Is the physician aware of the surrogates plan? If so, what responsibility does he/she have towards the biological parents?
6. Is the provider aware of the personal issues of each party? If so, what are the medical obligations if any?

Ethical Issues to Consider

Questions to consider with respect to the Ethical criteria:
1. Who's health is more important, the unborn baby or the surrogate mother?
2. Religious concerns on the part of the surrogate?
3. Religious concerns on the part of the biological mother and father?
4. Emotional considerations on the part of all people involved.
5. Implications in terms of the views of society.

Conclusions and Future Research

This paper has set forth a framework for why it is critical to find a methodology to help in the decision making process when the stakeholders involved have a "valid" stake in the outcome and when legal, health and ethical issues are involved. Three cases have been developed for future study with subjects that will be assigned a specific role in the decision making process. In the future, we would like to compare our modeling technique with an actual case to determine if technology and AHP can be used to either match a specific case's outcome to validate the court decision, or show that this technique can aid in determining a better outcome that takes into account the concerns of all parties involved.

References

In re Marriage of Buzzanca, 72 Cal. Rptr. 2d 280 (Ct. App. 1998)

Johnson v. Calvert, 851 P.2d 776 (Cal. 1993)

In re Marriage of Moschetta, 30 Cal. Rptr. 2d (Ct. App. 1994)

Saaty, Thomas L. (1994) *Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process,* Volume I-VI of the Analytic Hierarchy Process Series, Pittsburgh, PA: RWS Publications.

Planned Parenthood Affiliates of California Inc. (2004). Health Center. *Abortion at the First Trimester.* Retrieved from http://www.ppacca.org

STRATEGIES FOR CHOOSING A DISPUTE RESOLUTION METHOD

Judith Stilz Ogden, Clayton State University, Morrow, GA 30260,
JudithOgden@clayton.edu
Nikki McIntyre Finlay Clayton State University, Morrow, GA 30260,
NikkiFinlay@clayton.edu

INTRODUCTION

At its heart, business is about conflict. Consumers want the lowest prices they can get for the goods and services they buy; businesses want the highest prices they can get for the goods and services they sell. Workers want the highest compensation package possible; employers want to minimize costs. Under the assumptions of competition, the forces of supply and demand ensure that a price that maximizes total welfare (consumer surplus plus producer surplus) is set.

The assumptions of competition are heroic. There must be a lot of buyers and a lot of sellers. All firms will charge the same (market) price, because products are homogeneous (indistinguishable from each other). There must be easy entry and exit into the industry. Both sides of a transaction must have all the relevant information. If any of these assumptions is violated, the industry is not competitive. Under non-competitive conditions, total welfare may or may not be maximized. Most industries in the US are fairly competitive. In many cases, regulation arises to protect the various agents under non-competitive situations.

However, disputes arise, particularly when one agent in a transaction has information that the other party does not. Negotiation of contracts, disagreements about the terms of a contract, and improper behavior can also lead to disputes. Over the past twenty years there has been an explosion in the use of different dispute resolution methods. Organizations from schools and governments to business and courts have considered their use. Some forms are used significantly more frequently. Others are virtually unknown to anyone outside of the profession. How do organizations select the method of dispute resolution that they used. More importantly, how should they select the method? This paper will consider a number of factors that should be considered and then apply them to a variety of dispute resolution methods.

As noted in Shelborn and Porca (2004), alternatives to litigation can reduce the transactions costs associated with settling a dispute. Alternatives can also expand the possible solution set, and offer the involved parties a chance to get more complete information and a more detailed settlement than would occur in a courtroom. Finally, certain alternatives can foster the cooperation necessary to a resolution rather than engendering conflict.

Blackard (2001) states that alternative dispute resolution (ADR) processes can be very beneficial when conflicts arise between management and employees. He notes that the costs can be lower in terms of litigation expense, time and effort, and the process can build trust in management and enhance communication, while supporting diversity and the need for change.

The purpose of this paper is to define the various forms of dispute resolution and to assess the factors to consider when choosing a particular process.

FORMS OF DISPUTE RESOLUTION

There are a number of processes that are accepted as part of the arsenal of dispute resolution methodology. The most common forms are discussed below. Sometimes the terminology is used inconsistently and interchangeably.

1. Litigation
Litigation is familiar to most Americans. It involves a case, controversy, or lawsuit being brought in the court. The filing party is called the plaintiff. The party being sued in a civil case, or who is being prosecuted in a criminal case, is called the defendant. If the parties cannot settle (more than 90% of all lawsuits are settled without a trial), the case goes to trial ('Lectric Law Library). The trial is an adversarial proceeding in which the parties, usually through their attorneys, present evidence and call witnesses to testify in an attempt to prove their case. The party who loses at the trial level can appeal to the appropriate appellate court which will consider only the legal issues in the case. (Findlaw.) Both trial courts and appellate courts are limited by the law in terms of the type of cases they can hear and the remedies that can be awarded. The entire process follows strict procedural rules.

2. Arbitration
Arbitration is a private process in which the disputing parties agree to allow one or several individuals to make a decision about their dispute. The arbitration process is procedurally very similar to a trial, although arbitration can usually be completed more quickly and is less formal. For example, often the parties do not have to strictly follow the rules of evidence in an arbitration hearing, because there is no jury. (ABA, 1; Erickson) In some cases, the arbitrator is not required to apply the law. (ABA, 1) This may produce results not possible in court. At times, the arbitrator's only job is to interpret the contract that sent the parties to arbitration. After the hearing, the arbitrator issues an award. Some awards simply announce the decision, while others provide a "reasoned" award, which means the arbitrator give(s) an explanation of the decision. (ABA, 1-2) Instead of being held in a courtroom, an arbitration hearing may be conducted in conference room. Erickson and Bowen suggest that this might create a feeling of egalitarianism among parties (Erickson). The arbitration process may be either binding or non-binding.

a. Binding arbitration. With some exceptions, awards in binding arbitration can only be appealed on very narrow grounds. (ABA 1-2.) Collective bargaining agreements usually contain clauses providing for binding arbitration, but the clauses have become standard in other contracts, such as in construction agreements (Stipanowich, 75-76). The award issued as a result of binding arbitration is enforceable in court. (ABA 1-2.)

b. Nonbinding arbitration. If arbitration is non-binding, the arbitrator's award is advisory and in effect, will only become final if accepted by the parties. (ABA, 1-2) Otherwise, the parties are entitled to still have a trial. The process encourages settlement. Nonbinding arbitration is used frequently as part of a court annexed procedure. (Stipanowich, 87-88) Constitutional protections may prevent the courts from depriving some parties of jury trials.

3. Negotiation

Negotiation is a process in which disputing parties attempt to resolve their conflict. They do this unassisted by a neutral third party, but they may be represented by their attorneys. As was previously mentioned, the great majority of lawsuits settle before there is a trial. (ABA, 4) Negotiation is largely unstructured, and as a practical matter, everyone engages in some form of negotiation every day with family members, supervisors or employees, or store salesclerks.

4. Mediation

In mediation, a neutral third party or parties assist in settlement efforts. (Stipanowich, 84) It is a private process, and tends to be more flexible than some other forms of dispute resolution. (Stipanowich, 85). Even though courts sometimes mandate that certain cases go to mediation, the process is still considered to be "voluntary" because the courts do not mandate that the parties come to agreement. Some mediators conduct the entire process with all parties in the room. However, other mediators will separate the parties, shuttling back and forth between the two rooms in which the parties are located. If an agreement is reached, the mediator may help reduce the agreement to a written contract, which may be enforceable in court. (ABA, 3) There are three common styles of mediation.

a. Facilitative. In the facilitative style of mediation, the mediator is totally neutral and avoids presenting personal views on the merits of the case or settlement offers. The goal is to arrive at a settlement that both parties can accept. To achieve this, the mediator tries to get the parties to focus on interests, rather than positions. Total neutrality means not assisting either party, so it may be difficult to remedy a power imbalance between the parties. The mediator must definitely avoid giving legal advice. The best that the mediator can do is to ensure that both parties have a full opportunity to be heard on all issues, and do not feel coerced into accepting a settlement. (Imperati, 709-711.)

b. Evaluative. A mediator using the evaluative style frequently presents his or her own views on the relative merits of the case, and suggests options. The process of mediation is more directed and perhaps more likely to settle. The mediator places emphasis on the strengths and weaknesses of the cases or on the cost of not settling, rather than on a

mutually beneficial solution. (Imperati, 711-712.) Especially in cases involving civil litigation, parties sometimes specifically seek evaluative mediators.

c. Transformative. This is a relatively new dispute-resolution process that is used internally. Transformative mediation is intended to give the disputants a voice in the result and the process. The originators of transformative mediation say it is different from other types of mediation because it attempts to change the quality of the disputants' conflict interaction. This results in giving the parties a sense of empowerment through making their own decisions. The process also encourages knowledge and understanding of the other side's position. (Seidel, 386-387.)

5. Ombudsperson
The classical Ombudsman, as seen in Sweden, Denmark, and Finland, operated within the government, and handled complaints against administrative and judicial actions. (Wiegand, 97-99) Today, a variety of organizations, such as government agencies, schools and universities, hospitals, and newspapers, utilize these neutral individuals. Ombuds are usually outside the normal change of command and provide confidential assistance to those with problems with the organization. (Blackard, 59) The ombuds works within the institution to investigate the complaints independently and impartially. The process is voluntary, private and non-binding. (ABA, 4)

6. Neutral fact-finding
Neutral fact-finding is a process in which a neutral third party investigates an issue and makes a report. Employers or others may select the investigator in order to gage their case. In some situations the fact-finders are selected by the court for later testimony. The neutral fact-finding process is particularly useful for resolving complex scientific and factual disputes. (ABA, 4)

7. Minitrial
A minitrial is a private process in which the attorneys present condensed versions of their cases. A neutral third party may give a nonbinding opinion as to the likely outcome at trial. (Stipanowich, 86) The process is intended to encourage settlement.

8. Summary jury trial
The summary jury trial is very similar to a minitrial except that the condensed presentations are made before a jury that renders a nonbinding verdict. (Stipanowich, 87) It also encourages settlement.

9. Private judging
Private judging is a process in which the disputing parties agree to retain a neutral person, frequently a former judge, as a private judge. The private judge hears the case and makes a decision in a manner similar to a judge. In some states, the decision of the private judge may be appealable in the public courts. (ABA, 5)

10. Conflict coaching

Conflict coaching is a process of conflict analysis in which a coach and disputant communicate in order to develop the disputant's conflict-related understanding, strategies, and skills. The coach functions as both facilitator and expert. (Brinkert, 517-518.)

11. Case evaluation or early neutral evaluation
In case evaluation parties present the facts and the issues in dispute to an experienced neutral case evaluator. The case evaluator advises the parties on the strengths and weaknesses of their respective positions, and assesses how the dispute is likely to be decided by a jury or other adjudicator. The opinion is nonbinding and may lead to settlement.

Early neutral evaluation is similar, but it takes place soon after a case has been filed in court. The case is referred to an expert, usually an attorney, who is asked to provide a balanced and unbiased evaluation of the dispute. The expert again identifies each side's strengths and weaknesses and provides an evaluation of the likely outcome of a trial in an attempt to bring about a settlement.
(ABA, 2)

12. Other forms of dispute resolution
Especially in the workplace, employers may use other or combined forms of dispute resolution. They may set up panels to review the dispute. The panels may be composed of external or internal third party neutrals, or they may also be composed of the employee's peers. Some employers institute an ad hoc or open door policy. If an ad hoc policy is utilized the employer is familiar with different forms of dispute resolution, and utilizes whatever is most appropriate as disputes arise. There is no formal process that must be followed. An open-door policy tells the workers that the "door is always open," and encourages them to report any problems or issues.

A similar process would be a multi-door process. The name "Multi-Door" comes from the multi-door courthouse concept, which would include a courthouse with multiple dispute resolution doors or programs. Cases are referred through the appropriate door for resolution. (ABA, 3-4)

FACTORS TO CONSIDER IN CHOOSING A METHOD

There are a number of factors parties should consider in selecting the best form of dispute resolution. Most comparative research probably involves mediation and arbitration, or compares these two processes to litigation.

1. Fairness
Perceptions of fairness have implications for the effectiveness of the dispute resolution. The parties' perceptions of procedural fairness have been found to have an effect on the acceptance of an unfavorable outcome, and on evaluations of the neutral party (Brett & Karambayya, 1989; Brett, Karambayya, & Lytle, 1992). Procedural fairness improves

satisfaction with the resolution, fosters better relationships between the parties, and prevents the recurrence of the dispute (Brett et al., 1992).

Some research has suggested that disputants prefer mediation, in which parties cannot be forced to accept a settlement (Erickson), to arbitration, even if the mediation results in an impasse (Brett & Karambayya, 1989). Mediation also produces better results when evaluating factors such as satisfaction, fairness, and recurrence (Brett & Karambayya, 1989).

Fairness has been an issue in situations involving mandatory arbitration. Parties are required to use arbitration in many employment settings, consumer credit disputes, and broker-client disputes. The arbitrator or arbitrators are theoretically selected by the parties. However, if the pool of arbitrators is small, this may be an illusion. Further if one party, such as an employer, utilizes the services of the small pool of neutrals more often, they become known as "repeat players." The concern is that arbitrators will be more inclined to please them in order to insure future business. Also, it is not uncommon for the agreement to arbitrate to limit remedies, and eliminate some steps common in litigation, such as discovery. Some arbitration hearings are also limited in terms of time. Other forms of dispute resolution may or may not be perceived a being fair depending on how they are structured.

2. Confidentiality
Court proceedings, of course, take place in public. (Carper) All other forms promise some degree of confidentiality. In an arbitration hearing, even if the procedure is as much as like litigation as possible, its most attractive characteristic is that it promises to be confidential.

Communications made during mediation are frequently protected by evidentiary rules, and are not admitted during a trial. (Stipanowich, 85) Furthermore, in 2005, the American Bar Association, American Arbitration Association, and the Association for Conflict Resolution passed the Model Standards of Conduct for Mediators. While it does not have the force of law, it does provide some guidance as to generally accepted conduct by mediators. It states that a mediator shall maintain the confidentiality of all information obtained by the mediator in mediation, unless otherwise agreed to by the parties or required by applicable law.

The Code of Ethics for the International Ombudsman Association provides that the ombudsman will hold all communications with those seeking assistance in strict confidence, and will not disclose confidential communications unless given permission to do so. The only exception to this privilege of confidentiality is where there appears to be imminent risk of serious harm. (The IOA Code of Ethics.)

3. Cost
Cost is one of the primary reasons given for resorting to an alternative dispute resolution method. Any reduced cost may be due in part to the reduced time involved. (Discussed below.) Less complex methods are probably less expensive than litigation.

Due to its informality and flexibility, and the fact that it can be conducted in any convenient location, mediation is often less expensive than more elaborate techniques. It also does not always require attorney participation. (Stipanowich, 85).

It is often assumed that arbitration is also less expensive than litigation. That may not always be the case. Courts exist in every state and in most counties, and they are already staffed. (Carper) The cost of access to the courts is low but litigation can be expensive because parties must pay their own attorneys as well as other expenses such as expert witnesses and other fees. (Carper) In mediation, parties must pay the attorneys if brought to mediation, and also pay the mediator's fees. If the case does not settle, parties will still have to pay costs of arbitration or litigation. (Carper).

In arbitration, parties must still pay their attorneys and witnesses, but if they use an ADR organization, they must also pay forum fees. (Carper) Someone may also have to pay for a conference room for hearing. Furthermore, the parties must also pay the arbitrator's fees and expenses. Fees vary based on the arbitrator and the type of case. Some charge by the hour, some by the day. If the arbitrator must read briefs from the parties, or prepare a reasoned award, he or she will charge for those days also. (Carper; Silberman, 9-10)

A survey on the Cost of Arbitration prepared by Public Citizen in 2005, found that for an $80,000 consumer claim filed in the Circuit Court of Cook County, Illinois, the filing fee would be $221. If that same claim was brought before the National Arbitration Forum (NAF), the forum fee would be $10,925. The American Arbitration Association (AAA) would charge up to $6,650, and Judicial and Mediation Services (JAMS) would charge $7,950. There are additional fees in arbitration. NAF charges $75 to issue a subpoena, $150 for discovery requests, and $100 for continuances.

Currently, AAA frequently charges an initial filing fee and a case service fee. The fees correspond to the amount of the claim. For a claim of $0 - $10,000, the filing fee is $750, and the Case Service Fee is $200. For a claim of $75,000 to $150,000, the filing fee would be $1,800, and the Case Service Fee would be $750. Filing fees in courts can vary from state to state and even from county to county. (AAA) In North Carolina, filing fees are not based on the amount of the claim, but on the court in which the claim is filed. Filing fees are usually $76, $90, or $110, plus $15 for each item of civil process served by the sheriff.

4. Speed
Courts in most states are overcrowded, and trials are delayed. In 2005, Erickson and Bowen found that in Colorado, it took three years or more for a case to come to trial. (Erickson) Any other method of dispute resolution would probably be faster than that.

An arbitration hearing may be scheduled as soon as convenient for the parties' and arbitrator(s)' schedules, sometimes in a matter of weeks. Arbitration rules frequently have a time limit for the arbitrator to enter an award. (Erickson) Due to its informality and flexibility, mediation is often speedier than more elaborate techniques. (Stipanowich,

85). Also, many believe it is generally better to deal with disputes early on. They often go on longer than they should, and turn into a bigger case than they need be, sometimes due to misunderstanding of facts and legal issues. The sooner these can be resolved, the sooner the case can be settled. (Levin)

5. Expertise/qualified neutrals
In courts, decisions are made by a trained judge, or by a jury, unless waived. In arbitration, nonlawyers are often asked to make legal determinations. In mediation, the mediator does not actually make legal determinations, but an unrepresented party may waive legal rights without realizing it. There are qualified neutrals experienced in all forms of dispute resolution. The real issue is the method used for identifying and selecting them.

6. Flexibility
On a continuum of rigidity versus flexibility, a trial has the most rules and restrictions, followed by arbitration, and then probably, summary jury trials and minitrials. The most flexible method would probably be negotiation, followed by mediation.

7. Satisfactory result/compliance
Courts can, of course, compel compliance even when the losing party is not satisfied with the result. Courts can also enforce arbitration awards and settlement agreements.
It is widely believed that because mediation allows participants to take an active role in structuring the settlement, and even the process, satisfaction and compliance more likely. (Stipanowich, 86) Mediation can produce results that are not possible in litigation or even arbitration. In litigation, a judge or jury can only award what is permitted by law. In arbitration, results are often limited to what parties have agreed to or to what a contract specifies.

8. Maintenance of relationships
Court proceedings and arbitration are adversarial in nature, and damaging to a relationship. Mediation and negotiation are not. (Carper) One of the objectives of transformative mediation is to maintain, and improve, the relationship.

9. Establishing precedent
Despite all the advantages of other forms of dispute resolution, only litigation is designed to establish precedent. There are certain situations where parties need a determination from the courts. "Important legal issues . . .deserve public attention and debate." (Silberman, 18)

10. Predictability
Methods with the greatest predictability in their result are those that follow precedent. Of course, offers made in mediation and negotiation, though unpredictable, can be rejected.

11. Timing/when to use during the dispute
Mediation, negotiation, and some other less formal methods can be used at any time and can be used more than once. Consequently, parties can negotiate or mediate as soon as a

claim is filed. If there is no settlement, it can be attempted again. Combinations of methods can be used. Even after a court decision, parties frequently mediate when the case is on appeal.

12. Power issues
Power relates not only to the ability to propose and enforce settlements, but also to the ability to have issues even be addressed (Stulberg, 1998). The more formal methods of dispute resolution, such as litigation and arbitration, are probably the most effective means for neutralizing power differentials. While there are techniques that mediators can use to minimize, in some situations the power differentials are just too great for the weaker party to engage in meaningful mediation.

13. Empowerment
Self-determination is considered to be an important core of the mediation process.

> "Components of self-determination include: (1) having the necessary information for decision-making; (2) the ability to make autonomous decisions, including consenting to the mediation; (3) the capacity to articulate one's perspective, to negotiate in one's own best interest, and to evaluate options and alternatives; and (4) the ability to carry out an agreement.
> (Oberman, 795-796)

Mediation allows participants to take an active role in structuring the settlement and the process, making satisfaction more likely (Stipanowich, 86).

CONCLUSION

There are no hard and fast rules as to when to use which method. All the above factors should be considered, as well as any underlying issues to the dispute. Types of issues and the nature of the dispute will dictate that some factors are more important than others in a particular dispute.

REFERENCES

AAA Costs of Arbitration. http://www.adr.org/sp.asp?id=29297. (Visited 12/22/08.)

American Bar Association (2006). What you need to know about dispute resolution:the guide to dispute resolution processes. http://www.abanet.org/dispute/draftbrochure.pdf (Visited 12/22/08.)

Blackard, K., 2001. Assessing workplace conflict resolution options. Dispute Resolution Journal. February/April: 57-62.

Brett, J. M., & Karambayya, R. (1989). Managers Handling Disputes: Third Party Roles and Perceptions of Fairness. Academy of Management Journal, 3.

Brett, J. M., Karambayya, R., & Lytle, A. (1992). Effects of Formal Authority and Experience on Third-Party Roles, Outcomes, and Perceptions of Fairness. Academy of Management Journal, 35.

Brinkert, R. (2006). Conflict Coaching: Advancing the Conflict Resolution Field by Developing an Individual Disputant Process. Conflict Resolution Quarterly. 23:

Carper, D. L., J.B. LaRocco, 2008. What parties might be giving up and gaining when deciding not to litigate: a comparison of litigation, arbitration and mediation. Dispute Resolution Journal. May/July:48-60.

Cost of arbitration: executive summary (2002). LawMemo. http://www.lawmemo.com/arb/res/cost.htm. (Visited 12/22/08.)

Erickson, D.L., P.G. Bowen, (2005-2006). Two alternatives to litigation: an introduction to arbitration and mediation. Dispute Resolution Journal. Nov/Jan:42-49.

Findlaw. http://public.findlaw.com/library/pa-litigation-appeals.html (Visited 12/22/08.)

Imperati, Samuel J. (1997). Alternative dispute resolution symposium issue: mediator practice models: the intersection of ethics and stylistic practices in mediation. Willamette L. Rev. 33:703-737.

IOA Code of Ethics

Law.Com Dictionary. http://dictionary.law.com/default2.asp?selected=1175&bold=|||| (Visited 12/22/08.)

'Lectric Law Library. http://www.lectlaw.com/def/l055.htm (Visited 12/22/08).

Levin, Diane J. Dispute management biggest cost control opportunity companies have.

http://www.mediate.com/pfriendly.cfm?id=2463(Visited 12/22/08.)

Model Standards of Conduct for Mediators.

North Carolina Civil Court Costs.
http://www.nccourts.org/Courts/Trial/Documents/civil_costs.pdf(Visited 12/22/08.)

OBERMAN, S. (2005). Mediation Theory vs. Practice: What Are We Really Doing? Re-Solving a Professional Conundrum. Ohio St. J. on Disp. Resol. 20:775-829

Pryles, M., 1996. Assessing dispute resolution procedures. American Review of International Arbitration. 7: 267-287.

Reich, W.A., K. Kressel, K.M. Scanlon, G.A. Weiner, 2007. Predicting the decision to pursue mediation in civil disputes: a hierarchical classes analysis. The Journal of Psychology. 141(6): 627-635.

Shelborn, M. R. and S. Porca, 2004. The economics of mediation versus litigation. Proceeding of the 2004 Southeastern Decision Sciences Institute. 40-42.

Siedel, G. J. (2007). The Role of Business Deal Making and Dispute Resolution in Contributing to Sustainable Peace. Am. Bus. L.J. 44:379-390.

Silberman, L. (2002). International arbitration: comments from a critic. Am. Rev. Int'l Arb. 13:9-19.

Stipanowich, T.J., 1996. Beyond arbitration: innovation and evolution in the United States construction industry. Wake Forest Law Review 31: 65-156.

Stulberg, J. B. (1998). Fairness and Mediation. Ohio State Journal on Dispute Resolution, 13.

Wiegand, S. A. (1996). A just and lasting peace: supplementing mediation with the ombuds model. Ohio St. J. on Disp. Resol. 12:95-144.

ACCOUNTABILITY WITHIN VIRGINIA: ELECTED AND APPOINTED SCHOOL BOARDS

An Abstract

George S. Lowry, Randolph-Macon College, Ashland, VA 23005, glowry@rmc.edu
Catherine L. Staples, Randolph-Macon College, Ashland, VA 23005, cstaples@rmc.edu

BACKGROUND

Previous research investigating the accountability of appointed versus elected school boards in the Commonwealth of Virginia provides a starting point for an extended study of this same issue. [2] The original research examined the expenditures of 18 Virginia school districts—9 elected and 9 appointed—to determine whether any significant differences exist between the two. [2] This current study extends the previous research by examining several additional factors, including region within the state, income level of the citizens, standardized test scores of the districts, and funding by the state. It is anticipated that all of these factors, along with school district expenditures, will provide insight into the question of whether elected or appointed school boards are more accountable to its citizens.

INTRODUCTION

The education of children is a huge responsibility—one that oftentimes leads to considerable debate among parents, educators, politicians and more. While a state government is important in the education process, local school boards serve as the primary policy-makers within a school district. These boards have the power to create local policies, rules and regulations for the daily operations of the school district. Consequently, school boards often are at the center of every education debate that takes place within a locality. This paper analyzes whether the method of school board member selection, appointment or election, makes a difference in a school district's operations. The first section briefly describes Virginia's school system and the interrelationship of school districts and localities while the second part describes the research method and anticipated results of the study.

VIRGINIA'S SCHOOL SYSTEM

According to the Constitution of Virginia, responsibility for the education of elementary and secondary school-age children in the Commonwealth rests with the General Assembly. These responsibilities include determining how local school boards should be chosen. Until 1992, school boards in Virginia were appointed by the governing board of each locality or by a special school board selection commission tasked with these appointments. The General Assembly "resisted efforts to change the method for choosing school board members because of the belief that the schools should be insulated from politics."[4] However, in 1992, Virginia's General Assembly passed legislation allowing localities to place a referendum on their ballot. This

referendum provided citizens with the opportunity to vote on whether or not their local school board should be elected or continue to be appointed. In the 16 years since this legislation passed and Virginia voters began to choose, 82 percent of the local school boards now have elected members. Some localities, such as Hanover County and the City of Norfolk, placed the referendum on the ballot; however, the citizens did not approve the change. Those localities continue to utilize appointed school boards.

Why did so many localities choose to elect their local school board members? For many, much of the debate prior to a referendum focused on the need for a school board that was more responsive to the needs of the citizens and more accountable to the public. After the citizens of Charlottesville passed the referendum in November 2005, University of Virginia Professor Jeffrey Rossman, one of the individuals spearheading the city's referendum, commented that the school board should now be able to move "in the direction of greater accountability and greater diversity." [3]

While local school boards are responsible for the daily operations of a school district, it is important to realize that Virginia's school systems are unique in that they are financially dependent upon the local county or city government system. The local county or city governing board must provide funding for school operations since school districts have no taxing power. This "dichotomy of responsibility for budgetary and policy decisions at the local level may provide a balance of power for education while creating an inherent conflict between the local governing bodies and the local school boards in Virginia."[4]

Has the election of local school boards actually resulted in more accountability? Or has it resulted in governing bodies that want to stay in office and are willing to do whatever it takes to do so? The ability to elect school boards has not led to a utopian educational system. New problems have arisen while old problems continue to exist. Citizens of some localities, such as Virginia Beach and Fairfax County, have questioned the success of elected school boards. The purpose of this analysis is to evaluate whether elected school boards are more accountable to the citizen than their counterparts, appointed school boards.

METHOD

Preliminary results from a pilot study suggested no differences in per-student expenditures or the proportionate spending on education with respect to total school district expenditures when comparing elected and appointed school boards. Of interest in this current study is an expanded evaluation of school districts to include towns and cities, as well as a more comprehensive set of county bodies.

Of the 135 school boards in the Commonwealth, 111 are elected and 24 are appointed. The school districts are represented at the town, city, and county levels and of the elected boards, 2 are towns, 23 are cities, and 86 are counties. Of the appointed boards, 1 is a town, 14 are cities, and 9 are counties. In addition to evaluating differences at each of these levels, this study seeks to explore regional differences, which may include clusters of school boards in MSAs, subdivisions into geographic regions across the state (e.g. Tidewater, Northern Virginia,

Southwest Virginia, etc.), or in "urban", "sub-urban", and "rural" groupings. Further, controlling for income, standardized test scores (i.e. SOL scores), and the amount of state funding to the local districts will be considered.

The Virginia Department of Education and the Auditor of Public Accounts will serve as primary sources for data covering 2003-2006; at present, data for 2007 is unavailable.

RESULTS AND ANALYSIS

Following the procedures employed in a pilot study [2] comparisons of per-student expenditures in K-12 and proportions of expenditures with respect to total governmental expenditures, controlled for by size of district, income, standardized test scores, and contributions by the State are anticipated.

CONCLUSION

To be determined

REFERENCES

[1] Feuerstein, Abe, April 1996, "Interest Groups and the Shift From Appointed to Elected School Boards," presented at the *Annual Meeting of the American Educational Research Association*, New York City, New York.

[2] Staples, Catherine and George Lowry, October 2008, "Elected or Appointed School Boards: Is One More Accountable Than the Other?" in *Proceedings of the 2008 SEInforms Annual Meeting*.

[3] Stuart, Courteney, November 1995, ""Resounding' Victory: Does Elected School Board Knock Dems?" in *The Hook,* Issue No. 0446, Charlottesville, Virginia.

[4] Szakal, Norma E., July 1997, "The Governing Structure of Public Education in Virginia," in *The Virginia News Letter*, Vol. 13, No. 4, Weldon Cooper Center for Public Service, University of Virginia.

CORPORATE SOCIAL RESPONSIBILITY (CSR) – ISSUES AND PROMISES AMONG MNES IN CHINA

Sean Chen, Department of Business & Accounting, Furman University
Greenville, SC 29613. (864) 294-3554, sean.chen@furman.edu
Kirk R. Karwan, Department of Business & Accounting, Furman University
Greenville, SC 29613. (864) 294-2285, kirk.karwan@furman.edu

ABSTRACT

In September 2008, China's governmental health officials acknowledged publicly that baby formula produced by Sanlu, one of the largest dairy producers in China, had been contaminated with melamine and was poisonous. As of the first of January 2008, the poisonous dairy products have killed six babies and sickened 290,000 others. As we continue to see follow-ups to this story, we begin to wonder about the role of corporate social responsibility (CSR) in China as well as other parts of the developing world.

In this paper, we describe the poisonous milk powder scandal in China and its relationship to CSR, followed by a broader discussion on CSR policies and practices among multinational enterprises (MNEs) in China. In addition, we will report on a new development on CSR policy that is being implemented in Pudong New District (PND), a major financial district in Shanghai, among all companies. Finally, we describe the CSR policies employed by several MNEs in Shanghai and Suzhou, China as observed during our recent field trips to China to study business practices in general.

INTRODUCTION: THE POISONOUS MILK POWER SCANDAL IN CHINA

The poisonous milk powder incident that sickened people, particularly babies, caught the attention of the international media and consumer protection groups. After Sanlu Co., the manufacturer of the products in question, failed to 'successfully' cover up the scandal, the Chinese government found it necessary to crack down on illegal and unethical business practices in the entire dairy industry. As of January 2008, reports indicate that six babies have died and more than 290,000 people have fallen ill [4, 9]. Twenty-two dairy manufacturers that account for approximately 20 percent of China's dairy market, including Sanlu, were forced to destroy all their products. A number of corporate and governmental officials were fired due to their intentional cover-ups when the news was first released [3].

After reading reports like these, watchdog groups and business observers began to ask the question "Where is corporate social responsibility?" Like organizations in other parts of the world, is it not the case that companies in China are responsible for the well-being of their customers while making profits? Ironically, before the "poisonous dairy products" incident, Sanlu's corporate image was quite solid. Specifically, Sanlu had been listed among the Top 500 Chinese Companies (ranked 33 in sales revenue in 2007). In addition, and in part because the Fonterra Group (a New Zealand dairy company and the world's largest dairy exporter) had invested heavily in the company, Sanlu was listed as one of the multinational enterprises (MNEs)

typically perceived as "better" (i.e. "more ethical" and "better regulated") among Chinese organizations [8].

In early August, as the stage was set for the 2008 Beijing Olympic Games and news about the poisonous milk powder situation was being suppressed, scores of print media and major Web portals across China ran an award campaign called, "30 Years: Brands That Have Changed the Lives of Chinese". One of these boasted of the noteworthy achievements of Sanlu in changing the traditional Chinese life style into one that accommodated Westernized, dairy-based consumer products. In retrospect, observers have now argued that various types of misrepresentations are regularly perpetuated across China's so called "news media," without any accountability for the truthfulness of reports [3]. Another dairy product manufacturer, Yili Group Co., also faced the governmental crack-down. Like Sanlu, Yili claims to be another company with substantial foreign investment, i.e. an MNE, and with an impeccable corporate image. In a section entitled "Maintaining Olympic Quality" that appears on Yili's corporate website, the company still boasts that Yili was the first food brand in China to pass the vigorous inspections to become a sponsor for 2008 Beijing Olympics [8]. For us, one question remains, "Where is corporate social responsibility?"

MNE'S IN CHINA AND CORPORATE SOCIAL RESPONSIBILITY

Spurred by European-based MNEs and the focus on North American organizations after the Enron and other spectacular organizational collapses, MNEs that invest in developing countries are increasingly careful to specify their CSR roles. Starbucks, for example, has implemented its own set of socially responsible coffee-buying guidelines called CAFE (Coffee and Farmer Equity) practices, as well as other corporate policies that seek to minimize environmental impact [5].

The general perception that MNEs such as Starbucks will "do the right thing" and fulfill their CSR can be misleading. Many MNEs in China have been lacking in CSR policies as they develop and grow to be profitable in their Chinese operations. A recent report listed ten MNEs that have neglected their CSR. MNEs on the list include Sanyo, Honda (Japan), Michelin (France), Carlsberg (Germany), P&G, Starbucks, Fedex, Lucent (U.S.), LG (Korea) and Jinmailang (China) [7]. Starbucks in Beijing was cited for wasting 100 tons of water per day in coffee making. As global economic development zones, including the ones in China, compete for foreign direct investment, there is a tendency to turn a blind eye to CSR or other seemingly "non-essential" issues in city development. The same question that is posed to Chinese firms (i.e., "where is corporate social responsibility?") is an equally fitting question to ask of MNEs in China. At the very least, MNEs need to be mindful of long term environmental control and sustainability issues when they operate in China or any other country in the world [1, 2].

CORPORATE SOCIAL RESPONSIBILITY – A NEW DEVELOPMENT IN CHINA

For the past two decades, Shanghai has grown to be one of the largest financial centers in the world, and home to a conglomerate of MNEs. Among the many districts in Shanghai, the Pudong New District (PND) has been the leading area in terms of economic development and has

attracted the most MNEs. PND's website currently lists the number of MNEs in the district to be 13,000, with more than 250 of the Fortune 500 firms operating there.

An interesting development that has accompanied economic growth in Pudong and Shanghai is in the arena of corporate social responsibility (CSR). While PND's technological innovations have attracted numerous MNEs and a high level of foreign direct investment, the most innovative part of PND's city planning is the incorporation of CSR into its urban planning and development initiatives. At the 2008 Shanghai Forum on Building a Harmonious Society and Corporate Social Responsibility, the Chinese Ministry of Commerce announced that Pudong, Shanghai had been selected as an experimental site for CSR promotion [6]. In a 2007 survey conducted among 600 PND companies, 83 percent of the companies surveyed claimed to have a solid understanding of CSR, and were in the process of incorporating CSR as part of their corporate governance structure. PND has published goals of 1,000 companies including CSR as explicit parts of their corporate policy; 200 companies achieving CSR standards; and 300 MNEs providing post CSR evaluation results [6]. Since PND's future development is likely to be related to the MNEs abilities to fulfill their CSR roles, it is critical for PND to develop the city not only as a 'cash machine', but also as one where corporations are serious about 'paying their dues' to the surrounding areas and promoting the ability of people to live harmoniously and sustainably.

SUMMARY: ISSUES AND PROMISES

In the past two years, we have conducted field studies in Shanghai and Suzhou to study policies and practices regarding CSR among MNEs in China. The MNEs that we have studied include Chinese facilities of the Kemet Corp. and 3M China in Suzhou (Suzhou Industrial Park), as well as the Semiconductor Manufacturing International Company (SMIC) and Grace Semiconductor Company in PND (Zhangjiang High-Tech Park). We plan to conduct further studies on the CSR policies of other MNEs in Tianjin Port Free Trade Zone this year. In general, we have observed that it is difficult for Chinese companies as well as MNEs in China to implement CSR policies in their corporate operations. The pressures for production, sales, and profits have been paramount. In addition, we have identified ways that Chinese companies and MNEs are likely to adopt policies and improve on their CSR, including guidelines for annual CSR reports and the use of a governmental CSR website to impose pressure on companies that fail in this area. Further studies are needed in order to strengthen the concept and practices of CSR among companies in China.

REFERENCES

[1] Adler, C. (2006): "Corporate citizenship: can corporations save the world?" *Forbes Magazine*, November 28, 2006.
[2] Atkins, B. (2006): "Is corporate social responsibility responsible?" *Forbes Magazine,* November 28, 2006.
[3] Bandurski, D. (2008): "Sanlu's public relations pawns: a relay of lies in China's media," *China Media Project*, http://cmp.hku.hk/2008/09/28/1259/ last accessed October 10, 2008.

[4]   CNN (2008): "Milk scandal-tainted Sanlu files for bankruptcy," *CNN.Com/WorldBusiness,* http://www.cnn.com/2008/BUSINESS/12/25/sanlu.bankruptcy/index.html, December 26, 2008. Last retrieved January 2, 2009.

[5]   Crane, M. (2006): "When is being good not good enough?" *Forbes Magazine*, November 28, 2006.

[6]   CSR-Asia (2008a): "Pudong to be a model zone for CSR in China," posted July 10, 2008, http://www.csr-asia.com/ Last accessed August 18, 2008.

[7]   CSR-Asia (2008b): "Ten MNCs Fail on CSR in China," posted August 1, 2008, http://www.csr-asia.com/. Last accessed August 18, 2008.

[8]   Patton, D. (2008): "Fonterra's stake in San Lu given all clear," dairyreporter.com http://www.dairyreporter.com/Financial/Fonterra-s-stake-in-San-Lu-given-all-clear   last accessed October 10, 2008.

[9]   Toy, M. (2008): "China's milk crisis deepens as more than 50,000 ill," *World*, http://www.theage.com.au/world/chinas-milk-crisis-deepens-as-more-than-50000-fall-ill-20080922-4ls8.html, last accessed October 10, 2008.

[10] Yili Group, Inner Mongolia (2008): "Yili Industrial Group Co., Ltd." http://www.yili.com/english/ last accessed October 10, 2008.

THE DETERMINANTS OF SCORING IN NFL GAMES
AND BEATING THE SPREAD

C. Barry Pfitzner, Department of Economics/Business, Randolph-Macon College,
Ashland, VA 23005, bpfitzne@rmc.edu, 804-752-7307
Steven D. Lang, Department of Economics/Business, Randolph-Macon College,
Ashland, VA 23005, slang@rmc.edu, 804-752-7356
Tracy D. Rishel, Department of Business, Belmont Abbey College, Belmont, NC 28012,
tracyrishel@bac.edu, 704-461-5088

ABSTRACT

In this paper we attempt to predict the spread for National Football League (NFL) games for the 2008-2009 season. Separate regression equations are identified for predicting points for the home and away teams in individual games based on information known prior to the games. The difference in the predictions from the regression equations (updated weekly) serve as a prediction of the spread for NFL games and those results are used in a wagering experiment to determine if a successful betting strategy can be identified. All predictions in this paper are out-of-sample.

INTRODUCTION

Bookmakers set favorite/underdog spread lines for virtually all NFL games. Suppose the Dallas Cowboys are favored by 10 points over the Washington Redskins. Suppose further that a gambler wagers with the bookmaker on Dallas for this game. If Dallas wins by more than 10 points, the gambler wins the wager. If Dallas wins by fewer than 10 points (or loses the game), the gambler loses the bet. If Dallas wins by exactly 10 points, the wager is tied and no money changes hands. The process works symmetrically for bets on the Redskins (the underdogs) Since losing bets pay a premium (often called the "vigorish," "vig," or "juice" and typically equal to 10%), the bookmakers will profit as long as the money bet on the "favorite" is approximately equal to the amount of money bet on the "underdog" (Bookmakers also sometimes "take a position," that is, will welcome unbalanced bets from the public if the bookmaker has strong feelings regarding the outcome of the wager [see also the reference to Levitt's [5] work in the literature review]). It is widely known a gambler must win 52.4% of the wagers to be successful. That particular calculation can be established simply. Let P_w = proportion of winning bets and $(1 - P_w)$ = the proportion of losing bets. The equation for breaking even on such bets where every winning wager nets $10 and each losing wager represents a loss of $11 is:

$P_w (\$10) = (1 - P_w) (\$11)$, and solving for P_w
$P_w = 11/21 = .5238$, or approximately 52.4%.

This research attempts to identify methods of predicting the points scored by each team in a particular game based on information available prior to that game. The primary research question is whether or not these methods can then be utilized to formulate a successful gambling

strategy for the favorite/underdog wager, with success requiring a winning percentage of at least 52.4%.

The remainder of this paper is organized as follows: in the next section we describe the Efficient Markets Hypothesis as it applies to the NFL wagering market; we then offers a brief review of the literature; in the section that follows we describe the data and method; and that section is followed by wagering simulations; finally, conclusions are offered.

NFL BETTING AS A TEST OF THE EFFICIENT MARKETS HYPOTHESIS

A number of important papers have treated wagering on NFL games as a test of the Efficient Market Hypothesis (EMH). This hypothesis has been widely studied in economics and finance, often with focus on either stock prices or foreign exchange markets. Because of the difficulties of capturing EMH conclusions given the complexities of those markets, some researchers have turned to the simpler betting markets, including sports (and the NFL) as a vehicle for such tests.

If the EMH holds, asset prices are formed on the basis of all information. If true, then the historical time series of such asset prices would not provide information that would allow investors to outperform the naïve strategy of buy-and-hold (see, for example, Vergin [7]). As applied to NFL betting, if the use of past performance information on NFL teams cannot generate a betting strategy that would exceed the 52.4% win criterion, the EMH hypothesis holds for this market. Thus, the thrust of much of the research on the NFL has taken the form of attempts to find winning betting strategies, that is, strategies that violate the weak form of the EMH.

A BRIEF REVIEW OF THE RECENT LITERATURE

Nearly all of the extant literature on NFL betting uses the point "spread" as the wager of interest. The spread is the number of points by which one team (the favorite) is favored over the opponent (the underdog). Suppose team A is favored over team B by 7 points. A wager on team A is successful only if team A wins by more than 7 points (also known as "covering" the spread). Symmetrically, a wager on team B is successful if team B loses by fewer than 7 points or, of course, team B wins or ties the game—in any of these cases, team B "covers". Vergin [7] and Gray and Gray [4] are examples of research that focus on the spread.

Based on NFL games from 1976 to 1994, Gray and Gray [4] find some evidence that the betting spread is not an unbiased predictor of the actual point spread on NFL games. They argue that the spread underestimates home team advantage, and overstates the favorite's advantage. They further find that teams who have performed well against the spread in recent games are less likely to cover in the current game, and those teams that have performed poorly in recent games against the spread are more likely to cover in the current game. Further Gray and Gray find that teams with better season-long win percentages versus the spread (at a given point in the season) are more likely to beat the spread in the current game. In general, they conclude that bettors value current information too highly, and conversely place too little value on longer term performance. That conclusion is congruent with some stock market momentum/contrarian views on stock performance. Gray and Gray then use the information to generate probit regression

models to predict the probability that a team will cover the spread. Gray and Gray find several strategies that would beat the 52.4% win percentage in out-of-sample experiments (along with some inconsistencies). They also point out that some of the advantages in wagering strategies tend to dissipate over time.

Vergin [7], using data from the 1981-1995 seasons, considers 11 different betting strategies based on presumed bettor overreaction to the most recent performance and outstanding positive performance. He finds that bettors do indeed overreact to outstanding positive performance and recent information, but that bettors do not overreact to outstanding negative performance. Vergin suggests that bettors can use such information to their advantage in making wagers, but warns that the market and therefore this pattern may not hold for the future.

A paper by Paul and Weinbach [6] is a departure from the analysis of the spread in NFL games. They target the over/under wager, constructing simple betting rules in a search for profitable methods. These authors posit that rooting for high scores is more attractive than rooting for low scores. Ceteris paribus, then, bettors would be more likely to choose "over" bets. Paul and Weinbach show that from 1979-2000, the under bet won 51% of all games. When the over/under line was high (exceeded the mean), the under bet won with increasing frequency. For example, when the line exceeded 47.5 points, the under bet was successful in 58.7% of the games. This result can be interpreted as a violation of the EMH at least with respect to the over/under line.

Levitt [5] (of *Freakonomics* fame) approaches the efficiency question from a different perspective. It is clear that if NFL bets are balanced, the bookmaker will profit by collecting $11 for each $10 paid out. As we suggested earlier, bookmakers at times take a "position" on unbalanced bets, on the assumption that the bookmaker knows more about a particular wager than the bettors. Levitt presents evidence that the spread on games is not set according to market efficiency. For example, using data from the 2001-2002 seasons, he shows that home underdogs beat the spread in 58% of the games, and twice as much was bet on the visiting favorites. Bookmakers did not "move the line" to balance these bets, thus increasing their profits as the visiting favorite failed to cover in 58% of the cases.

Dare and Holland [3] re-specify work by Dare and MacDonald [2] and Gray and Gray [4] and find no evidence of the momentum effect suggested by Gray and Gray, and some, but less, evidence of the home underdog bias that has been consistently pointed out as a violation of the EMH. Dare and Holland ultimately conclude that the bias they find is too small to reject a null hypothesis of efficient markets, and also that the bias may be too small to exploit in a gambling framework.

Still more recently, Borghesi [1] analyzes NFL spreads in terms of game day weather conditions. He finds that game day temperatures affect performance, especially for home teams playing in the coldest temperatures. These teams outperform expectations in part because the opponents were adversely acclimatized (for example, a warm weather team visiting a cold weather team). Borghesi shows this bias persists even after controlling for the home underdog advantage.

DATA AND METHOD

We focus on predicting the spread for NFL games and the corresponding favorite/underdog line for that game. With the objective of estimating regression equations for home and away team scoring, data were gathered for the 2008-09 season for the analysis. The variables include:

TP = total points scored for the home and visiting teams for each game played
PO = passing offense in yards per game
RO = rushing offense in yards per game
PD = passing defense in yards per game
RD = rushing defense in yards per game
D = a dummy variable equal to 1 if the game is played in a dome, 0 otherwise
PP = points scored by a given team in their prior game
L = the betting point spread (line) on the game

Match-ups Matter (we think)

The general regression format is based on the assumption that "match ups" are important in determining points scored in individual games. For example, if the team "A" with the best passing offense is playing the team "B" with the worst passing defense, ceteris paribus, team "A" would be expected to score many points. Similarly, a team with a very good rushing defense would be expected to allow relatively few points to a team with a poor rushing offense. In accord with this rationale, we formed the following variables:

PY = PO + PD = passing yards
RY = RO + RD = rushing yards

For example, suppose team "A" is averaging 325 yards (that's high) per game in passing offense and is playing team "B" which is giving up 330 yards (also, of course, high) per game in passing defense. The total of 655 would predict many passing yards will be gained by team "A," and likely many points will be scored by team "A."

The dome variable will be a check to see if teams score more (or fewer) points if the game is played indoors.

The variable for points scored in the prior game (PP) is intended to check for streakiness in scoring. That is, if a team scores many (or few) points in a given game, are they likely to have a similar performance in the ensuing game?

We also test to ascertain whether or not scoring is contagious. That is, if a given team scores many (or few) points, is the other team likely to score many (or few) points as well? We test for this by two-stage least squares regressions in which the predicted points scored by each team serve as explanatory variables in the companion equation.

General Regression Equations

The general sets of regressions are of the form:

$$TP_{hi} = \beta_0 + \beta_1(PY_{hi}) + \beta_2(RY_{hi}) + \beta_3(D_i) + \beta_4(PP_{hi}) + \varepsilon_{hi} \tag{1}$$

and

$$TP_{vi} = \alpha_0 + \alpha_1(PY_{vi}) + \alpha_2(RY_{vi}) + \alpha_3(D_i) + \alpha_4(PP_{vi}) + \varepsilon_{vi} \ , \tag{2}$$

where the subscripts h and v refer to the home and visiting teams respectively, and the i subscript indicates a particular game.

Betting Strategies

Equations such as 1 and 2 are estimated and predictions are made for weeks 7 through 15 of the 2008-09 season. The difference between the each equation's predictions represents our estimated spread which will then be compared to the actual line for each game. For example, suppose $TP_{hi} = 24$ and $TP_{vi} = 16$, then the home team is favored by our method to win by 8 points. Thus if the actual line on the game is that the home team is favored by only 1 point (stated as home team -1), we might choose to wager on the home team for that game.

We entertain several strategies for wagering based on our predicted spread versus the actual betting line. We choose to make simulated wagers only if our predicted spread differs from the actual spread by 10, 8, or 5 points. Those simulated wagers will then be compared to the outcome of the actual game in a test for profitability. In summary:

      1. Bet only games for which our predicted spread differs from the line by more than 10 points.
      2. Bet only games for which our predicted spread differs from the line by more than 8 points.
      3. Bet only games for which our predicted spread differs from the line by more than 5 points.

As stated previously, a betting strategy on such games must predict correctly at least 52.4% of the time to be successful. If a given method cannot beat this 52.4% criterion, as a betting strategy it is deemed to be a failure.

Out-of-Sample Method

Since it is widely known that betting strategies that yield profitable results "in sample" are often failures in "out-of-sample" simulations, we use a rolling regression technique for each week of games. That is, we estimate equations TP_{hi} and TP_{vi} with the data from weeks 4-6 (we wait until week 4 so that the team statistics are more reliable), then "feed" those equations with the known data for each game through the end of week 6, generating predicted points for the visiting and home team for all individual games in week 7. The predicted points are then totaled and

compared to the point spread for each game. Next we add the data from week 7, re-estimate equations TP_{hi} and TP_{vi}, and make predictions for week 8. The same updating procedure is then used to generate predictions for weeks 9 through 15. This method ensures that our results are not tainted with in-sample bias.

RESULTS

Descriptive Statistics

Table I contains some summary statistics for the data set. Teams averaged approximately 212 yards passing per game (offense or defense, of course) for the first fifteen weeks of the season, and they averaged approximately 114 yards rushing over that same period. The statistics reported on the rushing and passing standard deviations without parentheses are for the offenses and the defensive standard deviations are (as you might guess) in parentheses. Interestingly, both passing defense and rushing defense are less variable across teams than are the offensive counterparts. Home teams scored approximately 23 points on average during weeks 1 - 15 and outscored the visitors by about two points. Total points averaged 43.6 over this period and the over/under line averaged 43.0 (the difference in these means is, of course, not statistically significant). Not surprisingly, the standard deviation was much smaller for the line than for total points.

TABLE I: SUMMARY STATISTICS (THROUGH WEEK 15)

Variable	Mean	Standard Deviation
Passing Yards	211.6	39.3 (21.8)
Rushing Yards	113.7	25.6 (21.4)
Visitor Points	20.8	10.4
Home Points	22.8	10.2
Total Points	43.6	13.5
Line	43.0	4.0
Spread*	-2.84	6.1
Win Margin*	-2.04	15.54

*Spread and win margins are stated in terms of the home team, i.e., home teams were favored by 2.84 points on average and won by an average of 2.04 points.

Note that the spread averaged -2.84 points, that is, the home team was favored by an average of a little less than 3 points

Regression Results

In the estimations of equations 1 and 2, we find no role played by points scored in the prior week and we also find no support for the hypothesis that scores of the opposing teams are related (estimations on these issues are available from the authors upon request). Typical estimated equations are:

$$TP_{hi} = -4.55 + .0381(PY_{hi}) + .0485(RY_{hi}) + 2.90(D) + e_{hi} \qquad (1')$$
$$(2.52)* \qquad (2.27)** \qquad (1.46)***$$

$\overline{R}^2 = .066$
SEE = 9.92
n = 164
$F = 4.81$
p-value for $F = 0.005$

$$TP_{vi} = -13.72 + .040(PY_{vi}) + .074(RY_{vi}) + 0.54(D) + e_{vi} \qquad (2')$$
$$(2.64)* \qquad (3.78)* \qquad (0.28)$$

$\overline{R}^2 = .101$
SEE = 9.84
n = 164
$F = 7.12$
p-value for $F = 0.000$

(***represents significance at α = .10 or better, ** represents significance at α = .05 or better and * represents significance at α = .01 or better for one-tailed tests)

For the home points equation (1'), with the exception of the dome variable, each explanatory is statistically significant at the α = .05 level or better and the equation explains a modest 6.6% ($\overline{R}^2 = .066$) of the variance in home points scored. (We retain the dome variable for symmetry with our earlier findings.) On the other hand, the F-statistic suggests that the overall equation meets the test of significance at less than α < .01. The estimated coefficients for all of the variables have the anticipated signs (although there is no theoretical reason other than weather—including wind—which makes indoor venues more conducive to scoring). To interpret those coefficients, an additional 100 yards passing (recall that this is the sum of the home team's passing offense and the visitor's passing defense) implies "about" four additional points for the home team, whereas an additional 100 yards rushing implies almost 5 additional points.

Surprisingly (that is, we don't have an explanation for this), the visiting team estimation yields a somewhat better fitting equation. The explanatory variables are statistically significant at α < .01 (with the exception of the dome variable), the equation explains about 10% ($\overline{R}^2 = .101$) of the variance in visiting team points, and the F-statistic implies overall significance at far less than α < .01. The coefficients for passing and rushing suggest a slightly greater effect for the visiting team than the home team. If the coefficients are to be believed, an additional 100 yards passing yields approximately 4 points for the visiting team, and an additional 100 yards rushing is worth 7.4 points.

The dome effect is weakly significant for the home team, but not significant for the visiting team. We retain the dome variable to be consistent with prior empirical results.

Do the regression equations produce reasonable results? On at least one basis, we can conclude that the answer is yes. Our model produces a predicted spread of -3.32—that is, the home team is expected to score 3.32 more points on average than the visiting team. This is consistent with the mean spread of -2.84 from Table I.

Betting Results

We entertain three betting strategies for the predicted points versus the over/under line on the games. These strategies are:

> 1. Bet only games for which our predicted spread differs from the betting line by more than 10 points.
> 2. Bet only games for which our predicted spread differs from the betting line by more than 8 points.
> 3. Bet only games for which our predicted spread differs from the betting line by more than 5 points.

It is widely known that a betting strategy on such games must predict correctly 52.4% of the time to be successful. If a given methods cannot beat this 52.4%, as a betting strategy it is deemed to be a failure.

TABLE II: RESULTS OF DIFFERENT BETTING STRATEGIES

Betting Strategy (Differential)	Games "Played"	W-L-T Record	Win Percentage
> 10 points	4	2-1-1	67%
> 8 points	10	6-3-1	67%
> 5 points	41	17-21-2	44.7%

Table II contains a summary of the results for the three betting strategies. The first betting strategy yields only four "plays" over weeks seven through fifteen. That betting strategy would have produced two wins, one loss, and one tie (or push, in betting parlance). For this small sample, this strategy is, of course, profitable. The second strategy (a differential greater than 8 points) yields 10 plays and a record of 6-3-1—a winning percentage of 67%. The 5 point strategy yields 41 bets and a 44.7% success rate.

It is important to note that we make no adjustment for injuries, weather, and the like that would be considered by those who make other than simulated wagers. We offer these methods only as a guide, not as a final strategy.

SUMMARY AND CONCLUSIONS

The regression results in this paper identify promising estimating equations for predicting the spread between the scores of NFL opponents. In a rolling regression framework, we apply the method to three simulated betting procedures for NFL games for weeks 7-15 of the 2008 regular

season. Betting strategies that require a large differential between the regression method and the betting line are profitable, albeit for a relatively small sample.

REFERENCES

[1] Borghesi, R. The home team weather advantage and biases in the NFL betting market. *Journal of Economics and Business*, 2007, 59, 340-354.

[2] Dare, W.H. & MacDonald, S.S. A generalized model for testing home and favourite team advantage in point spread markets. *Journal of Financial Economics*, 1996, 40, 295-318.

[3] Dare, W.H. & Holland, A.S. Efficiency in the NFL betting market: Modifying and consolidating research methods. *Applied Economics*, 2004, 36, 9-15.

[4] Gray, P.K. & Gray, S.F. Testing market efficiency: Evidence from the NFL sports betting market. *The Journal of Finance*, 1997, LII(4), 1725-1737.

[5] Levitt, S.D. How do markets function? An empirical analysis of gambling on the national football league. *National Bureau of Economic Research working paper* 9422, 2002.

[6] Paul, R.J. & Weinbach, A.P. Market efficiency and a profitable betting rule: Evidence from totals on professional football. *Journal of Sports Economics*, 2002, 3, 256-263.

[7] Vergin, R.C. Overreaction in the NFL point spread market. *Applied Financial Economics*, 2001, 11, 497-509.

FORECAST THE EXISTING-HOME SALES IN THE U.S.

Andrew Light
Liberty University

ABSTRACT

Since 2007, the U.S. housing market slump has become a major concern among the policy makers, investors, home owners, and the general public. What is the outlook for the housing market in the near future and will this problem be over soon? Based on the selected time-series model, our forecast suggests that the existing-home market will be stable in the next six months, November and December of 2008 and January through April of 2009.

INTRODUCTION

The housing market has been weak since its recent peak in 2005. Then, the sharp drop in the housing prices in 2007 contributed to the subprime loan crisis [1]. This dramatic change in the housing market not only affects the construction industry, it also may have a significant impact on the whole economy [3]. We are still in the midst of the housing problem with the increase in the delinquency rate and foreclosure rate.

In this paper, the time-series models as well as regression models are specified to forecast the existing-home sales in the U.S.. Through this research, we try to predict the future development of the housing market.

THE DATA PATTERN OF THE EXISTING-HOME SALES IN THE U.S.

Figure 1 shows the seasonally adjusted existing-home sales (EHS) in the U.S. from January 1999 to Octber 2008, the most recent data available. From the figure, we can see that EHS data have a slightly upward trend.

To confirm this trend pattern, a 12-period plot of autocorrelation functions (ACF) for EHS data is shown in Figure 2. Since all ACFs are significantly different from zero and slowly decreasing, this provides an additional evidence for a trend in the EHS data.

FIGURE 1

Existing-home sales (EHS) in the U.S. January 1999 to October 2008

EHS
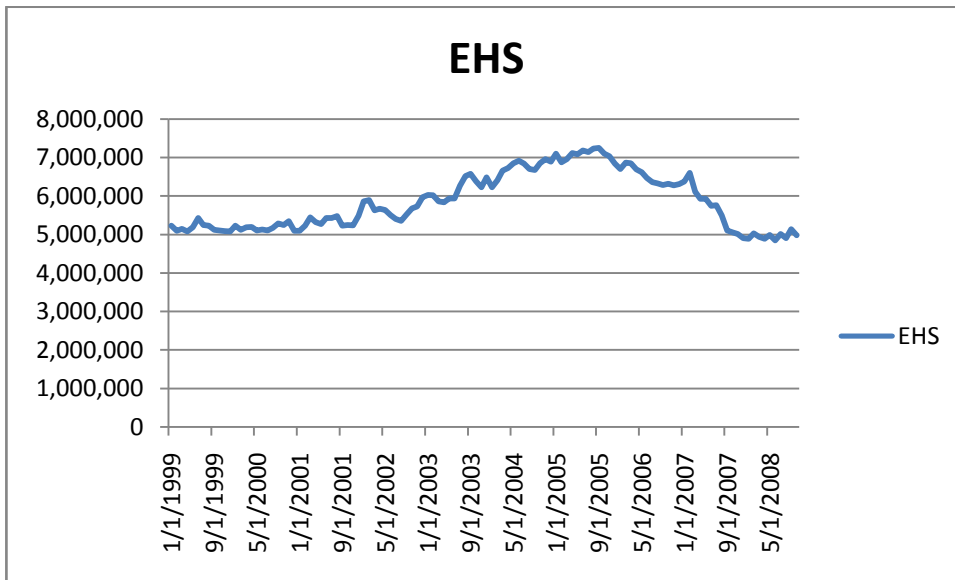
Data source: National Association of Realtors

FIGURE 2

12-period plot of autocorrelation functions (ACF) for EHS
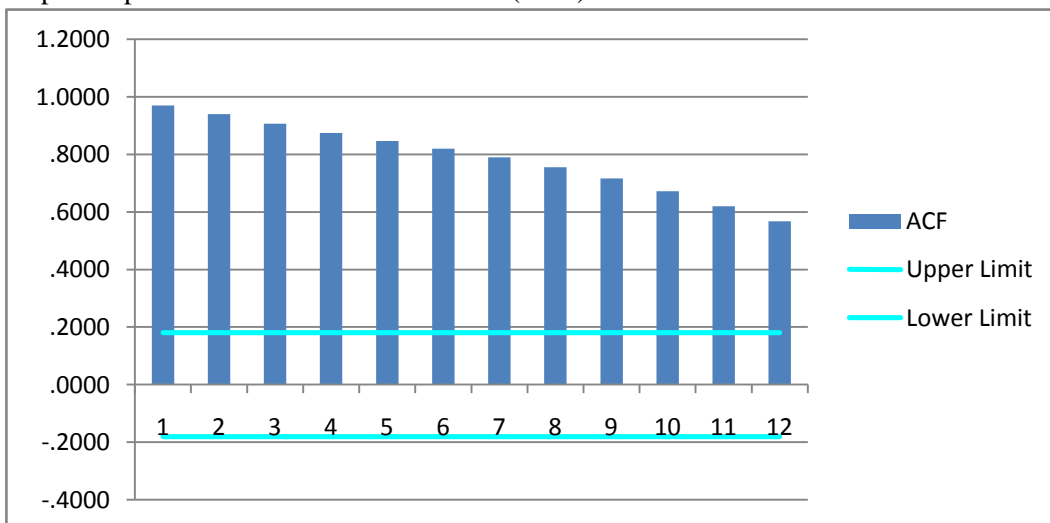
TIME-SERIES MODELS FOR EXISTING-HOME SALES

Since the EHS data have a trend, three time-series models are chosen for estimation and forecasting purposes: Holt's exponential smoothing, the decomposition, and the autoregressive integrated moving average (ARIMA) [4].

We use the data from January 1999 to April 2008 as the historical period for model specification. The next six months period from May 2008 to October 2008 is chosen as the holdout period in which the actual data are available to compare with ex-post forecast in order to evaluate the accuracy of the model.

Excel-based Forecast X software is used for estimation and forecasting [2]. Table 1 shows two error measurements, the mean absolute percentage error (MAPE) and the root-mean-squared error (RMSE), for different models.

TABLE 1

MAPE and RMSE

Models	Historical period			Holdout period		
	Jan. 1999-Apr. 2008			May 2008-Oct. 2008		
	MAPE	RMSE	RMSE/Mean*	MAPE	RMSE	RMSE/Mean*
Holt's exponential smoothing	1.90%	146,876	2.49%	5.46%%	312,050	6.26%
Decomposition with exponential smoothing	**1.09%**	**81,334**	**1.38%**	**1.83%**	**115,771**	**2.32%**
ARIMA(0,1,0)(1,0,0)	1.93%	145,971	2.47%	2.01%	127,245	2.55%
Regression model	**1.88%**	**142,659**	**2.41%**	**1.71%**	**104,548**	**2.10%**

*Mean of EHS for the historical period is 5,908,482 and for the holdout period is 4,981,667

For the historical period, the decomposition with exponential smoothing has the smallest MAPE and RMSE, while Holt's exponential smoothing and ARIMA have less than 2% in MAPE. However, when we perform the ex-post forecast for the holdout period, the errors in Holt's exponential smoothing increase significantly, but the decomposition with exponential smoothing and ARIMA maintain small errors.

REGRESSION MODELS FOR EXISTING-HOME SALES

For regression analysis, we consider the following independent variables, 30-year mortgages rate (Rate), the median price for existing home (Price), and real disposable personal income (RDPI). Using data from January 1999 to April 2008, we have regression equation (1)

(1) EHS = 13,954,930 – 354,546 Rate + 35.37 Price -1,554 RDPI

$$\qquad\qquad\qquad (-5.78) \qquad (11.56) \qquad (-9.21)$$

Durbin-Watson (1) = 0.36

Although all coefficients are significant, the signs for coefficients of Price and RDPI are not what we expect. Durbin –Watson statistic shows the existence of the first-order serial correlation.

One way to solve the problem of serial correlation is to add lagged EHS as an independent variable. The modified regression equation becomes

(2) EHS=1,558,868 + 0.96 EHS (t-1) - 67,214 Rate + 1.05Price – 138 RDPI

$$\qquad\qquad\qquad (24.78) \qquad\quad (-2.55) \qquad (0.58) \qquad (-1.60)$$

Durbin-Watson (1) = 1.95

There is no serial correlation now according to Durbin-Watson statistics. However, the signs for coefficients of Price and RDPI are still incorrect.

Since Price and RDPI are highly correlated with the correlation coefficient of 0.92, we choose to include only either Price or RDPI with lagged EHS and Rate in the model.

(3) EHS=1,267,332 + 0.98 EHS (t-1) – 64,124 Rate – 91.91 RDPI

$$\qquad\qquad\qquad (39.02) \qquad\quad (-2.49) \qquad\quad (-2.85)$$

Durbin-Watson (1) = 1.98

(4) EHS=626,610 + 1.00 EHS (t-1) – 51,818 Rate – 1.64 Price

$$\qquad\qquad\qquad (34.14) \qquad\quad (-2.10) \qquad\quad (-2.40)$$

Durbin-Watson (1) = 2.02 $\qquad R^2 = 96.06\%$ $\qquad$ Adj. $R^2 = 95.95\%$

The sign for the coefficient of RDPI in equation (3) is still incorrect. Equation (4) is the best regression model with correct signs for all coefficients, high adjusted R^2, no serial correlation problem, and all coefficients are significant.

We also specify the auto-regression model, AR(1), shown in equation (5)

(5) EHS= 93,192 + 0.98 EHS(t-1)
             (49.81)
     Durbin-Watson (1) = 1.81 R^2 = 95.79%

Compare with AR(1) model, equation (4) only has slight improvement in terms of higher R^2 value. We decide to choose equation (4) as our regression model for forecasting purpose because it shows that mortgages rate and housing price are important variables that affect the existing-home sales. The errors in estimation and forecasting using regression equation (4) are shown in table 1.

FORECAST EXISTING-HOME SALES FOR THE NEXT SIX MONTHS

Even though the regression model has smaller errors than those of the decomposition model for the holdout period, the decomposition model has much lower errors for the historical period. In addition, to use regression model in forecasting EHS, we need to forecast 30-year mortgages rate and the existing-home price first. This may add additional error in forecasting. Therefore, we choose the decomposition with exponential smoothing model and the data from January 1999 to October 2008 to forecast EHS for the next six months shown in Table 2 and the appendix. The forecast suggests that the existing-home sales would be stable for the period of November and December of 2008 and January through April of 2009.

TABLE 2

Actual and forecast EHS numbers for 2008

Month	Actual value	Fitted value	Forecast value
May-2008	4,990,000	4,924,787	
June	4,850,000	4,953,353	
July	5,020,000	4,961,781	
August	4,910,000	4,984,961	
September	5,140,000	5,007,684	
October	4,980,000	5,030,714	
November			**5,019,746***
December			**5,008,233**
January-2009			**5,013,832**
February			**5,031,697**
March			**5,018,915**
April			**5,006,831**

 *Mean for the forecast period is 5,016,542

CONCLUSION

What is the outlook for the housing market in the near future and will this problem be over soon? In this paper, we focus on the existing-home sales in the U.S. Based on our forecast, it seems that this market would be stable in the next six months. Give the market enough time to adjust and with the recent government intervention, the existing-home market might be on the way to recovery.

APPENDIX

The forecast EHS for the second half of 2008 based on the decomposition model with exponential smoothing trend.

Forecast -- Decomposition Selected			
	Forecast		
Date	**Monthly**	**Quarterly**	**Annual**
Nov-2008	5,019,745.65		
Dec- 2008	5,008,232,72	10,027,978.38	10,027,978.38
Jan - 2009	5,013,832.08		
Feb- 2009	5,031,696.98		
Mar- 2009	5,018,914.72	15,064,443.78	
Apr- 2009	5,006,830.76		

Accuracy Measures	Value		Forecast Statistics	Value
Mean Absolute Percentage Error (MAPE)	1.11%		Mean	5,861,335.93
			Standard	
R-Square	98.75%		Deviation	732,455.09
Root Mean Square Error	81,605.80			
Theil	0.55			

Method Statistics	Value
Method Selected	Decomposition
Basic Method	Exponential Smoothing
Alpha	1.00
Decomposition Type	Multiplicative

REFERENCES

[1] DiMartino, D. and Duca, J, (2007, Nov. 11). The Rise and Fall of Subprime Mortgages, Economic Letter- Insights from the Federal Reserve Bank of Dallas.

[2] Forecast X 6.0. John Galt Solutions, Inc.

[3] Wheelock, D. (2007) Housing Slump Could Lean Heavily on Economy. Federal Reserve Bank of St. Louis.

[4] Wilson, H. and Keating, B. (2007) *Business Forecasting*. New York, NY: McGraw Hill/Irwin.

The Economics of a Woody Ornamental Plant Breeding Program

Forrest Stegelin
Associate Professor, University of Georgia

For decades, businesses have observed and experienced the consumer response to branding. Brands of even the most common and mundane products have given the marketers of these products opportunities to differentiate and utilize different pricing strategies, in accordance with the positioning of the brand in the consumer's mind. Likewise, the producer of these products could also focus on margin improvement which leads to increased profits and improved profitability (return on investment).

Environmental horticulture producers and marketers did not partake in the branding activity until the late 1990s. The ornamental plant and floriculture sectors drifted toward the mature phase of the business and product life cycle, resulting in declining sales and enthusiasm for plant materials at retail; hence, a commodity status.

Plant breeding programs were, however, quite popular, but not in the environmental horticultural arena. Most of the commercial plant breeding programs were targeting agricultural commodities – rust-resistant wheat varieties, Round-Up™ Ready varieties of corn, soybeans and cotton, and other genetically-resistant commodity varieties, including many fruit and vegetable crops.

As reported by Traxler *et al*, 2005, two-thirds (67%) of the 2,241 Science Person Years (SY) in US plant breeding were employed by the private sector, one-quarter (24%) by State Agricultural Experiment Stations, and the balance by US Department of Agriculture (USDA). Each SY represents 2,080 hours (one year) of work by a person who has responsibility for designing, planning, managing, and conducting plant breeding research and related tasks, not including technicians, farm and clerical workers, computer specialists, research assistants, etc.

Horticulture plant breeding, which includes vegetable, fruit and ornamental breeding, accounted for one-third of the overall public sector research effort and one-fourth of the private sector research. Ornamental is the only crop category with significant growth in the number of SYs in the past decade.

Few cost analyses have been conducted to compare plant breeding methods, let alone the additional cost to a grower of conducting a private plant breeding program. In 1995, a cost analysis was conducted by Hodges *et a*l on 50 wholesale ornamental plant nurseries in Florida. Information was presented on sales, production volume, costs, assets, and efficiency indicators for container- and field-grown woody ornamentals. Only two of the 23 woody ornamental nurseries in the study grew plants in both container and field environments. A breakdown of the reported expenses indicated as a percent of sales, employee wages and benefits (33.8), management (4.5), materials (32), and overhead (29.2). Related research includes enterprise costs of production and cost comparisons of growing plant species in field, pot-in-pot, or in containers for various size operations and assorted plant species (Adrian *et al*, 1998). Most land grant universities have these publications in their College of Agriculture references.

The basic question posed in this study is "Does a plant breeding program generate an economic return to the company conducting the research?" To answer this question, the purpose of a plant breeding program must be defined. Most individuals would state that the purpose, simplistically, is to find and/or develop a differentiated plant, one that has traits or characteristics that are unique or more desirable than currently marketed plants, and that can be easily produced and be readily available in the marketplace.

Materials and Methods

Six crosses were made in a *Vitex* breeding program on the University of Georgia Horticultural Sciences Research Farm near Athens, Georgia. Parents and selections from segregating progeny were clonally propagated, and two replications of identical plants were grown in both containers and in-ground. A total of 648 plants were used in the study. Analysis hinged on whether treatment differences, trait correlations, or cross interactions occurred more favorably in either container production or in-ground production.

Labor hours and plant production and maintenance costs were recorded, beginning with the clonal propagation of selections, and continuing through planting in both treatments, plant maintenance, data collection and data entry. Total costs per plant were also calculated, factoring in the common input costs at the greenhouse stage prior to planting each treatment and labor hours for data entry.

Labor included tasks in the initial vegetative propagation stage of the study that was conducted in a greenhouse and was common to both environments. These included taking and sticking cuttings, filling containers with potting media, placing cuttings in containers, pesticide applications, watering, unloading of plants, and greenhouse cleanup. The greenhouse stage began August 2006 and ended April 2007 when plants were transplanted to either containers or ground. In-field treatment labor costs included tilling, planting, mulching, fertilizing, herbicide application, hand weeding, and data collection. Container treatment labor costs included planting, fertilizing, data collection, and weekly upkeep and maintenance (weed control and container blow-over, primarily). Data collection was taken through the growing season, evaluating characteristics used in the selection of potential *Vitex* cultivars. Labor value for each environment was calculated using the median hourly wage of $7.33 for the state of Georgia (Occupation Profile – America's Career InfoNet, 2008).

Quantities of all inputs were recorded and costs were calculated using prices charged at the time of purchase by commercial sources of inputs. These included plant material (various sources), containers (Progress Growers), potting media (Gro South), fertilizer (Scotts), pesticides (Hummert), herbicides (Athens Seed Company), and mulch (Smith Garden Products). Water usage was recorded for each treatment, but not for the greenhouse stage that was common for both treatments. All water was obtained from a large capacity University-owned well source used for multiple purposes, and with no billing, no charges for water nor pumping were assessed. Differential costs and water usage were obtained between treatments. Costs did not include overhead and fixed costs (depreciation, interest, repairs and maintenance, taxes, insurance, management, etc.). These costs were not charged as the study was done in a land grant

university research setting whereby the costs are not paid by the government entity. It was noted that in a standard business operation, these costs would have been determined.

Results and Discussion

Greenhouse costs that contributed to the total cost per plant included materials valued at $551.91 and labor at $1,634.59 for a total of $2,186.50, or $3.37 per plant for the 648 *Vitex* plants in the study. Labor associated with the daily hand-watering of plants constituted nearly half of the total cost of production. The highest cost factor for materials was the potting medium.

Costs associated with container production totaled $1,257.10, excluding the cost of water and drip irrigation, for the reasons discussed earlier. (Using a range of 1.8 to 2.54 centimeters of water per acre per hour, the container portion of the study used 342,733 to 511,639 liters more water than the in-ground portion of the study, which used mulch to help conserve water.) The labor and materials in the container treatment that contributed the most to the cost of this treatment were data collection and potting media.

Primary contributors to the in-ground costs were labor and mulch material. A majority of the labor was used to apply the mulch and to record data. Data collection for the in-ground analysis took 26 hours longer than collecting the same data with the containerized plants due to the spacing of the in-ground treatment at 1.5 meters apart, whereas the container treatment was spaced 30 centimeters apart. The spacing is also the reason for the amount of mulch (81 cubic yards) and time spent spreading the mulch over a larger surface area.

Conclusions

Were there any economic differentials associated with a *Vitex* plant breeding program, incorporating container production and field production, versus the normal plant production program of a commercial woody ornamental nurseryman? The first consideration was the comparison of the production methods – container versus field. No studies focusing on the commercial production of Vitex were observed. However, an enterprise cost analysis of producing crapemyrtle (Lagerstroemia indica L.) for three years under the three scenarios of in-field, pot-in-pot, and in containers was obtained from Auburn University (Adrian et al, 1998). For the three-year Auburn study, the above ground container costs of production were highest with in-field production slightly lower; the one-year Georgia study had the opposite economic evaluation, but did not include ownership costs nor the cost of water.

The primary concern for this study was the economics of a plant breeding program. The analysis hinges on whether treatment differences, trait correlations, or cross interactions occurred more favorably in either container production or field production. In general, plants were taller, wider, began flowering later, had longer average inflorescence length, total weeks flower, flower duration, and a later flower date in ground, as well as a higher inflorescence number and rating for average number of flowers on the inflorescence than in container. Although a cross with truly outstanding traits did not arise for further study, the selection in ground for the desired traits would be appropriate as the higher correlation in ground would be an appropriate representation of the plant's landscape or flower garden performance. A plant that grows well in landscape

conditions, with the proper promotion of benefits and features/traits, will garner a higher price for the grower and plant breeder.

Labor availability and costs for observation and data collection-entry-analysis during just a one-season study on *Vitex* added over 100 hours, or a 0.5% Science Person Year, to the labor charges at a wage rate twelve times the average laborer's wage. Furthermore, plant breeding programs in ground require adequate and wider spacing so as to isolate plants from unplanned crossing effects and to provide room for the breeder and researcher to do the plant evaluations and data collection, so land as a resource may also be of concern. The risk of a multiple year plant breeding program yielding no new plant material to the marketplace is a genuine possibility, with labor being a sunk cost.

A more applicable analysis focuses on completing a benefit-cost (B/C) ratio using the time value of money concept, whereby time frames or years of benefits and of costs plus discount rates must be stated. The formula for a B/C ratio is to subtract the present value of the costs from the present value of the benefits, thereby measuring the relative profitability of the venture, rather than the total net benefits, by measuring the benefits generated for each dollar invested. The benefits arise from the increased marketing margin resulting from selling the successful plant introduction at a higher price than the standard or alternative plant, even with the relatively higher costs of a plant breeding program.

The costs accrue during the first years of the plant breeding program when selection and growth and data collection are the focus, but the benefits do not occur until after the plant is developed and made available to the marketplace and is actually sold by the grower-breeder. Since none of the plants that showed potential as to becoming the target for a plant breeding program were even test marketed, there is no indication of the enhanced margin or the benefit values for the plant. However, assuming some marketing revenues associated with selling *Vitex* suggests that from a purely dollars and sense perspective, the plant breeding program is discouraging (an economic and a financial loss in the long run, although profits might be attainable in the short run without consideration for paying for the plant breeding program.

Selected References

Adrian, J.L., C.C. Montgomery, B.K. Behe, P.A. Duffy, and K.M Tilt. 1998. Cost comparisons for infield, above ground container, and pot-in-pot production systems. *J. Environ. Hort.* 16:65-68.

Hodges, A.W. and J.J. Haydu. 1995. *Florida's Ornamental Nursery Industry: Financial and Marketing Performance.* IFAS/FRED 95-31.

Traxler, G., A.K.A. Acquaye, K. Frey, and A.M. Thro. 2005. Public Sector Plant Breeding Resources in the US: Study Results, 2001.

CONSERVING FUEL: ADDING THE TRUCK DRIVER TO THE EQUATION

James A Winton, Clayton State University, Morrow, GA 30260jwinton@student.clayton.edu
Gregory A. Allen, Clayton State University, Morrow, GA 30260gallen1@student.clayton.edu
Nikki M. Finlay, Clayton State University, Morrow, GA 30260NikkiFinlay@clayton.edu

ABSTRACT

While oil prices plummeted in October 2008, renewed tensions in the Middle East sent prices up as the year ended. Since the price of oil is not only unpredictable, but also out of the control of consumers and businesses in the US, conservation has become increasingly important, particularly in the and logistics industry. At the heart of the problem is getting individual drivers to be a part of the solution. A lack of incentives in the compensation of truck drivers and the pressure to drive as many miles as possible, given the time constraints imposed by federal regulations (FMCSA, 2005), makes it difficult to get drivers to conserve fuel. The purpose of this paper is to look at the various ways that truck drivers can be part of overall efforts to reduce fuel costs.

THE PRICE OF OIL

During 2007 and 2008, as the economy weakened and as oil prices rose, transportation and logistics companies looked for ways to conserve fuel. Along with revisiting how the supply chain works, which focused on cheap labor and cheap transportation costs (Simchi-Levi, et. al., 2008), many transportation companies are looking at ways to encourage their truck drivers to conserve fuel. The purpose of this paper is to look at the various ways that truck drivers can be part of overall efforts to reduce fuel costs.[1]

---

[1] As of 10/10/08, the price of fuel had fallen as the price of crude fell below $80 a barrel. While this may limit the focus on conservation for many firms and their drivers, it is nevertheless still good business practice to find and encourage cost reductions.

In 1892, German inventor Rudolf Diesel patented a compression engine design. For 116 years, heavy equipment has run off liquid compression engines, using a product that has recently been known as liquid gold – Diesel Fuel. The market price of diesel is based on several different factors. The largest ingredient of diesel fuel is crude oil, which has had a remarkable increase in price. Through the early part of 2008, the world had seen a significant increase in the per gallon fuel rate based on the consumption by many foreign nations. Moreover, based on the increase in price, speculators entered the market, which in turn, drove the price even higher. Several supply hiccups including Hurricane Katrina, strikes in Venezuela (Schleicher, 2003), and legal problems for Russian producers have also contributed to rising prices.

"For the year 2007, diesel fuel accounted for about 18 percent of total refined petroleum products and 82 percent of the total distillate consumed in the United States (Department of Energy, 2008)." "The American Trucking Association (ATA) is deeply concerned about the impact of diesel price increases on the motor carrier industry and on our national economy (ATA, 2008)." The single largest expense in commercial transportation is fuel prices. (See Figure 1 for National Retail Averages for 2007-2008.) The purpose of this paper is to look at ways to reduce fuel costs in the transportation industry, by targeting the fuel consumption of truck drivers.

The key to understanding how to improve the growing fuel expense for trucking companies is a review of how and why it has increased. The US Department of Energy (DOE) has determined that the single largest item driving the price of diesel is the increase in cost of crude oil. The cost of crude oil now accounts for about 64% of the diesel pump price (See Figure 2, DOE, 2008). The price of crude oil was at record highs (in July 2008) primarily because of worldide oil demand relative to supply.

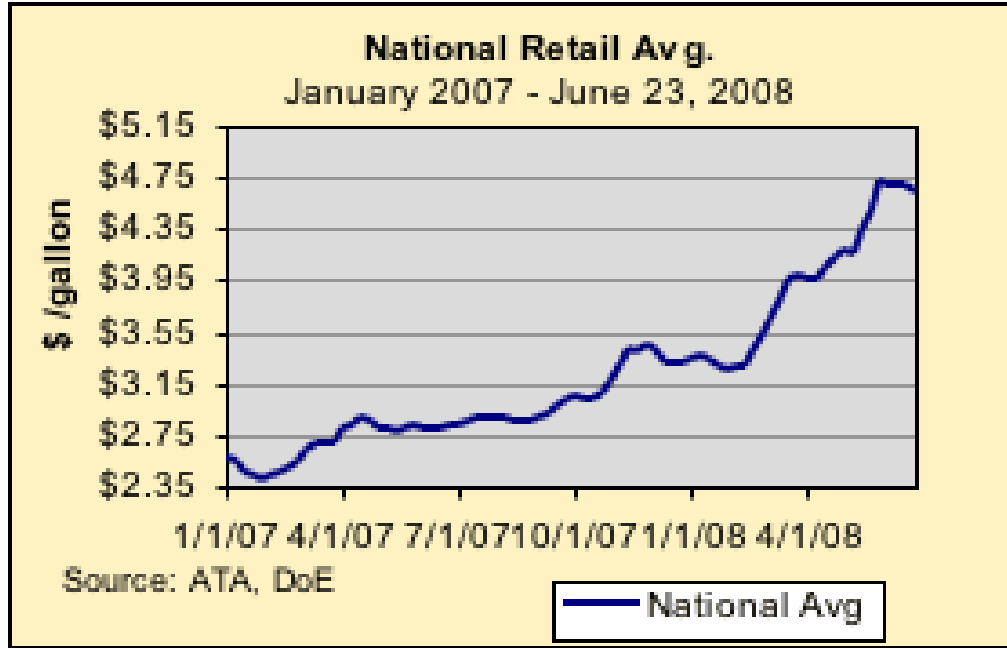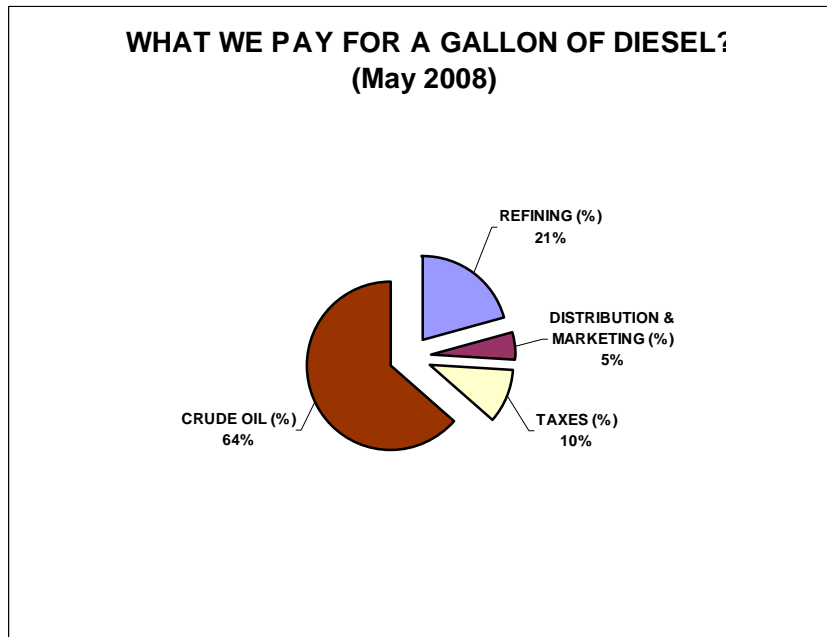Figure 1: National Retail Average (Diesel)

Figure 2: A Gallon of Diesel

Since the factors previously listed are out of the control of the trucking industry it is important to focus on actions to reduce the consumption of diesel fuel. A key component of the process is getting truck drivers themselves to be aware of the cost to the firm (and eventually to themselves) and to be conscious of their place in the firm's cost cutting efforts.

HOW DRIVERS CAN CONSERVE

The following are some of the ways the individual trucking firm and its drivers can reduce fuel expenses.

Driver Idle Time– Reducing the amount of time that the engine is running while it is idle is a key component of the process. "Long haul truck drivers idle their trucks to heat or cool their cab during the federally-required 10 hours rest period for every 11 on the road." (IDLEAIRE, 2001-2007). "Idling results in poor rest for the driver, consumes fuel while moving no product, reduces engine life, requires additional engine maintenance, and pollutes the air." The solutions to these issues are to have the drivers use a technology similar to that developed by IDLEAIRE Corporation. "The system enables truck drivers to switch off their diesel engines and still enjoy heat, AC, and many of the amenities of the home and office while resting better. (IDLEAIRE)." Below is a photo of commercial tractors using the IDLEAIRE system. The yellow tubes hook directly to the tractor allowing hot or cold air to be blown into the tractor at the drivers' request.

Traffic Supervisor Routing– To improve fuel consumption, dispatchers should confirm routing on all deliveries. It is important to have drivers directed on the appropriate interstate system to eliminate unnecessary miles and known areas for delays.

In addition, routing needs to be scheduled such to minimize the amount of time on the road with empty trailers. Some truck drivers have refused to deliver to certain areas. While a sledgehammer approach has been taken at some firms—drivers have been denied overtime and other perks—incentives to encourage drivers to participate actively in cost-cutting measures may be a better long-term approach.

Reduction of Maximum Speed – Historically, tractors have had a maximum speed of 67 mph. The following chart shows how fuel consumption increases as engine speed increases.

Figure 3: Engine Speed
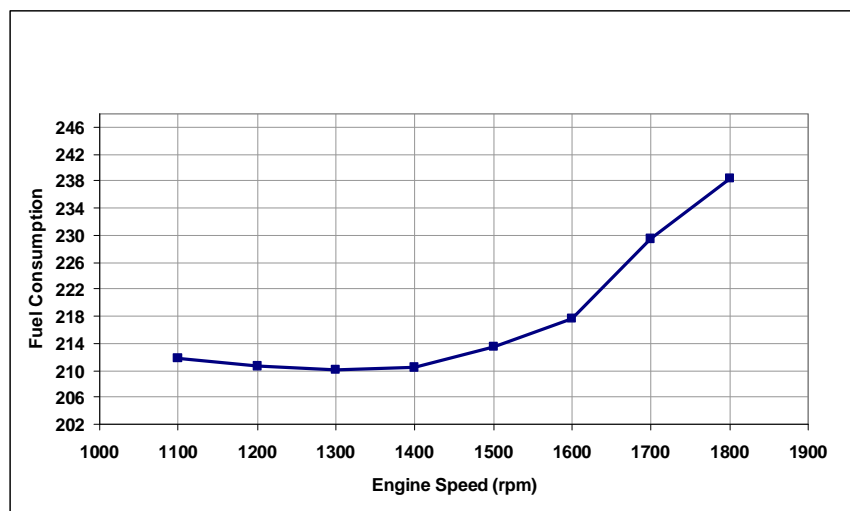
Based on the increase in fuel price it is recommended that the maximum speed limit on all tractors be reduced to 65 mph. However, the current incentive system (pay per mile) and federal mandates for rest encourage speeding. One of the ways to get drivers to cooperate is to change the pay scale to an hourly wage (with minimum expectations for deliveries and performance). In addition, some trucking firms have tried to pay bonuses to drivers who keep their consumption below a certain level during a given time period. As with most systems, this doesn't work if the driver is getting close to the limit. The driver may fuel the truck with his own money and pocket the bonus, defeating the purpose of the scheme.

Optimize Off Loading Procedure – The transportation industry uses several methods to unload the product from the trailer. This action area is tied directly back to the action of idle time reduction. When a trailer is unloaded by air pressure or pump, the tractor's engine must be on. The key to optimizing fuel when unloading is to operate the engine at a lower RPM.

Program ECM (Progressive Shifting) – All modern vehicles are now built with an internal computer called an ECM. This computer can be set to optimize the 29 different parameters for fuel conservation. All company owned tractors can have their ECM reprogrammed to the correct setting on all parameters.

Driver Training On Progressive Shifting – Progressive Shifting was a driving technique designed to reduce the RPM level of the tractor's engine as it is being driven down the road. Many professional drivers believe that horsepower is the key but as the following chart demonstrates, the true key to performance is torque. Driver training to recognize the "sweet spot" (below 1500 RPM) is one way to take advantage of the savings resulting from progressive shifting and reducing RPMs. (See Figure 4.)

Figure 4: Progressive Shifting and RPMs
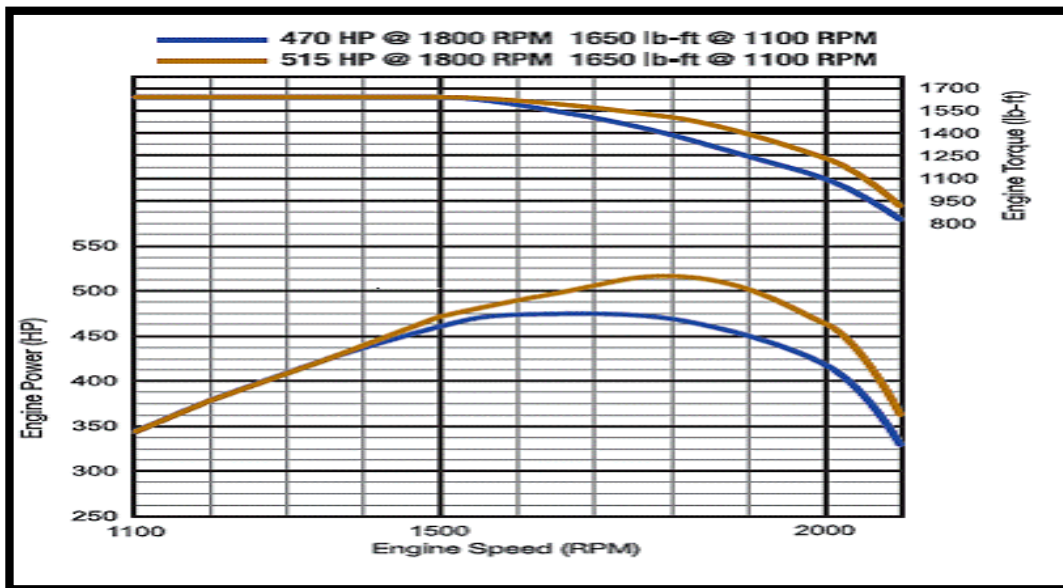
Tire Preventative Maintenance – Proper attention to tire maintenance is extremely

important to fuel conservation. There are six different potential issues with a tire that can have a

direct affect on the tire's life span and the fuel consumption of the vehicle.

1.)   Low Air Pressure

2.)   High Air Pressure

3.)   Value Caps

4.)   Duel Mismatch Air Pressure

5.)   Mismatch Tire Height

6.)   Irregular Wear

It is important to note that drivers must consistently monitor their tires for these potential

failures. For long-haul operation, thoroughly checking all tires prior to the unit departing and

checking while in-route no more than every two hours are ways to minimize the costs associated

with poor tire maintenance. This will allow the driver to identify a problem with the tire prior to

having a failure or consuming too much fuel. (As with reducing speed, this will also improve safety.)

While individual trucking firms cannot affect the market price of diesel fuel, they can take measures to reduce the costs of fuel on operations. Part of the process involves driver training and cooperation. As noted by a member of the Trimac organization, "We have determined that there will be there will be very little benefit to the organization unless there is 100% participation by our driver force." As with any improvement process, additional follow-up on the success of these actions is also necessary.

References

American Trucking Association (May 9, 2008). National fuel price crisis *Truckline,* Retrieved May 7, 2008, from www.truckline.com/fuelpricecrisis

Department of Energy (June 2008). Diesel fuel price: What consumers should know Retrieved July 3, 2008, from http://www.eia.doe.gov/bookshelf/brochure/diesel/

Federal Motor Carrier Safety Administration (October 1, 2005). Hours of service regulations. Retrieved January 2, 2009, from http://www.fmcsa.dot.gov/rules-regulations/topics/hos/hos-2005.htm.

IDLEAIRE (2001-2007). *The Challenge.* Retrieved July 6, 2008, from http://www.idleaire.com

Schleicher, A. (January 22, 2003). Venezuelan oil strike *NewsHour Extra.* Retrieved January 2, 2009, from http://www.pbs.org/newshour/extra/features/jan-june03/venezuela.html

Simchi-Levi, D., Nelson, D., Mulani N., and Wright, J. (September 22, 2008). High oil prices. *Wall Street Journal.*

CONVERGENCE IN LATIN AMERICA
WHAT DO WE KNOW?

Kyle Wiggins Randolph-Macon College, Ashland, VA 23005, (804) 752-7307,
kwiggins@rmc.edu
C. Barry Pfitzner, Randolph-Macon College, Ashland, VA 23005, (804) 752-7307,
bpfitzne@rmc.edu

ABSTRACT

This paper tests the convergence hypothesis implication of the neoclassical growth models for Latin American nations over the period from 1970 through 2003. The convergence hypothesis suggests that nations with similar characteristics will find that per capita income levels will become more equal over time—that poorer nations will grow more rapidly than richer nations. We find very little evidence of absolute convergence over the sample period. We do, however, find that when controlling for literacy rates, the convergence hypothesis is more strongly supported by the evidence.

INTRODUCTION

Despite having many of the same advantages for economic growth as Europe and the Pacific Rim nations, Latin America has failed to achieve anything near similar rates of growth in per capita incomes. It is well known there have been some short-run macroeconomic shocks, including exchange rate crises, debt crises, inflation crises, balance of-payment crises, financial crises [3, p.1], but overall the essential components for growth have been there. The political systems and governments for the last 30 or so years have been relatively stable. Property rights have been managed and enforced, inflation is generally under control, the tariff rates have been declining and the currencies have all but completely stabilized against the dollar. Despite all of these positives, Latin America had fallen far behind in terms of economic growth.

The focus of this paper is not to document the lack of growth in Latin America, nor to test directly its causes; rather we test the convergence hypothesis of the models of economic growth to see if this growth implication applies to this particular group of countries. We test all of the Latin American countries, with reliable data, for absolute convergence and two types of conditional convergence; one with respect to education levels and one with respect to tariff rates. We assume that countries that have lower education levels will grow more slowly than countries with better educated work forces. Similarly, we expect that countries with lower tariff rates will engage in more trade and grow faster as well.

SAMPLE AND DESCRIPTIVE STATISTICS

We collected growth rates and several other statistics for the twenty-one Latin American nations. Table 1. All of the per capita real income data are from the Penn World Tables [4]. The annual data span the period from 1970 through 2003. Table I ranks the 21 nations in terms of annual rates of growth over that 33 year span. Though several large nations such as Chile and Brazil

achieved some degree of success in terms of growth over this period, others, including Argentina and Venezuela performed poorly, with little or even negative growth. Furthermore as a region, there is little dispute that Latin America underperformed relative to other nations. Overall growth in per capital incomes averaged only slightly more than 1% per year across these nations.

TABLE 1: GROWTH RATES IN PER CAPITA INCOMES 1970-2003

Rank	Country	Annual Growth Rate (%)
1	Puerto Rico	2.94
2	Dominican Republic	2.77
3	Panama	2.32
4	Suriname	2.26
5	Belize	2.22
6	Chile	2.05
7	Brazil	1.80
8	Colombia	1.71
9	Ecuador	1.47
10	Paraguay	1.39
11	Mexico	1.34
12	Costa Rica	1.26
13	Uruguay	1.02
14	El Salvador	0.76
15	Honduras	0.65
16	Guatemala	0.57
17	Bolivia	0.51
18	Argentina	0.13
19	Peru	-0.19
20	Venezuela	-0.66
21	Nicaragua	-1.75

Figure 1 (see the **RESULTS** section) shows the performance of these Latin American nations over this time frame in graphic form.

CONVERGENCE THEORY

Simply put, the theory of convergence states that countries with poorer economies tend to grow at faster rates than richer economies. With that noted, in the long-run all economies should converge with respect to per capita incomes. As one paper describes the process on convergence between states:

> "Convergence is ultimately a product of diminishing returns to capital, as economies with less initial capital per worker relative to their steady state equilibrium will have greater returns and higher growth rates."[5]

It should be noted however, that there are some serious limitations on this theory as Moses Abramovitz emphasized in his publication of "Convergence and Deferred Catch Up" [1]. One of the assumptions the theory makes is that for a country, or a group of countries, to benefit from convergence there must be a certain framework in place. For instance, the country/countries must have the ability to obtain capital, trade and absorb technologies, and participate in global/regional trade. Keep in mind that all of these pieces must be in place while simultaneously the laggard countries must not have limiting exogenous factors such as "natural or military disasters, or dysfunctional forms of economic organization and public policy that may have ruled in the past but that have been effectively reformed." [1]

Unconditional and Conditional Convergence Testing

Empirical testing for what is known as β convergence in per capita income across nations or regions often utilizes a form of the neoclassical growth model, popularized by Barro and Sala-i-Martin [2, for example], that allows the growth rate of per capita income between two points in time to be related to some initial level of income. That form may be represented as:

$$\log(y_{it} / y_{i,t-1}) = a - (1 - e^{-\beta}) \cdot \log(y_{i,t-1}) + \mu_{i,t}$$

(1)

where t represents the time (year) and i represents the nation or region. The left-hand side variable represents the growth rate of per capita income, and the right-hand variable is the log of per capita income at the beginning of the period over which growth is measured. The coefficient β is estimated by non-linear least squares techniques. If β is estimated to be positive, convergence is implied—lower per capita income nations (or regions) grow faster than those nations (or regions) with higher initial per capita incomes. A larger estimate of β represents faster convergence.

For time separated by years, equation (1) is modified as

$$(1/T) \cdot \log(y_{it} / y_{i,t-T}) = a - [(1 - e^{-\beta T}) / T] \cdot \log(y_{i,t-T}) + \mu_{i0,T}$$

(2)

Where T = the length of the interval in years between initial income and its level at the end of the period, so that the left-hand side of (2) becomes an annualized growth rate. The estimate of β in this form is independent of the interval T.

Finally, for β convergence, the estimate of β will be biased if there are shocks that affect certain subgroups within the regions in asymmetric ways. For example, an energy price shock could affect the coal mining regions in a different way than regions in which economic activity is oriented more toward service or manufacturing. If such influences are to be accounted for in the regressions, equation 2 is simply expanded to include other variables as follows:

$$(1/T) \cdot \log(y_{it} / y_{i,t-T}) = a - [(1 - e^{-\beta T}) / T] \cdot \log(y_{i,t-T}) + \theta_i OV_i + \mu_{i0,T}$$

(2′)

where *OV* represents other variables. Such variables may include educational attainment levels, measures of asymmetric shocks, and other relevant variables.

First we test for absolute convergence through the entire period, 1970—2003. We then test by decade, a common practice in this type of analysis.

As mentioned before, in this paper we also control for two other factors that might influence growth. In theory the better educated countries should grow at a faster rate when compared to a less educated country. To control for this we factor in the average illiteracy rate through the entire data sample (1970-2003) and then test for convergence. We then test for the effect of tariff rates the same way we test for education. It should be pointed out that the tariff data we used for this part of the project might not hold up to close scrutiny. The tariff rates we used came from a source [4] that only had tariff rates from 2006. For better analysis one might examine the change in the tariff rates over a certain period of time and test that for convergence. In order for the tariff rates to capture the effect we wish to measure requires that countries with high tariff rates now would also have had higher tariff rates throughout the entire period when compared with the countries with lower tariffs.

RESULTS

So that the reader can appreciate the idea of convergence in per capita incomes, we offer Figure 1. If convergence were occurring for these nations, the time series would show some visual evidence of the same.

FIGURE 1: PER CAPITA INCOMES 1970-2003
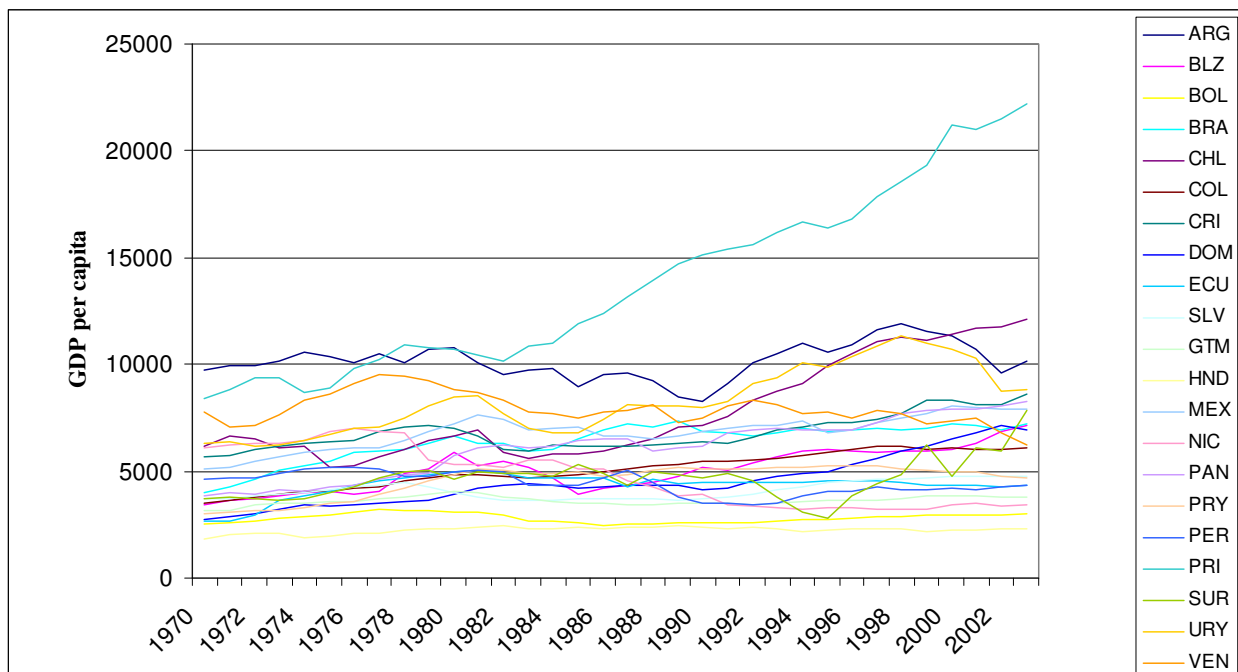
At first blush, such does not seem to be the case. (The top line in the time series at the end of the sample period is Puerto Rico and it can be argued that Puerto Rico should be excluded from the analysis since it is a territory of the United States.) Even ignoring the case of Puerto Rico, there

does not seem to be visual evidence of convergence for these nations. However, it is prudent to test statistically for convergence and to test the sub-periods as well.

Absolute Convergence

TABLE 2: REGRESSIONS FOR ABSOLUTE CONVERGENCE IN PER CAPITA INCOMES ACROSS LATIN AMERICAN NATIONS

Period	$\hat{\beta}$	$\overline{R}^2$	see
1970 – 2003	0.00276 (0.0498)	0.000	0.011
1973 – 1983	0.0181* (0.0107)	0.108	0.0165
1983 – 1993	-0.0184 (0.0110)	0.066	0.0220
1993 – 2003	0.0027 (0.0100)	0.000	0.01974

(*significant at α < .10, standard errors in parentheses, see = standard error of the estimate, n = 21, all regressions include an unreported constant term.)

Table 2 contains the results of the statistical tests for absolute convergence. The estimated convergence coefficient, $\hat{\beta}$, is correctly signed for the full period, but it does not pass the test of statistical significance. For the first sub-period, the coefficient is signed correctly, meets the test for statistical significance and indicates that incomes during the decade from 1973-83 converged at 1.8% per year. The coefficient is incorrectly signed for 1973-83, congruent with much research that suggests that convergence took a break world wide in the 1980s. We experimented with excluding Puerto Rico from the sample, but the general conclusions were unaffected.

Figures 2-5 show the visual evidence for absolute convergence for the full period and each ten year sub-period.

FIGURE 2: ABSOULTE CONVERGENCE 1970-2003
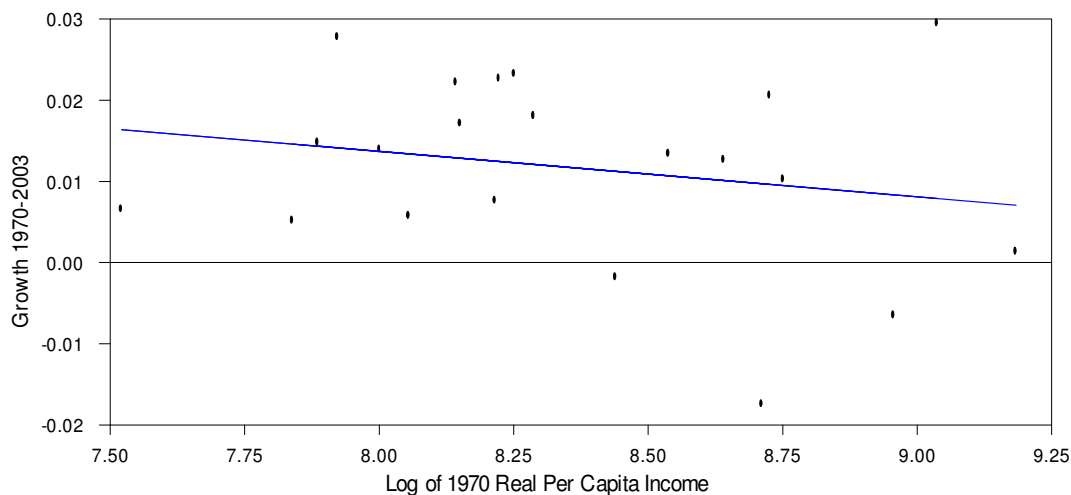
If the regression line has a negative slope convergence is indicated and the steepness of the line suggests the speed at which incomes were converging. Conversely a line with a positive slope would indicate *divergence*, meaning the richer nations or regions grew faster than the poorer nations. There is very little evidence, statistical or visual, that Latin American per capita incomes converged over the period 1970-2003 (see Figure 2). Figure 3 depicts the significant convergence from 1973-1983.

FIGURE 3: ABSOULTE CONVERGENCE 1973-1983
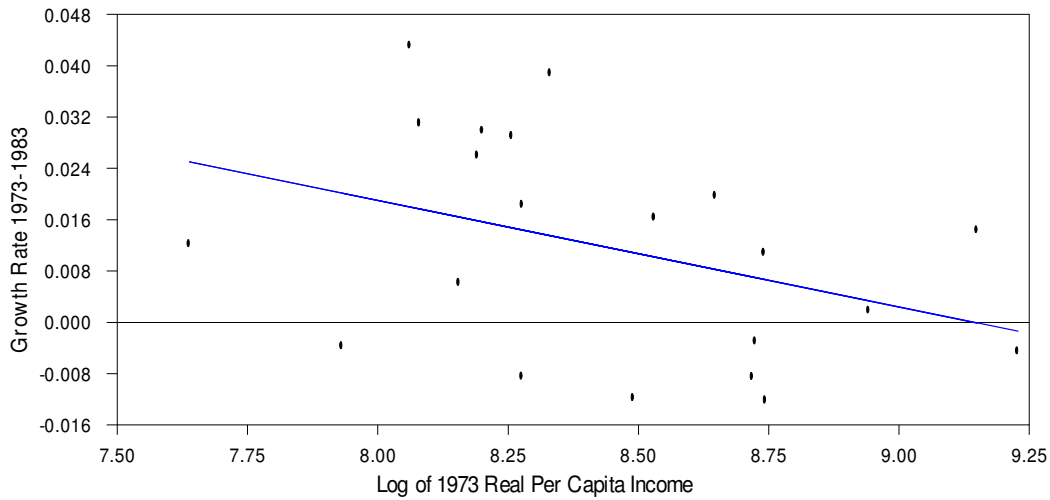
As pointed out by Sala-i-Martin, around the world convergence stopped for about a decade starting the late 1970's and ending in the late 1980's [5]. There have not been any concrete explanations for the phenomenon, we just know it happened. Latin America was no exception to the world wide phenomenon—during the decade from 1983-1993 Latin American countries in fact show some evidence of divergence.
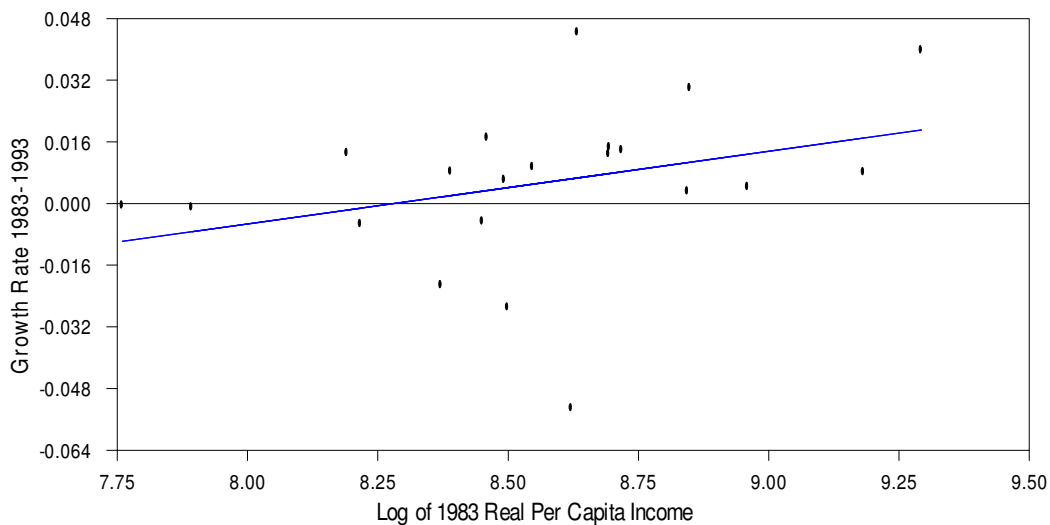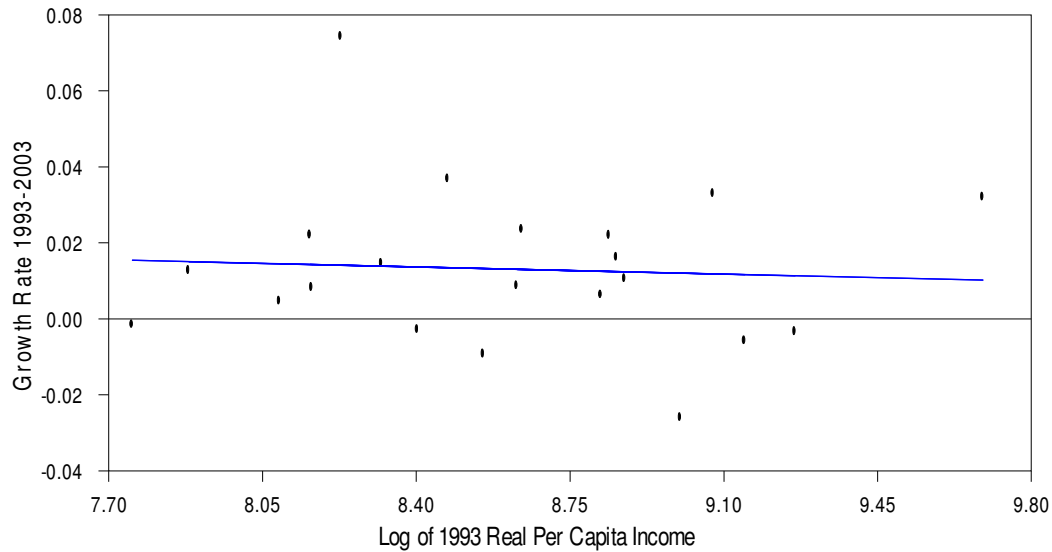
FIGURE 4: ABSOULTE CONVERGENCE 1983-1993

FIGURE 5: ABSOULTE CONVERGENCE 1993-2003

For the decade ending in 2003, the slope of this regression is approximately zero, meaning that the poorer countries grew at about the same rate as the more wealthy countries.

Conditional Convergence

Convergence may be underestimated if we fail to control for such things as human capital endowment differences across nations. We use a proxy for human capital endowment of illiteracy rates. Nations with less well-educated populations are expected to experience slower rates of economic growth. Interestingly, incorporating illiteracy rates results in much improved statistical results for the convergence hypothesis. For the full period, the regression results raises $\overline{R}^2$ to .30, the coefficient estimate on the illiteracy rate ($\hat{\theta}$) is statistically significant at $\alpha <$ .01, the estimate of β is also statistically significant (at $\alpha < .05$), and the implied rate of convergence is a little over 2% per year. Table 3 compares the results for the two types of convergence.

TABLE 3: ABSOLUTE AND CONDITIONAL CONVERGENCE COMPARED

Convergence	Coefficient Estimates	$\overline{R}^2$	see
Absolute 1970 – 2003	$\hat{\beta} = 0.00276$ (0.0498)	0.000	0.011
Conditional 1970 – 2003	$\hat{\beta} = 0.0205*$ (0.0115) $\hat{\theta} = -0.00072**$ (0.00024)	0.297	0.0097

(*significant at $\alpha < .05$, ** significant at $\alpha < .01$, standard errors in parentheses, see = standard error of the estimate, n = 21, all regressions include an unreported constant term.)

It is fair to conclude that, for Latin America, controlling for human capital endowment results in much greater evidence in favor of convergence.

The results for the tariff rates as an additional control variable were not successful. When the tariff rates were introduced into the convergence equation, the coefficient estimate for the tariff variable was statistically insignificant and convergence was not implied. When tariff rates were introduced along with the variable for illiteracy, the coefficients for convergence and illiteracy were essentially unchanged and the coefficient for the tariff rate variable was not significantly different from zero. We recommend that the results for the tariff rates should not be taken seriously. We believe our tariff variable is flawed, since we were able to obtain tariff data for only one year and such a measure fails to capture the dynamics of the tariff reductions that have occurred across Latin America in recent years.

CONCLUSIONS

Based on the evidence from 21 Latin American nations, we draw several important conclusions. First, there is little evidence of absolute convergence in per capita incomes over the period 1970-2003. In only one decade (1973-83) is there evidence of the type of income convergence implied by the neoclassical growth models. However, those models also suggest that failing to control for differences in human capital can cause estimates of convergence to be biased. Thus, second, we find that a simple proxy for human capital, illiteracy rates, improves the estimated equation to the extent that significant convergence is indicated for the Latin American nations over the full sample period. Finally, though we believe openness to trade is an important contributor to growth, our tariff measure is likely inappropriate as a measure of impediments to growth, because it does not measure changes in the structure of tariffs over time.

REFERENCES

[1]   Abramovitz, Moses with P. David. Convergence and deferred catch up*,*" *1996*, in Landau et al., editor*, Mosaic of Economic Growth*.

[2]   Barro, R.T., and Sala-i-Martin, X. (1991). Convergence across states and regions. *Brooking Papers on Economic Activity 1*, pp. 107-182(a.)

[3]   Cole, Harold, Lee E. Ohanian, Alvaro Riascos, and James A. Schmitz, Jr. Latin America in the rearview mirror. *Federal Reserve Bank of Minneapolis Research Department Staff Report.* 351(2004): 1-1.

[4]   Heston, Alan, Robert Summers and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006.

[5]   Pfitzner, C. Barry, Steven Lang, and David Brat. "Explaining the failure of incomes to converge in Virginia during the 1980s," *Proceedings of the Thirty-Seventh Annual*

Meeting, Southeast Region of the Decision Sciences Institute, February, 2007 (Co-authors: Steven D. Lang and David A. Brat).

[6]   http://www.latinbusinesschronicle.com/app/article.aspx?id=155, accessed on May 21, 2008

[7]   Sala-i-Martin, X. The classical approach to convergence. *The Economic Journal*, 1996, 106(July), 1019-1036

MEASURES OF PERFORMANCE FOR FUND MANAGEMENT: DOES ACTIVE INVESTMENT PAY?

Shabnam Mousavi, Georgia State University, 35 Broad Street, Atlanta, GA 30330, smousavi@gsu.edu, (404) 413-7335
Reza Kheirandish, Clayton State University, 2000 Clayton State Blvd., Morrow, GA 30260, rkheiran@clayton.edu, (678) 466-4532
Lari Arjomand, Clayton State University, 2000 Clayton State Blvd., Morrow, GA 30260, LariArjomand@clayton.edu, (678) 466-4530

ABSTRACT

There is a strong line of work in the finance literature that promotes passive management of funds, which mainly concerns with mutual funds. The comparative valuation of different styles of management boils down to the methods used for measuring the effectiveness of the executed styles. Here, we entertain a recent result of studying costs of active management, adjacent to a new theoretical structure for performance evaluation. Highlighting a specific definition of a passive portfolio, we motivate an extension on these studies that attempts at answering a major question: Would the value of active investing alter through applying more sophisticated measures?

Keywords: Performance evaluation, dynamic measures, fund management.

MEASURING ACTIVE MANAGEMENT: EFFICIENCY AND COST

Advocating passive investment has an established line of work associated with it (for example see Bogel, 2008), which mainly focuses on the preferred method of management for mutual funds. Although doubts have been raised that active management of mutual funds needs to be measured beyond static contributions, this issue for hedge funds seems to be more acute. It is plausible to presume that the dynamic contribution represents the main and larger portion of active management in hedge funds. We want to focus on appropriate measures of active

managements in hedge funds to further explore the effects of active management. This idea was formed initially as a reflection on the following three articles. Andrew Lo (2001) constructed what he called "an ambitious research agenda", in which he reviewed major performance measures and argues for alternative measures for active investing in highly dynamic stances such as hedge fund management. (For classic work on alternative performance evaluation measures see Treynor and Mazuy (1966), and Henriksson and Merton (1981)). Lo (2007) redefines passive investing, and then develops an active/passive (AP) decomposition of the expected return of a portfolio. It has a static and a dynamic element, and measures the generated return from active management by contributing that to the dynamic element. Decomposing management contributions in this way allows for a framework in which questions such as "whether hedge-fund investors are paying for alpha and getting beta from their investment," can be adequately addresses and potentially resolved.

Recently, Kenneth French (2008) evaluated and estimated costs associated with active investing in American stock market, and concluded that investors are losing an average of 67 basis points per year because of active investing, compared to passive investing. This is a considerable loss! In this study, he goes beyond mutual funds and includes hedge funds into his calculations. He uses estimates of all costs of engagement in active investment and his summing of gains and losses comes out negative. Putting French and Lo's work side by side, there is an interesting question here to be explored. On one hand, French's calculations suggests that active investment results in an overall social loss. On the other hand, hedge fund active management is, at least theoretically, generating positive value. Can we use Lo's sophisticated method of dynamic evaluation for active investing, and revisit French's topic. Does that alter any of the previously shown results?

PRACTICAL DIFFICULTIES AND POTENTIAL GAINS

Lo's focus is on hedge funds. Lo reasons that the nature of hedge fund management makes the performance of such activity inherently different from what can be captured by the

standard/traditional static approach. That we need a dynamic measure to do justice to active management is not a new topic, but most of the work has focused on mutual funds not hedge funds. French puts all kinds of investments ultimately together and hedge funds are only one part of his subject matter. The insight that we can expect from utilizing Lo's measure to hedge fund calculations in relation to French's topic, involves several practical concerns especially because of unavailability of hedge fund data.

One guaranteed outcome from this investigation, independent of what data would be available, is to focus on the theoretic structure of Lo's dynamic measure. Specify how and where that differs from existing dynamic measures, such as those developed by Ferson for mutual funds, and the pioneering work of Merton. Lo states in his paper, that his framework is "more general." Since Lo's decomposition allows for separating the value generated from active v passive management, it can be logically used to derive conditions that detangle alpha and beta, in a purely theoretical way. This in turn, would allow for deriving conditions under which hedge funds have 'real' advantage performance resulting from active resources. Thus a minimum intellectual value can be expected from pursuing this idea, even in the absence of any data.

A SYSTEMATIC APPROACH

One way to gain some insight into the abovementioned issues can be sketched as follows. One can start from Lo's (2007) 'new' definition for passive investment, and the decomposition of expected return, specifically developed to address the value of active investment in hedge funds. DEFINITION1 ([3], p. 10): A passive portfolio is any portfolio with weights w_{it} that are uncorrelated with its corresponding returns R_{it} for all $i= 1,…,n$.

The expected return of any portfolio P is the sum of three components:

(1) Security selection, depends on the alphas,

(2) Factor timing, depends on covariance between the portfolio betas

and factors, and

(3) Risk Premia, represents the expected return from passive exposure to factor risks.

Where the first two are active sources of expected return and the last one is the passive

component.

A fundamental comparison could be set up with Ferson's construct, where Ferson's intertemporal measure was developed to evaluate the active management of mutual funds. This will produce a survey on the subject of performance evaluation through a comprehensive juxtaposing study of what masters of the field have produced so far. It might prove particularly fruitful, since Lo makes no reference to Ferson in either of his works on performance evaluation, Lo 2001 and 2008. To enrich this comparison, we suggest consulting the body of work listed next as well as a comprehensive bibliography on performance evaluation: http://pages.stern.nyu.edu/~sbrown/performance/bibliography.html.

REFERENCES

[1] Bogel, J. C. A question so important that it should be hard to think about anything else. *Journal of portfolio management,* 2008, 34, 95-102.

[2] Campbell, J. Y. & Lo, A. W. & MacKinlay, A. C. *The Econometrics of Financial Markets*. Princeton, NJ: Princeton University Press, 1996.

[3] Daniel, K. & Grinblatt, M. & Titman, S. & Wermers, R. Measuring Mutual Fund Performance with Characteristic-Based Benchmarks. *Journal of Finance* 1997, 52(3), 1035-1058.

[4] Ferson, W. E. & Vincent A. W. Evaluating Fund Performance in a Dynamic Market. *Financial Analysts Journal*,1996, 52(6), 20- 28.

[5] French, K. R. The cost of active investing. http://ssrn.com /abstract=1105775. 2008.

[6] Lo, A. Risk management for hedge funds: Introduction and overview. http://ssrn.com/abstract=283308. 2001.

[7] Lo, A. Where do alphas come from?: A new measure of the value of active investment management. http://ssrn.com/abstract=985127. 2007.

[8] Treynor, J. & Mazuy, K. Can mutual funds outguess the market? *Harvard Business Review*,1966, 44(3), 131-36.

USING RATES OF RETURN TO FORECAST RETURNS

An Abstract

George S. Lowry, PhD, Department of Economics/Business, Randolph-Macon College, glowry@rmc.edu

Wesley M. Jones, Jr., PhD, School of Business Administration, The Citadel, wes.jones.edu

INTRODUCTION

In a recent pilot study, errors in forecasts of future returns showed little differences when arithmetic and geometric mean calculations served as the basis for the projections. Using annual returns on the DJIA and S&P for 1954 to 2007, 1-year-, 5-year-ahead, and 10-year-ahead forecasts were made based on 5-, 10-, 15-, and 20-year histories based on both arithmetic and geometric averages. This study proposes to incorporate short-term treasury securities in the analysis as well, but also to incorporate Blume's formula (a weighted average of geometric and arithmetic means) into the analysis to assess the efficacy of the forecasts. Forecasts will be compared against the actual returns earned for the period.

BACKGROUND

Drawing from a recent pilot study [6], forecasts of future rates of return performed with equally poor results when arithmetic and geometric means served as the foundation for the forecasts. This research draws on that pilot study to (1) fully incorporate the use of an alternative model, Blume's formula [1], (2) improve the analytic models employed, and (3) add US treasury securities to the data set.

Calculation Models

Calculating actual returns on investments relies on an arithmetic mean. It generates accurate and unambiguous results. Using arithmetic means of historical returns as a forecast for the future, however, can be upwardly biased depending on the forecast period. Longer-termed forecasts benefit from the use of geometric means, however in the shorter time horizons, a downward bias may occur. Blume [1] explores the biases of both estimation methods and offers a weighted average approach that combines the two methods in a way that counteracts the inherent bias each. Work by others in finance that extends beyond common finance texts have explored this condition [2, 3, 4, 5] and interestingly, other disciplines face the same dilemma of choosing an appropriate metric [8, 9].

Building on prior work, this paper will evaluate the efficacy of return forecasts using arithmetic, geometric, and averaged means (via Blume's formula) when applied to specific data sets of market returns. In particular, data from the Dow Jones Industrial Average (DJIA), Standard and Poor's 500 index (S & P 500), United States treasury securities (short-term) are of interest to continuing research. Evaluating the accuracy of forecasts built on historical data

(histories covering 5-, 10- 15-, and 20-years) for varying investment time horizons (1-, 5-, and 10-years) and errors can provide some guidance to future research in estimating rates of return. Of special interest to future research is the impact of varying investment strategies (proportions invested in each of the sample sets) on realized returns when those strategies are dependent upon mean return forecasts.

DATA AND METHOD

Daily closing values for the various securities and indices will be used as the basis for forecast returns within each class of assets. For example, annual data from the DJIA spanning 1954 through 2007 will be included.

Forecasts for each n-period will be calculated using either arithmetic or geometric approaches where the returns using the arithmetic mean for time period "t" (A_t) are given by:

$$A_t = \frac{1}{n}\sum_{i=1}^{n}(1 + r_i) - 1 \tag{1}$$

Similarly, annual returns for less than yearly periodic rates of return using the geometric mean for time period "t" (G_t) are given by

$$G_t = \left\{\prod_{i=1}^{n}\frac{1+r_i}{n}\right\} - 1 \tag{2}$$

Blume's [1] formula, as adapted by Ross, *et al.* [7], suggests using a weighted average of the geometric and arithmetic means of annual values to generate an expected return (R_t), where the weighting factors are determined as the proportion of the forecast period to the historical review period, such that,

$$R_t = \left(\frac{T-1}{N-1}\right)G_t + \left(\frac{N-T}{N-1}\right)A_t \tag{3}$$

where N is the number of periods of historical data used and T is the forecast horizon.

Calculating forecasts using the three methods for the various investment horizons will be compared against the actual returns for those periods. Tests for differences and significance should provide insight into the efficiency of each.

RESULTS

To be determined.

CONCLUSIONS

To be determined.

REFERENCES

[1] Blume, Marshall E. (1974). "Unbiased estimators of long-run expected rates of return."

Journal of the American Statistical Association 69 (347), 634-638.

[2] Cooper, Ian. (1996). "Arithmetic versus geometric mean estimators: Setting discount rates for capital budgeting." *European Financial Management* 2 (2), 157–167.

[3] Brodsky, D.A. (1982). "Arithmetic versus geometric effective exchange rates." *Review of World Economic*s 118 (3), 546-562.

[4] Bruner, R.F., Eades, K.M., Harris, R.S, Higgins, R.C. (1998). "Best practices in estimating the cost of capital: Survey and synthesis." *Financial Practice and Education*, Spring/Summer.

[5] Jacquier, E., Kane, A., Marcus, A.J. (2003) "Geometric or arithmetic mean: A reconsideration." *Financial Analysts Journal*.

[6] Lowry, George S. and Jones, Wesley M. (2008). "Evaluating forecasts of rates of return: Geometric and arithmetic means dual it out." *Proceedings of the 2008 SEinfORMS Annual Meeting.*

[7] Ross, Westerfield, and Jordan. (2008). *Fundamentals of Corporate Finance*, 8th edition. McGraw-Hill Companies.

[8] Seixas, N.S, Robins, T.G., Moulton, L.H. (1988). "The use of geometric and arithmetic mean exposures in occupational epidemiology." *American Journal of Industrial Medicine* 14(4), 465-77.

[9] Smothers, C.D., Sun, F., and Dayton, A.D. (1999). "Comparison of arithmetic and geometric means as measures of a central tendency in cattle nematode populations." *Veterinary Parasitology* 81 (3), 211-224.

PREDICTING ACCEPTANCE OF ELECTRONIC MEDICAL RECORDS:

WHAT FACTORS MATTER MOST?

Shanan G. Gibson & Elaine D. Seeman
College of Business, East Carolina University
gibsons@ecu.edu; seemane@ecu.edu

ABSTRACT

The current paper compares the degree to which variables associated with three common theories, Davis's Technology Acceptance Model (TAM), Ajzen's Theory of Planned Behavior, and Moore and Benbasat's Innovation Diffusion Theory (IDT), successfully explain variance in medical personnel's acceptance of electronic medical records (EMR) technologies. All of the variables of interest were found to account for statistically significant amounts of variance; Attitude toward EMR (from the Theory of Planned Behavior) was the construct which predicted the greatest amount of variance in intentions to use EMR, followed by Usefulness (from TAM), and Relative Advantage (from IDT). Perceived Social Influence and Behavioral Control explained the least amounts of variance in usage intentions.

INTRODUCTION

At the 2005 Southeast Decision Sciences Institute conference, we presented a paper entitled The Theory of Planned Behavior and its Role in Technology Acceptance: Model Development Utilizing Computerized Physician Order Entry (CPOE) which marked the beginning of a study seeking to lay a framework for a new model of technology acceptance that incorporates the unique features of physicians and physician extenders, and the complex environment in which they work. At that juncture qualitative analysis of physician interviews supported our research assertion that the constructs associated with the Theory of Planned Behavior impacted the physicians' acceptance (or lack thereof) of CPOE within the current environment. In 2006, a follow-up was provided that utilized simple descriptive statistics from a very small hospital sample as a preliminary step toward proving quantitative substantiation. Following this, in 2008, data was presented that indicated that the Theory of Planned Behavior did explain variance in medical personnel's stated intention to utilize a newly introduced Electronic Medical Records (EMR) system. Since that time, we have included an additional construct of interest, relative advantage provided by technology, and conducted more sophisticated analyses to determine which factors within the theories of interest do the best job of explaining variance in intention to adopt a newly implemented EMR system. The objective of this paper is to report these findings related to acceptance of EMR and substantiate the importance of considering factors beyond those associated with TAM when examining technology acceptance among medical professionals.

The Electronic Medical Record integrates patient information systems so that patient demographic, financial and medical information can be collected, accessed, transmitted and stored in a readily available digital format (Hough, Chen, & Lin, 2005; Steele, Gardner, Chandra, & Dillon, 2007). EMR technology represents a movement from paper-based care activities toward outcome-focused, evidenced based processes (Mangalompalli, Rama, Muthivalian, Jain, & Parinam, 2007). This shift can be an agent for change and improvement by eliminating confusing or illegible hand-written order documentation, minimizing transcription errors and

fundamentally reducing clinical mistakes. Most importantly EMR technology allows physicians fast access to appropriate patient information allowing prompt diagnosis and treatment (Chao, Jen, Chi, & Lin, 2007). In critical situations, such quick access saves lives (Steele, Gardner, Chandra, & Dillon, 2007). While healthcare organizations recognize the advantages associated with the use of the EMR, adoption of the technology has been slow. To date, less than ten percent of American hospitals have implemented electronic medical record keeping as part of their technology strategy for health information (Gardner, 2007). Reasons for the slow deployment include expenses related to upgrading existing paper systems, funding for additional workstations and resources, and the challenges associated with achieving and maintaining physician buy-in and acceptance. According to John Hammergren, CIO of McKesson, "It's really not a technological barrier. The systems are available and we can provide those interconnections. The issue is one of adoption. Are people really ready to do this? As long as it's easier to script it out and hand it to a voice-activated nurse, that's what the physician will do" (Colvin, 2007). We have based our study on this issue-physician acceptance of the Electronic Medical Record.

THEORETICAL BACKGROUND

The Technology Acceptance Model
Davis's (1989) Technology Acceptance Model (TAM) has been and remains an important and viable tool for researchers. Research based upon TAM has offered valuable insights into how and why individuals choose to accept or reject technology. However, many of the studies utilizing the TAM or some variation of the TAM have focused on general user populations working in varying occupational settings, and utilizing a wide spectrum of information technology solutions (Gefen & Straub, 1997; Taylor & Todd, 1995; Veiga, Floyd, & Dechant, 2001; Venkatesh & Morris, 2000).

However, physicians and physician extenders (i.e. physician assistants and nurse practitioners) differ quite markedly from general users. They are highly educated, highly trained professionals, working in stressful and highly politicized environments. Given the complexity of the healthcare industry and its unique occupational dynamics, we feel that the TAM in and of itself, may not be an appropriate methodology for explaining technology acceptance as it applies to medical practitioners.

The Theory of Planned Behavior
Advocates of the Theory of Planned Behavior suggest that all behavior is motivated by individual decisions that are based on an individual's intention to perform that behavior.
Intention to perform a behavior, in turn, is influenced by the individual's perceived control over the performance of that behavior, his or her attitude toward performing the behavior and his or her perception of social norms (pressure or approval from important referent individuals to perform a behavior).

The Theory of Planned Behavior asserts that behavioral control reflects an individual's belief regarding the ease of performing or completing a task. Behavior control is similar to the Technology Acceptance Model's perceived ease of use construct. Indeed the TAM was derived in part from the Theory of Planned Behavior. However, the Theory of Planned Behavior incorporates the individual's past experience as well as a sense of control into choosing a behavior.

According to the Theory of Planned Behavior, individuals behave in accordance with their beliefs (Ajzen, 1988). This theory has considerable support for behaviors in medicine, education, business, and the general population. The Theory of Planned Behavior implies that doctors' attitudes, their subjective norms and perceived behavioral control are positively related to their planned and actual behavior concerning the acceptance of new organizational technology operationalized as an Electronic Medical Records system. Indeed, prior research by Seeman and Gibson (2008) found that the constructs associated with the Theory of Planned Behavior did in fact explain variance in medical personnel's stated intention to utilize a newly implemented EMR system.

Innovation Diffusion Theory

Innovation diffusion theory (IDT) has been used to study the adoption of a variety of innovations, not all of which are technological (Rogers, 1995). Within information systems, Moore and Benbasat (1991) have utilized the characteristics of IDT to successfully predict technology acceptance. The constructs associated with IDT in the technological realm are: relative advantage, ease of use, image, visibility, compatibility, results, and voluntariness of use.

Given the inclusion of both TAM and the Theory of Planned Behavior in the current study, and the high similarity of their constructs to those associated with IDT, the current study will include Relative Advantage as an additional construct anticipated to explain physician acceptance of EMR. Relative Advantage is defined as "the degree to which an innovation is perceived as being better than its precursor" (Moore and Benbasat, 1991, p. 195).

METHODS

Research Setting, Participants, and Procedures

As part of an on-going, multi-phase research endeavor examining the implementation of electronic medical records, faculty associated with both a medical school from a large regional university and a large multi-physician practice were asked to complete an anonymous survey regarding their perceptions of EMR implementation at their respective locations. Completed surveys (57% male, 43% female) were received from 102 of the physicians that were invited to participate. The average age of physician participants was 42.4 years old, with an average of 13.8 years practicing medicine, 7.2 years at the current location, and 6.7 years in their current job position.

Survey Instrument

The survey instrument used for the current study was based on questions derived from Davis's TAM model (Davis, 1989), Ajzen's Planned Behavior model (Ajzen, 1988), and questions derived from Person X's Relative Advantages construct. Hence, participants responded to questions measuring the central constructs of the TAM: the perceived ease of use of EMR technologies and the perceived usefulness of EMR, questions measuring the central constructs of the Theory of Planned Behavior: perceived behavioral control, attitudes toward EMR technology, and perceived social pressure regarding EMR usage, and questions that considered the relative advantages offered by EMR versus the traditional written records systems. In all instances, respondents used a 7-point Likert-type scale where one was "Not at All" and seven was "Very Much So."

To assess the criterion of technology acceptance, participants were asked to indicate the degree to which they concurred with a statement assessing their intention to utilize EMR technology in the future. This is highly consistent with previous technology acceptance studies that have utilized intention to use technology as indicative of technology acceptance.

All survey items are shown in Table 1 grouped by construct.

Analyses

In order to examine the degree to which each of the constructs of interest explained variance in intentions to embrace EMR, a series of multiple regression procedures were conducted. Details of these analyses are described in the *Results* section.

RESULTS

Six distinct multiple regressions were conducted to determine how well each of the constructs of interest explained variance in physician acceptance of EMR technology.

For the constructs associated with TAM, the regression equation with the perceived usefulness was significant, $R^2 = .549$, adjusted $R^2 = .510$, $F (8, 101) = 14.138$, $p < .01$. Likewise, the regression equation for perceived ease of use was also significant, $R^2 = .503$, adjusted $R^2 = .471$, $F (6, 101) = 15.96$, $p < .01$. Based on these results, perceived usefulness appears to provide more insight into why medical personnel embrace EMR technology.

With regard to the Theory of Planned Behavior, the regression equation for Attitude toward EMR was significant, $R^2 = .699$, adjusted $R^2 = .673$, $F (8, 101) = 26.467$, $p < .01$. Both Social Influence ($R^2 = ..355$, adjusted $R^2 = .329$, $F (4, 101) = 13.370$, $p < .01$) and Behavioral Control ($R^2 = .343$, adjusted $R^2 = .309$, $F (5, 101) = 10.029$, $p < .01$) were also significant, but each explained considerably less amounts of variance than other variables already considered.

Lastly, the construct of Relative Advantage, from IDF, had a significant regression question, $R^2 = .516$, adjusted $R^2 = .474$, $F (8, 101) = 12.396$, $p < .01$.

Table 2 summarizes the results above by listing each of the constructs of interest according to the amount of variance accounted for in EMR acceptance.

Table 2. Constructs and Variance Accounted For

Construct	R^2	Adjusted R^2
Attitude toward EMR	.699	.673
Usefulness	.549	.510
Relative Advantage	.516	.474
Ease of Use	.503	.471
Social Influence	.355	.329
Behavioral Control	.343	.309

Table 1. Survey Items

TAM Items

Perceived Ease of Use (α = .594)

I find EMR flexible to interact with.

I find EMR to be easy to use.

I find it easy to get EMR to do what I need it to do in my patient care & management.

It is easy for me to become skillful in use the EMR technology.

Learning to operate EMR is easy for me.

My interactions with EMR are clear and understandable.

Perceived Usefulness (α = .859)

The primary benefit of EMR is patient safety.

EMR is related to a physician's ethical responsibility to "do no harm."

I find EMR useful for my patient care and management.

Using EMR enhances my service effectiveness.

Using EMR improves my patient care and management.

Using EMR enables me to complete patient care more quickly.

Using EMR increases my productivity in patient care.

Theory of Planned Behavior Items

Perceived Behavioral Control (alpha = .72)

I know why EMR was/is being implemented at my organization.

Individual physicians have the ability to influence the decisions regarding EMR.

Individual physicians will influence the decisions regarding EMR.

I have the knowledge necessary to use EMR.

I have the resources necessary to use EMR.

Perceived Social Influence (alpha = .35)

Medical leadership believes that I/we should use EMR.

My feelings of responsibility toward my patients influence me to use EMR.

My peers think I/we should use EMR.

The culture here embraces EMR technology.

Attitudes Toward EMR (alpha = .87)

EMR will be successfully implemented at other organizational locations.

EMR is an appropriate tool for physicians to use.

I like the idea of using EMR.

I find EMR technology useful for my patient care & management.

Using EMR is a good idea.

Using EMR is pleasant

Using the EMR system is a wise idea.

I have embraced the EMR technology in my workplace.

Innovation Diffusion Theory Items

Relative Advantage (alpha = .95)

EMR will lower my malpractice risk in the future.

EMR will increase my overall effectiveness.

EMR will increase my overall efficiency.

EMR will increase my profitability.

EMR will enable greater achievement or success in my work.

EMR will increase the amount of autonomy & independence I experience at work.

EMR will lead to greater amounts of recognition for my work.

EMR improves my ability to build medical relationships with my patients.

DISCUSSION & FUTURE RESEARCH

As pointed out by Hu et al. (1999), professionals might subtly differ in their acceptance of technology when compared with individuals in an ordinary business setting. While the advantages of using the Electronic Medical Record in physician decision making are clearly recognized, this study explores reasons beyond those constructs associated with TAM that explain the slow adoption of this technology. A major contribution of this research is the finding that constructs associated with both the Theory of Planned Behavior (Attitude toward EMR) and Innovation Diffusion Theory (Relative Advantage) could explain greater amounts of variance than does the TAM construct Perceived Ease of Use.

Future research might consider how technology adoption by physicians is affected by other factors such as culture. For example, perceived usefulness appears more important in western culture while non-western cultures utilize ease of use more in determining intention and actual use (Schepers & Wetzel, 2007).. Given the diverse ethnicity of the physician population, studying the relationship of ethnicity to EMR acceptance would also be an important contribution.

From an organizational perspective, the role of EMR as a source of medical organizational change (Jimmieson, Peach & White, 2008) offers an avenue of extending this research. For example, examining the role that the constructs from the Theory of Planned Behavior, Innovation Diffusion, and the Technology Acceptance Model might collectively play in assisting the implementation of this technological change would be a valuable implication for practice. Finally, Venkatesh and Balla, (2008) have suggested a need for research regarding the role of interventions in decision making that can lead to increased acceptance and better use of Information Technology. As the EMR moves from larger to smaller hospitals and practices, adoption decisions and intervention creates yet another research avenue.

REFERENCES

Ajzen, I. (1988). *Attitudes, Personality and Behavior*. Milton Keynes (UK): Open University Press.

Chao, C., Jen, W., Chi, Y, and Lin, B. (2007). Improving patient safety with RFID and mobile technology, *International Journal of Electronic Healthcare*, Vol. 3, No. 2 pp. 175-192.

Colvin, G. (2007). Wiring the Medical World, *Fortune*, February 19, 2007, Vol. 155, No. 3 pp. 87-94

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-339.

Ferren, A. (2002). Gaining MD Buy-In: Physician Order Entry. *Journal of Healthcare Information Management*, 16(2), 67.

Gardner, Tom. Six Trends to Bank On *Fortune*, 6/25/2007, Vol. 155 Issue 12, p85-92

Gefen, D. & Straub, D. (1997). Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model. *MIS Quarterly*, 21(4), 389-400.

Hieb, B. & Handler, T. (2001). The Critical Role of Orders in the Delivery of Healthcare. Gardner Research AV-14-1473.

Hough, C.B.H., Chen, J.C.H. and Lin, B. (2005). Virtual health/electronic medical record: current status and perspective, *International Journal of Healthcare Technology and Management*, Vol. 6, No. 3, pp. 257-275

Mangalompalli, A., Rama, C, Muthiyalian, R., Jain, A.K, and Parinam, A.M. (2007). High-end clinical domain information systems for effective healthcare delivery, *International Journal of Electronic Healthcare*, Vol. 3, No. 2 pp. 208-219

Moore, G.C., and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), pp. 192-222.

Rogers, E. *Diffusion of Innovations*, Free Press, New York, 1995.

Seeman, E. and Gibson, S. (2008). The theory of planned behavior and its role in technology acceptance of electronic medical records implementation. Proceedings of the 2008 SE DSI Annual Conference, Orlando, FL.

Steele, R., Gardner, W., Chandra, D., and Dillon, T.S (2007). Framework and prototype for a secure XML-based electronic health records system, *International Journal of Electronic Healthcare*, Vol. 3, No. 2 pp. 151-174.

Taylor, S. & Todd, P. (1995). Assessing IT Usage: The Role of Prior Experience. *MIS Quarterly*, 19(4), 561-570.

Veiga, J., Floyd, S., & Dechant, K. (2001). Towards Modeling the Effects of National Culture on IT Implementation and Acceptance. *Journal of Information Technology*, 16, 145-158.

Venkatesh, V. & Morris, M. (2000). Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and their Role in Technology Acceptance and Usage Behavior.*MIS Quarterly*, 24(1), 115-139.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425-478.

RFID USE IN TODAY'S LARGE MANUFACTURING FIRMS: AN EXPORATORY STUDY

Angappa Gunasekaran, Charlton College of Business, University of Massachusetts-Dartmouth, North Dartmouth, MA 02747, 508-999-9187, agunasekaran@umassd.edu
Timothy Shea, Charlton College of Business, University of Massachusetts-Dartmouth, North Dartmouth, Ma 02747, 508-999-8445, tshea@umassd.edu
David Lewis, College of Management, University of Massachusetts-Lowell, Lowell, Ma. 01854, 978-934-2758, David_Lewis@uml.edu

Abstract

Radio-Frequency Identification (RFID), while still evolving, is making significant inroads into manufacturing firms. This paper, based on recent data, explores the actual, current use of RFID in large manufacturing firms as well as presents current opinions from the field about the future of RFID use. The paper begins with a literature search on RFID followed by an introduction, an analysis and discussion of the recently collected data, and a conclusion.

RFID Literature Search

RFID technology, specifically RFID chips and their accompanying information systems have impacted business in two particularly important ways. First, traditional barcodes are being replaced by RFID (Asif and Mandviwalla, 2005; Chuang, 2005; DoIT, 2004a, DoIT, 2004b, DoIT, 2004c, Wang et al., 2005). Secondly, RFID technology allows remote access to information which is stored in a chip (Das, 2002; ITAA, 2004; Want, 2004). An article in Business Wire (2008) indicated that contact less smart cards are the largest users of RFID technology. The rest of the section discusses RFID use in industry followed by predictions for future use of RFID in industry.

RFID in Industry

There have been many applications of RFID in industry and many research articles that describe its use and impact along with the challenges in implementing and using RFID applications. Resatsch, et al. (2008) examined the use of RFID technology in the retail industry. They found that the technology was found to be innovative at the point of sale, but the need for further information depended on the types of products being sold. Wired (2008) talks about the integration of RFID with Oracle software by NCR, a large manufacturer. This application adds value by monitoring inventory throughout the supply chain in real time and allows for easier material handing and identification of parts. Wired (2008) discusses the use of RFID technology in the logistics field. Barratt et al (2007) reports the results of four cases on various organizational responses to a corporate mandate to implement RFID technologies. Barlow (2006) reports on the business value of these new technologies as reported by several executives of firms currently using the technology.

Ngai, et al (2008) indicates that RFID main uses are in logistics and supply chain management. The technology has the ability to identify, categorize, and manage the flow of information and goods through the supply chain. Moon et al (2008) found that: the major advantages of RFID in the supply chain of the fashion industry were improved operational efficiency and effectiveness; increased sales and profits are the major perceived benefits; while implementation cost, compatibility with current systems, data accuracy, top management attitude, and staff acceptance are the key challenges. Harrop, et al (2008) indicates that new technology is now in the form of labels, rather than cards or plastic moldings. Wamba, et al (2006) describes how RFID and electronic product code (EPC) can provide major opportunities to redesign the shipping and receiving processes for major corporate advantage.

Not surprisingly, there are challenges in applying RFID applications and a growing body of experience to draw from those companies who have already implemented RFID systems. Van de Wijngaert (2008) explores when companies should invest in the technology and does not find a simple answer, rather, that there are interacting factors which impact the decision. Wireless News (2007) provides case studies of seven companies implementing RFID, and in a separate article provides information targeted at companies who are considering implementing RFID technology. An article in Manufacturing Business Technology (2005) describes the challenges of using the information retrieved from RFID tags into business decision making.

Next, predictions for future RFID use are presented.

Predictions for Future Use of RFID

Evans (2005) points out that RFID is poised for tremendous growth. Overall, the RFID business is expected to total $25 billion by the year 2017 (Harrop, et al, 2008). Specific markets, such as the new market for contactless bank cards, is expected to reach $4 billion in the next 10 years (Business Wire, 2008).

Heinrich (2005) describes why RFID applications will continue to grow rapidly. He says, "It can speed and automate everyday processes, reduce costs and contribute real-world, real-time awareness with an automated system of RFID tags on products and readers at important locations." He goes onto to say, that just as with any new technology implementation, "Most importantly, a business must clearly define business goals and map technology onto them, obtain support from the top, choose a good IT vendor, and start small while laying the groundwork for expansion". One significant challenge for the future is what to do with the enormous influx of data that RFID systems provide. Frontline solutions (2005) reports the results of a Forrester Research group study which found the vendors have no plans on what to do what the vast amounts of data captured from the new RFID tags.

Finally, since the future use of RFID systems will be based on the business value, or strategic value, that the systems provide a company, Evans (2005) describes several ways that RFID systems can provide business value, including "enhance visibility, optimize

supply chains, reduce latency, and eliminate paperwork and outdated and irrelevant processes." Tseng, et al (2007) provides a useful summary that identified seven potential strategic benefits of RFID systems. They based their results on five case studies from five hospitals in Taiwan. Their seven potential benefits are:

- *Effective communications*. Through improving data visibility and matching people and entities automatically, RFID can improve the effectiveness of communications among staff members.
- *Increased asset utilization*. Matched with a wireless networking system, RFID can improve the utilization of assets through the mobility, intelligence and communications capability of any tagged object.
- *Enhanced patient-care process*. Through the intelligence built into systems and the extended availability of intelligent support systems, RFID technology can optimize the patient-care process.
- *Active Patient Management*. An RFID system can transform the pattern of traditional healthcare by allowing the patient to participate actively in their treatment process, enabling them to initiate each medical treatment item and provide a mechanism for them to query their treatment information at any time.
- *Virtual integration of the supply chain.* An RFID technology can virtually integrate information/resource sharing across the supply chain by improving the visibility of data during workflow, the capability to collect information and by spanning a variety of organizational environments and business processes.
- *New service strategy*. Through RFID and the wireless sensor network environment established by EPCglobal, the meanings and constraints associated with location, space and time can be changed, so that RFID allows for new services to be created or existing services to be customized in innovative ways.
- *New business opportunities*. RFID can provide opportunities for new business opportunities.

The next section describes the collection, analysis and discussion of new data collected in order to better understand the current use of RFID system in manufacturing.

Research Methodology

An extensive questionnaire was designed based on RFID system issues identified by previously published research and feedback from an industry focus group. The questionnaire was then sent to selected large manufacturing companies for feedback. The data presented in this paper is based on 7 completed questionnaires. There is particular value in the results due to the quality and job responsibilities of the respondents – General Manager, Logistics/Supply Chain Manager, Vice-President, Line Manager, CEO, and Director – with an average of over 20 years experience.

Results

The 7 companies are all large manufacturing companies, all with International operations. They average about 2,500 employees and have average annual sales of over

$400,000,000. All Likert scale results are 1 to 5, with 5 representing "high" or "strongly agree".

Current Use of RFID

The data for this section is divided into companies that actively use RFID and those that do not. Four of the seven companies (53%) are currently implementing RFID.

Companies Actively Using RFID

The respondents for companies actively using RFID consider themselves very knowledgeable about RFID (4.5 out of 5) and their company's quite knowledgeable about RFID (4.2). The companies use RFID in different ways -- logistics, manufacturing (e.g., packaging), and security. All four companies use RFID tags for customers, 2 use RFID tags internally, and 1 uses RFID tags for suppliers. In all 4 companies, RFID tags are applied through cartons; 3 companies apply RFID tags through skids; two companies apply them for individual products. All four companies use passive tags, with one company also using active tags. All four companies use labels. One company uses "read only" tags, one company uses "WORM" tags and two use "read/write" tags.

However, RFID is not used extensively, either for B2B (with an average response of 1.8 out of 5.0) or B2C (2.0 for the 3 companies engaged in B2C). When asked about benefits RFID brought to the company, based on a list of 12 possible benefits, the top two benefits identified were "better supply chain management visibility" and "improved distribution management". The least important benefits were "need of price accuracy", "reduce pressure from competitors", and "gain competitive advantage". The barriers to the implementation of RFID in their companies that were considered most important – based on 12 possible barriers -- were "high primary investment", "uncertainty about return on investment", and "difficult to integrate into the existing supply chain".

Overall, there is a mixed reaction to the use of RFID in their companies. When asked how they would summarize their overall opinion of RFID, they averaged 3.5 out of 5.0 . Some specific comments include:
- "We can not, at this time, find an application that would justify the expense of the middleware required to manipulate the data"
- "The technology is still developing. There are issues with the ability of RFID to acquire information from a high percentage of items moving past the readers."
- "Currently, we are experiencing growing pains."

Companies Not Actively Using RFID

For the other 3 companies (43%) that have not implemented RFID, the respondents are less knowledgable about RFID (3.0 out of 5 compared with 4.5 out of 5, above) and their companies are also less knowledgeable (3.7 vs. 4.25).

When asked about benefits RFID could bring to the company, based on a list of 12 possible benefits, the top two benefits identified were the same as the ones identified by companies currently using RFID -- "better supply chain management visibility" and "improve distribution management". In addition, the companies not currently using RFID technology highlighted "keep pace with latest technology" and "make business processes more efficiently". The least important benefits were the same as for companies active in RFID - "need of price accuracy", "reduce pressure from competitors", and "gain competitive advantage". Two of the barriers to the implementation of RFID in their companies that were considered most important were the same as the ones identified by companies using RFID -- "high primary investment" and "uncertainty about return on investment".

While 2 of these 3 companies are actively in a discovery/research phase on RFID, none of them are sure when they intend to begin using RFID:
- "Our customers are not driving us to implement and from an internal standpoint we have not built a ROI case that allows for the investment."
- "RFID's can help us manage some of our products but the cost is a limiting factor to use RFID for all our inventory management needs."
- "Our business is in B2B tier supplier environment where RFID offers far less value. Bar codes are doing fine."

They are slightly less optimistic about RFID, with an overall opinion of RFID at 3.3 vs. 3.5 from companies that are currently using RFID.

Future of RFID

The future of RFID in manufacturing is unclear. When asked, the 4 companies that are currently using RFID split in their opinion – 2 said RFID is "important" to the company's future while 2 said they were "uncertain". The 2 companies that said "important" also were the only 2 companies of the 7 that "strongly agreed" with the statement that "It would benefit our business if our suppliers and other partners had RFID capabilities". The 3 companies currently not using RFID answered with 2 "not important" and 1 "reasonably important". Overall, the specific comments reflected a lukewarm future:
- "Like anything else, the technology will catch up and then be more useful"
- "It is very unclear at this time that the technology will be as useful to manufacturing, but it may serve niche markets such as banking and retail"
- "RFID may have higher value for consumer goods going to multiple points of sales."

When asked more specific questions, the future that would make RFID more prevalent only clears up a little. The companies agreed on a couple of items. All the companies "agreed" or "strongly" agreed that "cost justification is critical". Only one company did not agree that "RFID technology will inevitable replace barcodes in the future". But for some questions, the future of RFID was divided. They were divided (4 to 3 in favor) whether "the ability to track items via RFID could significantly affect pricing and delivery for customers". They were divided (4 to 3 against) when asked, "if I were not

being compelled to implement RFID by my customer's needs I would not implement it now". Finally, when asked whether "the implementation of an effective RFID plan would require significant re-engineering of our processes", the vote was split between those who have active RFID systems (3 out of 4 companies disagree) while those companies that do not have active RFID systems who either "agreed" or were "uncertain".

Conclusion

The conclusion, based on the new data collected, is that the reality of RFID today in large manufacturing companies is less optimistic that the literature. The RFID technology still poses significant challenges. The actual, specific benefits for using RFID are also unclear which makes the all-important cost justification for using RFID problematic. However, there is a general consensus that the technical issues will be resolved, that RFID will become a mainstream technology, and that the proper role of RFID in manufacturing – e.g., as more of a niche technology or as prevalent throughout manufacturing – will also emerge in the near future.

References

Anonymous (2008). *NCR Integrates RFID and Mobility Software with the Oracle E-Business Suite* Wireless News; Coventry Apr 21st. p.n/a

Anonymous (2008). Contactless Smart Cards Are the Largest RFID Sector by Far and the Business is Booming , Business Wire; New York; Apr 17st. p.n/a

Asif, Z., and M. Mandviwalla (2005). Integrating the supply chain with RFID: A technical and business analysis, *Communications of the Association for Information Systems* **15** (24), pp. 393–426.

Barlow, R. D. (2006). Making a convincing business case for RFID. . Healthcare Purchasing News (1098-3716) October 1st. 30 (10), pp.10-14.

Barratt, M. & T. Choi (2007). Mandated RFID and Institutional Responses: Cases of Decentralized Business Units. Production & Operations Management (1059-1478) September 1st. 16(5), pp.569-585.

Chuang, Y.W. (2005). An exploration of application of radio frequency identification technology in hospitals. Working Paper, National Taiwan University.

Das, R. (2002). An Introduction to RFID and Tagging Technologies. Free IDTechEx White Paper, IDTechEx, Cambridge, UK.

(a) DoIT (2004). Final Report of Location-Based Medicare Application, Department of Industrial Technology, Ministry of Economic Affairs, ROC.

(b) DoIT (2004). Final Report of Location-Based Medicare Application, Department of Industrial Technology, Ministry of Economic Affairs, ROC.

(c) DoIT (2004). Final Report of Intelligent Digital Health Network, Department of Industrial Technology, Ministry of Economic Affairs, ROC.

Evans, B. (2005). RFID Is Already Proving Its Value, Business Advantage InformationWeek; Manhasset (8750-6874) Oct 31st. Vol. 1062, p.76.

Frontline Solutions (1528-6363) (2005). Business Intelligence Vendors On RFID Sideline. April 1st. 6 (3), pp.12-14.

Harrop, P. (2008). RFID Becomes More of a Label Business Converting Magazine; Newton (0746-7141) January. 26 (1), p.4.

Heinrich, C. E. (2005). RFID - growing your business through real-world awareness Logistics and Transport Focus; Corby (1466-836X) June. 7(5), p.25.

Information Technology Association of America (ITAA) (2004). Radio Frequency Identification: RFID …Coming of Age. White Paper, Information Technology Association of America, Arlington, VA, June.

Lidwien Van de Wijngaert, L, Versendaal, J, & R. Matla (2008). Business IT Alignment and technology adoption; The case of RFID in the logistics domain, Journal of Theoretical and Applied Electronic Commerce Research; Curicó (0718-1876) April. 3(1), p.71.

Manufacturing Business Technology (1554-3404) (2005). Technology vendors set the stage for RFID data integration to business systems. November 1. 23(11), p.55.

Moon, K. L., & E. W. T. Ngai (2008). The adoption of RFID in fashion retailing: a business value-added framework Industrial Management + Data Systems; Wembley (0263-5577). 108(5), p.596.

Ngai, E., Riggins, F., & E. Ngai (2008). RFID: Technology, applications, and impact on business operations. International Journal of Production Economics (0925-5273) April 1. 112(2), p.507-509.

Resatsch, F., Sandiner, U., Leimeister, J., & H. Krcmar (2008). *Do Point of Sale RFID-Based Information Services Make a Difference? Analyzing Consumer Perceptions for Designing Smart Product Information Services in Retail Business.* Electronic Markets (1019-6781), September 1st. 18(3), p.216-231.

Tzeng, S., Chen, W., & F. Pai (2008). Evaluating the business value of RFID: Evidence from five case studies. International Journal of Production Economics (0925-5273) April 1st. 112(2), p.601-613,.

Wamba, S., Bendavid, Y., Lefebvre, L., & E. Lefebvre (2006). RFID technology and the EPC network as enablers of mobile business: a case study in a retail supply chain. International Journal of Networking & Virtual Organisations (1470-9503) September 1st. 3(4), pp.450-462.

Wang, S. W., Chen, W. H., Ong, C. S., Liu, L. & Y.W. Chuang (2006). RFID applications in hospitals: A case study on a demonstration RFID project in a Taiwan hospital. In: R. Sprauge, Editor, *Proceedings of the 39th Hawaii International Conference on Systems Science, Kauai, HI,* January. *January 2006*, IEEE Computer Society Press, Los Alamos, CA.

Want, R. (2004). Enabling ubiquitous sensing with RFID, *Computer* **37** (4), pp. 84–86.

Wireless News; Coventry (2007). Reporterlinker.com: Deploying a RFID Solution - Practical Case Studies and Business Plan October 26th, p.1

Wireless News; Coventry (2007). Research and Markets: Report Offers Case Study of RFID Solution Deployment, Related Business Plan October 26th, p.1.

BUSINESS INTELLIGENCE (BI):
A CASE STUDY OF ACHIEVING OPERATIONAL EXCELLENCE
IN CHEMICAL AND KAOLIN MANUFACTURING

Jason Maxwell
Georgia College & State University
and KaMin, LLC
Plant Manager, Sandersville Plant
530 Beck Boulevard
Sandersville, GA 31082
478-553-3508
Jason.Maxwell@kaminllc.com

Patricia Layton
KaMin, LLC
Global Demand Planning Manager, Sandersville Plant
530 Beck Boulevard
Sandersville, GA 31082
478-553-3509
Patricia.Layton@kaminllc.com

Tanya Goette
Georgia College & State University
ITM Department
CBX 12
Milledgeville, GA 31061
478-445-5721
Tanya.Goette@gcsu.edu

ABSTRACT

This paper presents information on business intelligence (BI) and its use in industry. The specifics of BI in the chemical industry are discussed. A sample of a specific case where BI has been used through integration with an enterprise resource planning system is given. It is determined that having the key information and performance measures in place to evaluate business decisions is critical to the successful use of BI.

INTRODUCTION

Manufacturing industries throughout the United States of America are faced with a fierce battle to sustain market share within today's global economy. Countries such as China, Indonesia, Thailand, and Mexico are weighing in as heavy players in the market as a result of vast improvements to information systems and technology enhancements that have allowed rapid transfer of products at low costs through e-commerce and other free trade channels. Most manufacturing corporations have adopted some type of business intelligence (BI) system which enables key decision makers to obtain real-time market data both internally and externally to their business. Key performance indicators (KPIs) are needed in order to understand how the business is performing externally in the market place (customer demand, revenues, complaints, etc.) and internally to achieve operational excellence (equipment efficiencies, identify specific projects to cut costs, etc.) [6]. The focus of this paper will be to discuss how a business intelligence

system within a chemical manufacturing environment, with specific focus on the kaolin industry, can be integrated with process management, knowledge management, and enterprise resource planning (ERP) systems to transform the business into a competitive giant in its applicable markets.

KNOWLEDGE AND INTELLIGENCE

First, it is important to understand how intelligence and knowledge are critical to make proactive decisions that positively impact the bottom-line before the competition realizes what has hit them. The fundamental concept called "intelligence" is different from "information" [5, p. IT5]. Intelligence is actionable information that can be best described as data turned into knowledge that in turn is actually used for something. One definition is, "intelligence is knowledge and foreknowledge of the world that is the prelude to decision and action" [5, p. IT5]. History is a good example of how intelligence has changed as the world has evolved from long lead times to transmit critical information into real-time intelligence that is easily distributed to multiple key decision makers within corporations and/or government agencies throughout the world.

On July 4, 1776, the U.S. claimed its independence from Britain and Democracy was born. A super-power was instantly created within the world as many people across the seven continents heard of the "American Dream". However, this critical information was not heard until months later. The victory and independence for the U.S. was founded on the industrious attitudes of people from the free-world that relentlessly defeated their opponent through critical intelligence. This intelligence was central to the U.S. (the battle occurred in the U.S.) and enabled key decision makers to act quickly and strike when it counted. On the other hand, the opponent of the U.S. lacked the critical intelligence needed to make key decisions due to the Atlantic Ocean separating the supreme leaders. At that time, intelligence messages could take up to a month before a decision was made to initiate action.

On the day that U.S. claimed its victory in the American Revolutionary War, King George III of England had no idea that American independence had been achieved. The battle was over, and it took a few weeks before the key leader was aware of his country's defeat. With today's modern technology, King George III would receive minute by minute intelligence that would enable him and his key military units to react according to their strengths. Given our modern culture and England's strength as a country compared to the U.S. at that time, American independence could have easily turned out differently. This illustration is a prime example of how intelligence has evolved in the past 200 years. Receiving intelligence and acting quickly is critical before you become defeated by the opponent. In the case of today's chemical companies, lack of intelligence will lead to a loss of market share and the eventual consolidation or shut-down of operations due to diminishing customer demand.

COMPETITIVE BUSINESS INTELLIGENCE

What most chemical companies really want is a competitive business intelligence system. This is defined as "the organizational means to systematically collect, analyze, and disseminate information as intelligence to users who can act on it" [5, p. IT5]. A key contributor to successful leverage efforts is a very simple one. Typically, whoever knows more in advance and responds to that knowledge quickly wins [5].

Understanding how a competitive business intelligence system functions is important as we move forward in this discussion. Operational raw data is usually stored in corporate databases. Specialized software is utilized to tie this data together into a data warehouse. The data warehouse is used to link tables of information allowing for extensive analysis. Business analytics tools are utilized to extract data from the data warehouse and manipulate it into reports, alerts, graphs, forecasts, or other data mining initiatives.

These reports are disseminated quickly to key decision makers to proactively and strategically move the business forward.

There are a few elements necessary to ensure a functional BI system within a chemical manufacturing environment. Business intelligence solutions allow companies to establish a performance management framework for targeting, reassuring, notifying, and adjusting their processes to comply with performance objectives [6]. The first step for a company is to define key performance indicators (KPIs) to turn strategic goals into measurable results. The latter really focuses on getting the right information needed to thrive and succeed in today's fast-paced business environment. At all levels, employees need to be aware of the key business drivers and results related to their position in the company. More importantly, in order to better facilitate their specific task focus, employees need to know how these facts deviate from the planned or forecasted values.

Kulbeda and Hodge described the success formula for chemical companies as "external challenges, plus internal pressures, minus the company's ability to manage product through the value chain equals a significant portion of chemical company's operational success" [1, p.5]. Typically, external challenges drive a need for operational effectiveness. Products and brands are key to obtaining competitive differentiation, market share and demand. However, most strategies for long-term differentiation based on products, features or services are difficult to sustain. In other words, products and brands are important but not enough by themselves.

Market factors were overwhelmingly the top external challenge that accounted for 81% of CEO responses in a recent poll [1]. Although broad in scope, market factors can be interpreted as competitors, customers, and pricing. Other key external factors, such as globalization and regulation, do little to ensure chemical corporations maintain high prices or roomy margins. Long-term sustainability must come from business model innovation [1]. A perennial push to preserve margins revolves around reducing costs. Internal challenges drive a need to improve operational effectiveness by targeting the critical path of the product itself. That is, moving product from sourcing to distribution quickly, inexpensively, and effectively. Many chemical companies are utilizing lean manufacturing and six sigma methodologies to target non-value added activities in the value chain and eliminate the activity or improve the efficiency or variation that is generated by those functions.

OTHER INDUSTRY USES OF BI

The drug industry, as related to the chemical industry, found through BI that more was not always better [4]. They thought that high-throughput screening during the research process of new drugs was the key. After time, and with the help of a BI system, the industry realized that better screening (higher quality) is the number one priority to obtain more accurate hits on targets faster [4]. This was performed through improved information flow between discover research and clinical development.

SIMPLE BI SOLUTIONS (EXCEL)

Business intelligence is an essential component and needed for any manufacturing based company to stay competitive in the market place by delivering low cost products with excellent quality. One journal article described that today the most popular and inexpensive BI tool is Microsoft Excel [7]. Excel is not fancy, but business users are pretty comfortable with it because it allows them to aggregate data, quickly apply formulas, perform data analytics, and share results with other people. The latter is a result from Excel being easily installed on every business person's PC (personal computer). Excel is a low automation solution but it works, and works without any help from IT departments [7].

CRITICAL USES OF BI IN THE CHEMICAL INDUSTRY

Product-intensive functions (procurement, manufacturing, and distribution) within a chemical company typically take the brunt of margin scrutiny and represent the biggest opportunity for improvement through business intelligence [1]. BI in procurement can be used to analyze raw material suppliers for quality, volume, and pricing. Typically, procurement managers can access data in pricing to secure long-term pricing contracts with vendors. In addition, discounts can be secured which in return generates costs savings for the company as well as minimizing potential scrap or rework that could be initiated by inferior raw materials [1]. BI in manufacturing can be used by plant management to understand the connection and relationship between performance measures and the detailed manufacturing components. In addition, operational data can be tracked more efficiently and linked with overhead costs to quickly understand how to maneuver the elements required in order to achieve financial success. Finally, BI in chemical distribution can be used to reduce inventory (working capital), improve order entry, and reduce delivery time. The latter is usually performed through business activities such as warehouse management, inventory management, order management, fleet management, etc. Distribution directly contributes to the overall chemical products cost structure and provides a critical link to the heart of a chemical company's revenue: the customer. By improving business intelligence to procurement, manufacturing, and distribution, chemical companies can be more responsive with their business decisions and improve margins [1].
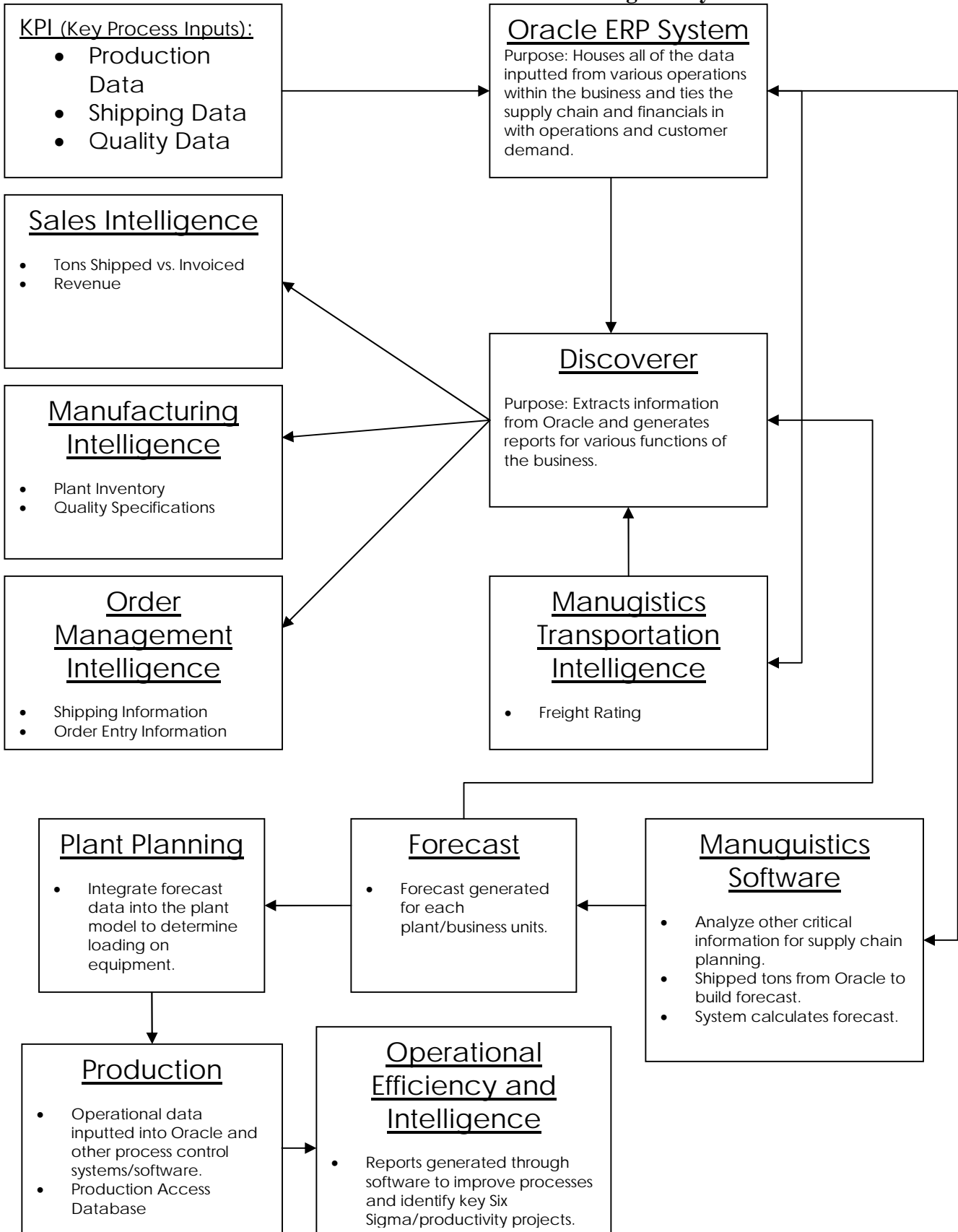
BI USES IN KAMIN LLC

As a specific case in the chemical industry, kaolin (clay) manufacturing will be discussed in order to further shed light on how business intelligence drastically impacts responsiveness to the market and the industry's margins. About 40 years ago, kaolin mining and manufacturing was simply described as dirt that was extracted from mother-nature and brought into a plant through simple processes to remove elemental impurities in order to improve clay opacity (make the clay whiter and brighter). The polished product was finally placed in a bag or railcar for shipment to specific customers. During those years, kaolin reserves were abundant, and customers[i] utilized kaolin as the primary contributor to their formulations. Typically, price was not as dynamic as it is today due to raw material costs (kaolin crude, chemicals, bags, etc.) and energy costs (natural gas, fuel oil, electricity, etc.) being fairly stable and predictable. Given the stability of the energy costs, kaolin prices were set at a rate that was favorable for both the producer and the consumer. This allowed for some level of predictability of the cost structure. Thus, enterprise resource systems were not as critical, and business intelligence was not as sophisticated.

As time progressed, natural resources diminished somewhat, raw material costs exponentially increased, and energy costs climbed to all time highs. Over the same period, technology drastically evolved through information systems, the Internet, and science. Kaolin customers are under the same scrutiny as other industries, and, thus, have found ways to cut costs by using less kaolin in formulations. In addition, rapid innovation of high technology equipment utilized to manufacture products cheaply and more efficiently have evolved in order to sustain competitiveness in the global economy with the likes of China, Mexico, and other third world countries who continue to discover ways to manufacture products at lower costs.

In order to control market share and sustain competitiveness, the kaolin industry has adopted strategies based on a BI system to procure large volumes of raw materials at low prices, manufacture products more cheaply through innovation and process improvements, and deliver products efficiently and on-time to its customers. Business intelligence systems were established to meet the demands of the market and have been synergized with process management, knowledge management, and ERP systems to quickly analyze and develop an informed decision on the basis of what is described by many as an avalanche of information [5, p. IT5]. Figure 1 illustrates how the BI system utilized by KaMin LLC ties into the ERP system (Oracle) to extract critical intelligence in a timely manner to decision makers [2].

FIGURE 1: KaMin LLC ERP/BI Intelligence System

KPI (Key Process Inputs):
- Production Data
- Shipping Data
- Quality Data

Oracle ERP System
Purpose: Houses all of the data inputted from various operations within the business and ties the supply chain and financials in with operations and customer demand.

Sales Intelligence
- Tons Shipped vs. Invoiced
- Revenue

Manufacturing Intelligence
- Plant Inventory
- Quality Specifications

Discoverer
Purpose: Extracts information from Oracle and generates reports for various functions of the business.

Order Management Intelligence
- Shipping Information
- Order Entry Information

Manugistics Transportation Intelligence
- Freight Rating

Plant Planning
- Integrate forecast data into the plant model to determine loading on equipment.

Forecast
- Forecast generated for each plant/business units.

Manuguistics Software
- Analyze other critical information for supply chain planning.
- Shipped tons from Oracle to build forecast.
- System calculates forecast.

Production
- Operational data inputted into Oracle and other process control systems/software.
- Production Access Database

Operational Efficiency and Intelligence
- Reports generated through software to improve processes and identify key Six Sigma/productivity projects.

Key process inputs from the manufacturing process are entered or scanned into the Oracle (ERP) system, which include production data (run-time, throughputs, chemical dose rates, etc.), shipping data (customer, location, quantity, volume, etc.), and quality data (customer specifications: brightness, rheology, particle size, etc.). The Oracle system houses all of the data from various operations within the business and bridges the gap between operations, supply chain, sales (customer demand), and finance. Oracle has the capabilities of tying different functions of the business together very quickly in order to generate key reporting and intelligence information.

Discoverer software is utilized for the purpose of extracting information/data from Oracle and generating reports for various business intelligence functions. Four critical intelligence reports are generated for key decision makers with responsibilities over different functions of the business. Sales intelligence reporting primarily focuses on tons of kaolin shipped and invoiced to specific customers, and the revenue associated with these shipments within given time periods. This information is essential to determine how the business is performing from a revenue and volume standpoint at any given time. The president, finance and sales team primarily utilize sales intelligence reporting report on a daily basis. Manufacturing intelligence reporting is utilized by operations leaders to determine plant inventories (working capital), and overall operational efficiencies. This information is essential to determine an attention focus on a daily, weekly, and monthly basis to ensure that overhead costs are minimized and products are produced effectively. Order management, transportation intelligence, and forecast reporting is heavily utilized by the supply chain department to determine order entry accuracies, precise freight ratings, and accurate shipping information [2].

In addition to BI systems, KaMin LLC utilizes demand planning and collaboration modules from Manugistics to extract other critical information necessary for supply chain planning. Shipped tons are pulled from Oracle and the software automatically calculates a forecast for a specific plant. The forecast is uploaded into a plant model (an intricate Excel spreadsheet) to determine plant loading over a given time period. Production is scheduled based on order entry through Oracle, and at the end of each month, forecasts are compared to actual production shipments to determine a percentage of accuracy.

Prior to the BI system at KaMin LLC, much of the activities during the first two weeks of the month involved gathering information about the previous month's operational and financial performance through non-integrated systems [2]. Off-line spreadsheets captured critical information in typical silo fashion as these systems lacked integration or data linkage. Tracking performance monthly was the frequency allowed with existing manpower at the time. Due to the latter, upper management did not have access to the critical real-time information which is vital in making key business decisions to generate incremental wealth and propel past the competition [2].

BI has become an essential requirement to do business within the kaolin industry and to sustain a competitive edge by controlling costs on a real-time basis. KaMin currently uses the BI system to link costing, shipments, open orders, and production data. Snap-shot reports can be pulled throughout the month by upper management allowing them to make informed decisions. Another example of management's pre-BI issues was the inaccuracy and lack of data when projecting expected volumes and revenues. Today, reports linking shipments, non-invoiced shipments, project gross margin, and standard costs can be easily pulled at any time [2]. In addition, once ERP and BI systems were fully implemented, fewer resources were necessary to operate and maintain system components and business reporting needs.

From a competitive perspective, KaMin is positioned well to gain intelligence on market conditions and consumer preferences. KaMin's intelligence from the Vice President of Supply Chain, Mr. David Mayfield, confirms that "Engelhard (a competitor of KaMin LLC) was very good at data mining and utilizing data to generate meaningful reports on Sales and Operations data to feed their planning optimization software in order to validate plant models and confirm the decision making process.

KaMin's advantage is a more integrated utilization of the Oracle system versus Engelhard's use of their system. With the acquisition of Engelhard by BASF, and subsequent implementation of SAP, it is expected that there was an improvement in the accuracy of their ERP data. The advantage that KaMin had with regard to more accurate bill of materials, routings, etc. may have been lessened with the full implementation of SAP" [3]. In summary, Mr. Mayfield illustrates "that the more thorough use of the ERP system leads to a more thorough use of the BI system. There is a trust in the data and the system when there is use and accuracy in the system" [3].

KaMin LLC has been very effective in the market place by utilizing BI systems to make key decisions with accurate information. As a result, the entire efficiency of the organization has improved through a reduction of redundant transactional steps as compared prior years, and the manufacturing process can be more easily managed and controlled through process management and BI. Knowledge management is also utilized in other areas, especially in science and technology, for further process improvements. The Internet, combined with newly innovated product solutions from research and development, has yielded huge improvements to the KaMin's bottom-line.

CONCLUSION

Chemical manufacturing, including the kaolin industry, will continue to be challenged by strong competition, both domestic and foreign. Business intelligence, ERP, process and knowledge management are all essential ingredients to build a dynasty that will withstand drastic shifts in the marketplace. Regardless of what type of BI system manufacturing companies utilize, the key is to have the right information and performance measures in place to properly evaluate business results. Finally, hiring the right people is essential in order to make tough decisions and lead the organization to the top. People still remain the greatest asset to building a well-rounded team and allowing for a functional/effective BI system.

REFERENCES

[1] Kulbeda, J. & Hodge, R. Business Intelligence for Operational Effectiveness: Improving Insight and Visibility into Chemical Companies, "Product-Intensive" Functions," IBM Global Business Services, WHITE PAPER, 2007, 1-26. http://www-03.ibm.com/industries/chemicalspetroleum/doc/content/bin/chem_bi_white_paper.pdf.
[2] Layton, P. *Interview*. KaMin LLC: Business Intelligence System and Functionality, 2008.
[3] Mayfield, D. KaMin's Business Intelligence System, 2008.
[4] Mullin, R. Software and database vendors aim to supply researchers with tools to extract quality from quantity, Chemical & Engineering News, 01 October 2007, 85 (40), 19-20. http://pubs.acs.org/cen/coverstory/85/8540cover2.html.
[5] Nature American Inc. Competitive business intelligence gather and analysis, Nature Biotechnology, October 2000, 18 Supplement, IT5 –IT6. http://www.nature.com/nbt/journal/v18/n10s/pdf/nbt1000_IT5.pdf.
[6] Tkach, Daniel. Business Intelligence and Process Effectiveness Processes, *Wisconsin Technology Network*, 2002, 05 December, 1-3. http://wistechnology.com/articles/470/.
[7] SYS-CON Media Inc, Business Intelligence in the world of Rich Internet Applications, 2008 http://www.web2journal.com/read/280900_p.htm.

---

[i] The primary customers are paper industries which utilize the product for coating applications, and industrial markets which utilize kaolin as a pigment for a variety of products, i.e. paint, insulation in wire and cable, tires, etc.

Motivations for Using Short Messaging Service

Liqiong Deng, Richards College of Business, University of West Georgia, Carrollton, GA 30118, (678) 839-5532, jdeng@westga.edu,
Jun Sun, College of Business Administration, University of Texas – Pan American, Edinburg, TX 78539, (956) 381-3353, jsun@utpa.edu,
Douglas Turner, Richards College of Business, University of West Georgia, Carrollton, GA 30118, (678) 839-4847, dturner@westga.edu,
Bradley Prince, Richards College of Business, University of West Georgia, Carrollton, GA 30118, (678) 839-4845, bprince@westga.edu

ABSTRACT

Given the increasing importance of short messaging service (SMS) as a means of mobile communication, the purpose of this study was to develop a comprehensive measurement instrument of motivations for using SMS. Drawing on the uses and gratifications theory, we conducted explorative qualitative and quantitative studies to identify factors motivating the use of this service. Using factor analysis, we discovered a five-factor scale that consists of ubiquitous communication, affection/sociability, information-seeking, fashion, and non-intrusive communication motivations. The motivations of ubiquitous communication and non-intrusive communication were found to predict the amount of SMS usage. The implications of the proposed scale are discussed for future research.

INTRODUCTION

As the mobile voice communication market approaches saturation, carriers are focusing on messaging as a crucial value-added service to garner more mobile subscribers and generate greater market revenues. Specifically, short messaging service (SMS) is emerging as one of the most important forms of asynchronous communication that carriers provide. It is projected that in 2009 U. S. subscribers will send over 126 billion messages via their mobile devices, generating $8.6 billion revenue [1]. To significantly increase the usage of and revenue from SMS, it is necessary to first understand what motivates people to use SMS. Nowadays, people are presented with a wide variety of choices of communication media (e.g., email, instant messaging (IM), mobile voice communication, and SMS). A solid understanding of the factors motivating usage of SMS over other communication media can advance our knowledge of SMS use and lead to better designs for the user experience.

To date, most research has focused on the use of SMS by teenagers and young adults. Recently, as SMS becomes pervasive in our daily lives, older people also recognize the convenience of using SMS. It has been reported that over 74% of all mobile phone users worldwide use SMS text messaging [2]. Very few studies have investigated the varied motivations for using SMS in a comprehensive manner.

Therefore, the purpose of this study is to more fully understand the motivations for using SMS. Specifically, we draw on the uses and gratifications theory to understand users' gratification-

seeking motivations underlying their usage of SMS. These motivations are closely related to users' SMS usage behaviors, media and content choice, and involvement in SMS experience [3]. A sound measurement of SMS usage motivations will provide a foundation for future research investigating the relationships between SMS usage motivations, SMS experience, SMS usage behaviors (e.g., frequency of SMS usage, SMS communication content, etc.), and outcomes of SMS usage (e.g., satisfaction, communication efficiency, relationship building/enhancement, etc.). The measurement can be employed to build a taxonomy of SMS users based on their motivations, thereby providing mobile carriers with guidance for SMS service design and delivery. Moreover, by integrating the concept of uses and gratifications theory with the traditional focus on rational utility, this research provides a new perspective for technology usage research and emphasizes the importance of users' psychological needs in shaping the choice and use of communication media.

LITERATURE REVIEW

Most IS research on technology adoption and usage draws on Davis' technology acceptance model (TAM) [4], Ajzen and Fishbein's theory of planned behavior (TBP) [5], and Venkatesh et al.'s unified theory of acceptance and use of technology (UTAUT) [6]. These models provide valuable insights on adoption and use of technology at the workplace, where adoption is usually not under the volitional control of user. These findings however may not apply to the adoption of SMS, which is almost completely voluntary use. While user beliefs about technology usefulness and ease-of-use have been shown to predict adoption of technology at the workplace [4], however, perceived usefulness and ease-of-use may not provide adequate motivations to use SMS.

Today, people face a broad range of choices in media for fulfilling their communication needs, such as email, voice mail, instant messaging, and so on. SMS emerges as new alternative means of asynchronous communication, which users may lack a compelling motivation to adopt. It was reported that US has been lagging behind Europe and Japan in the adoption of SMS. As pointed out by Järvenpää et al. (2003), consumers will use new mobile services only when those services create new choices where mobility really matters and positively affect their lives. This makes it appropriate to employ the uses and gratifications theory in studying the adoption and use of SMS.

The uses and gratification theory focuses on the individual use and choice of communication media motivated by the desire to satisfy a wide variety of psychological needs. The uses and gratification theory has been widely applied to study the motivations underlying media consumption in an everyday context [7], such as conventional telephone[8], pager [9], email [10], and cell phone [11]. The theory assumes that media users are active participants in their media choice and use [12]. They are aware of their needs and select appropriate media to gratify their needs [12]. Much of the uses and gratifications research has focused on identifying the gratifications satisfied by the use of certain media [13, 14]. It has provided support for both intrinsic and instrumental motivations underlying media usage. As such, the motivations underlying conventional telephone usage are functional motive, i.e., information seeking, making appointments, etc., and relational motive, i.e., chatting, keeping contacts with family and friends, etc. [15]. Cell phone usage is motivated by mobility, immediacy, instrumentality, and affection/sociability [11]. This study builds on prior research on uses and gratifications in exploring the gratifications most sought from the use of SMS.

RESEARCH METHOD

Data Collection and Sample

The data was collected with an online questionnaire targeted to users of SMS. A screening question was included at the beginning of survey to determine whether the respondent is using SMS at the time of the survey. The survey website was designed in such a way that only the existing SMS users who use SMS at least once per day will be able to proceed with the survey. An email invitation with a link to the survey was sent to an online consumer survey panel. Cash incentive was provided to encourage participation in the survey. A total of 197 useable responses were received. All the respondents used SMS at least once a day. There were 121 female respondents (61.42%) and 76 male respondents (38.58%). The respondents' ages ranged from 18 to 67. A total of 119 respondents were between 18 and 29 years (60.41%), and the remaining 78 respondents were between 30 and 67 years old (39.59%). Most respondents (n=179, 90.86%) have used SMS for more than one year. 44.16% of the respondents (n = 87) sent at least one and maximally five SMS-messages a day, and 55.84% of the respondents (n = 110) sent more than five SMS-messages a day.

Measures

The gratifications of SMS usage were measured with a combination of items used previously in the gratification literature [8, 11, 16] and new items based on the interviews with SMS users. The items from the existing literature were modified to describe the gratification sought in SMS. In addition, in-depth interviews were conducted with the end users of SMS to understand SMS usage motivations from the user's perspective and generate new gratification items. A total of 47 items were generated and tested in a pilot study using a student sample. Based on the results of the pilot study, 27 items were eliminated due to low factor loadings, high crossing-loadings, or low communalities. The remaining 20 items were included in the survey. Survey participants were asked to respond to each item statement on a 7-point Likert-type scale anchored by "1=strongly disagree" and "7=strongly agree".

We also measured the amount of SMS use by asking the respondents to report the average number of SMS messages sent per day. Respondents were also asked about their age, education, gender, occupation, and length of SMS use.

DATA ANALYSIS

Principal component factor analysis with varimax rotation was run to determine the potential groupings of the 20 gratification items of SMS usage. An eigenvalue of greater than 1.0 was required to retain a factor.

The factor score was calculated for each of the SMS motivation factors by averaging the scores of the items for the factor. A hierarchical multiple regression analysis was performed to examine the relationships between SMS motivation factors and amount of SMS use. The length of SMS usage was entered in the first block, the demographic variables (age, gender, and education) were entered in the second block, and the SMS motivation factors were entered in the third block for the hierarchical regression analysis.

RESULTS

Factor Analysis

The value of Kaiser-Mayer-Olkin Measure of Sampling Adequacy, which examines the existence of patterns among measurement items, was greater than 0.89 (well above the 0.50 criteria). The Bartlett's Test of Sphericity was significant at the 0.0001 level, indicating that the items were correlated and suitable for factor analysis [17].

Table 1. Gratification Items and Factors

Factor	Item	Content
Ubiquitous Communication	UBQT1	To have the convenience of contacting others anytime anywhere
	UBQT2	To contact people easily whenever I need to
	UBQT3	To have the ease of contacting people anytime anywhere
Affection/ Sociability	AFSO1	To share experiences and emotions with friends
	AFSO2	To communicate emotions
	AFSO3	To express affections
	AFSO4	To plan logistics for social events
	AFSO5	To coordinate activities with others
	AFSO6	To organize social events
	AFSO7	To coordinate time/places for social events
Information Seeking	INFO1	To receive information or notifications, such as weather/traffic condition, appointment reminder, and etc.
	INFO2	To keep up-to-date with everyday occurrences
	INFO3	To receive information on topics I am interested in such as news
Fashion	FASH1	To look fashionable
	FASH2	To feel stylish
	FASH3	To feel cool
Non-intrusive communication	UINT1	To have private communication in public
	UINT2	To communicate with people without interrupting currently ongoing events
	UINT3	To communicate without having to commit to a spoken conversation
	UINT4	To communicate with no commitment required

Varimax rotation was performed on the data and resulted in a clearly identifiable five component solution representing five gratification dimensions with eigenvalues greater than 1.0. The five dimensions explain 77.33% of the total variance. Table 1 presents the items and their corresponding factors. The first factor, "ubiquitous communication", suggests a use of SMS motivated by the convenience/ease of maintaining contacts anytime anywhere. The second factor is affection/sociality, which indicates the motivations of using SMS to express emotions and coordinate social events [16]. The third factor, information seeking, reflects the use of SMS motivated by the need to receive relevant information and keep up-to-date with everyday occurrences [16]. The fourth factor is fashion, which pertains to the use of SMS for being fashionable and stylish [16]. Non-intrusive communication emerged as the fifth factor, which

demonstrates the motivations of using SMS to avoid a spoken conversation and have private communication without interrupting any ongoing events.

All the items had loadings of above 0.50 to their corresponding factors. No item yielded cross-loadings above 0.40, indicating good discriminant validity. Factor reliability was estimated by assessing the internal consistency of the scale items using Cronbach's alpha, which were all above 0.70. Therefore, the measures were considered reliable. The factor loadings and Cronbach's alpha values are reported in Table 2.

Table 2. Factor Loading and Reliability for SMS Gratification Dimensions

Item	Ubiquitous Communication	Affection/ Sociability	Information Seeking	Fashion	Non-intrusive communication
UBQT1	.869				
UBQT2	.825				
UBQT3	.865				
AFSO1		.688			
AFSO2		.770			
AFSO3		.745			
AFSO4		.742			
AFSO5		.696			
AFSO6		.757			
AFSO7		.743			
INFO1			.810		
INFO2			.543		
INFO3			.685		
FASH1				.885	
FASH2				.913	
FASH3				.914	
UINT1					.609
UINT2					.659
UINT3					.823
UINT4					.692
Number of Items	3	7	3	3	4
Cronbach's Alpha	.91	.93	.81	.95	.80

Hierarchical Multiple Regression

To investigate how the SMS motivation factors extracted from the factor analysis influence the amount of SMS use, we conducted hierarchal multiple regression analysis. The amount of SMS use was regressed on three blocks of variables: the length of SMS usage, followed by the demographics variables (age, gender, education), and the five SMS motivation factors.

The total variance explained for the amount of SMS use was 31.0% (R Squared). The length of SMS usage and demographic variables accounted for 14.2% of the variance on the amount of

SMS use. The five SMS motivation factors explained the additional 16.8% of the variance in the amount of SMS use. The results also show that ubiquitous communication ($\beta = .152$, $p = 0.05$), and non-intrusive communication ($\beta = .183$, $p = 0.037$) were significant predictors of the amount of SMS use.

CONCLUSIONS AND FUTURE RESEARCH

The purpose of this research was to discover the gratification factors that motivate the use of SMS. Five types of SMS motivations were identified – ubiquitous communication, affection/sociability, information seeking, fashion, and non-intrusive communication. These results are largely consistent with previous studies on the cell phone and pager [11, 16]. Non-intrusive communication emerged as a unique motivation factor for SMS. It suggests the motivation of using SMS to avoid talking. By eliminating the need to talk on the phone, SMS is discreet and does not intrude on the privacy of user when sending and receiving messages. Furthermore, the motivations of non-intrusive communication and ubiquitous communication were found to significantly predict the amount of SMS use. Both motivations point to the convenience of using SMS to maintain contacts wherever the user is and whenever the user wants.

In an attempt to integrate the uses and gratifications theory and technology usage research, this study enriches our understanding of the gratifications people seek from SMS and relates these gratifications to the SMS usage behavior. This study opens several avenues for future research. First, due to the exploratory nature of this study, the findings of this study should be subject to more rigorous testing in future research. Second, future research can investigate how SMS users' motivations will vary with regards to gender, age, and usage contexts. Third, a taxonomy of SMS users can be constructed based on their motivations for using SMS. This will provide a useful tool for mobile carriers to understand their users and tailor the design and delivery of SMS to certain user segments. Finally, more work is required to explore the consequences of the gratifications sought from the use of SMS, such as SMS usage patterns, user satisfaction, relationship building/enhancement, etc.

REFERENCES

[1]   Golvin, C.S. & Charron, C. Sizing the us mobile messaging market. *Business View Market Overview,* 2004

[2]   Mellor, B. Nomads at last. in *Economist,* 2008.

[3]   McQuail, D. With more hindsight: Conceptual problems and some ways forward for media use research. *Communications: The European Journal of Communication Research,* 2001, 26(4), 337-350.

[4]   Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly,* 1989, 13(3), 319-340.

[5]   Ajzen, I. & Fishbein, M. *Understanding attitudes and predicting social behavior.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1980.

[6]   Venkatesh, V., Morris, M.G., Davis, G.B. & Davis, F.D. User acceptance of information technology: Toward a unified view. *MIS Quarterly,* 2003, 27(3), 425-478.

[7]   Lin, C.A. Uses and gratifications. in *Clarifying communication theories: A hands-on approach*, Stone, G., M. Singletary & V.P. Richmond, Eds. Ames: Iowa State University Press, 1999, pp. 199-208.

[8]   O'Keefe, G.J. & Sulanowski, B.K. More than just talk: Uses, gratifications and the telephone. *Journalism and Mass Communication Quarterly,* 1995, 72(4), 922-933.

[9]   Leung, L. & Wei, R. Seeking news via the pager: An expectancy-value study. *Journal of Broadcasting and Electronic Media,* 1999, 43(3), 299-315.

[10]   Dimmick, J., Kline, S. & Stafford, L. The gratification niches of personal e-mail and the telephone. *Communication Research,* 2000, 27(2), 227-248.

[11]   Leung, L. & Wei, R. More than just talk on the move: Uses and gratifications of the cellular phone. *Journalism and Mass Communication Quarterly,* 2000, 77(2), 308-320.

[12]   Katz, E., Blumler, G. & Gurevich, M. Utilization of mass communication by the individual. in *The uses of mass communication: Current perspective on gratifications research* Beverly Hills, CA: Sage, 1974, pp. 19-32.

[13]   Rubin, A.M. Media uses and effects: A uses and gratifications perspective. in *Media effects: Advances in theory and research* Hillsdale, NJ: Erlbaum, 1994, pp. 417-436.

[14]   Swanson, D.L. Understanding audiences: Continuing contributions of gratifications research. *Poetics: Journal of Empirical Research on Literature, the Media and the Arts,* 1992, 21, 305-328.

[15]   Claisse, G. & Rowe, F. The telephone in question: Questions on communication. *Computer Networks and ISDN Systems,* 1987, 14, 207-219.

[16]   Leung, L. & Wei, R. The gratification of pager use: Sociability, information-seeking, entertainment, utility, and fashion and status. *Telematics and Informatics: An International Journal on Telecommunications & Information Technology,* 1998, 15(4), 253-264.

[17]   Hair, J.F., Anderson, R.E., Tatham, R.L. & Black, W.C. *Multivariate data analysis*, 5 ed. New Jersey: Prentice Hall, 1998.

NETWORK SECURITY FOR CYBER WAR

Allison Johnson and Matthew Diana

James Madison University, Harrisonburg, Virginia 22807-0001 USA

Young B. Choi, Department of Computer Information Systems and Management Science,

James Madison University, Harrisonburg, Virginia 22807-0001 USA

+1 (540) 568-7031, choiyb@jmu.edu

Abstract

In this paper, we will discuss the emerging dimension of war called cyberwarfare. First, we will study what cyberwar is, and also look into some recent attacks on countries' networks that is considered acts of cyberwar. Next, we will look into what weaknesses these attackers are exploiting. It is impossible to fight a war when one does not know where the enemy is coming from and what vulnerabilities the enemy is exploiting. Understanding the weaknesses, we can then discuss how serious of a threat cyberwar is. There are many types of threats with varying levels of significant damage. The government is not the only target either; the private industry and civilians can also be targets. Finally, we will discuss possible ways to reduce the threat of cyber attacks to our networks. This is a very serious issue in a time where technology is becoming a staple in our lives and also a main form of communication.

Introduction

Many people do not realize that while we are fighting a war overseas, we are also fighting a war every day in our networks. An emerging issue that the government and private industry are dealing with is cyberwarfare. This is where cyberspace becomes yet another battlefield, which U.S. forces of all kinds must defend against hackers. It is very difficult to monitor all activity on a network, if not impossible. Therefore, many hackers are able to enter a network and steal information undetected. Information, as they say, is power. And valuable information in the wrong hands could be catastrophic, mostly because there is no way of knowing how much information was compromised and when or how the hacker will use it. There are no physical barriers in cyberspace, and the U.S. cannot censor the information that is shared via the Internet. This makes defending our networks and valuable information very difficult. Recognizing this complex issue, President Bush has increased spending in this area in an attempt the keep us and our secrets safe. In order to design solutions to reduce cyber attacks, we need to understand what cyberwar is, how it is typically used, what weaknesses are being exploited, and current technological advances in the making.

What is cyber warfare?

Cyber warfare is defined, according to Wikipedia.com, as the use of computers and the Internet in conducting warfare in cyberspace. Cyber warfare can also be used in defending and attacking information along with computer networks throughout cyberspace. Cyberspace is defined as an operational domain of the electromagnetic spectrum spanning the commons, homeland and battle space, bounded and enabled by military and commercial information and communication technology. This can be very dangerous to the receiver due to the fact that cyber warfare has no limitations and almost every time it attacks, it destroys exactly what it wants to. In this day and age, many countries are not up to date with the technology and therefore are more vulnerable to these cyber attacks. Many countries that are attacked don't have these very advanced technologies because many of these technologies are far too expensive. In cyber warfare, it is extremely difficult to locate the origin and even the nature of how powerful the attack was and much damage it caused. Russia, China, Germany, and France are a few countries that are incorporating cyber warfare into their military.

Many countries, along with the United States, believe that cyber attacks, if big enough, can be devastating and pose a very real national security threat. After the many terrorism attacks have occurred, many people believe that computers and information technology will be next in line for the terrorists and some even believe that they will disrupt crucial infrastructure such as our transportation, banking/finance, or communications. Straight from one of the Office of Naval Intelligence reports in 2000, "A couple of years ago, the Central Intelligence Agency (CIA) only mentioned Russia and China specifically as possible cyber threats. Today, U.S. officials indicate that more than 20 countries have various kinds of information operations (IO) directed against

the United States. The CIA testified more recently that adversaries are incorporating cyberwarfare3 as a new part of their military doctrine. A declassified Navy threat assessment identifies Russia, China, India, and Cuba as countries who have acknowledged policies of preparing for cyber warfare and who are rapidly developing their capabilities. North Korea, Libya, Iran, Iraq, and Syria reportedly have some capability, and France, Japan, and Germany are active in this field." Cyber war can also be the offensive information mounted against an adversary and it's also categorized as denying an adversary to attack a country. There are a few electronic effects of cyber warfare, such as high energy radio frequency guns and electromagnetic pulse generators to overload circuitry. Many cyber effects that occur are penetration of networks, sensor jamming, and destroyed equipment through cyberspace.

What are some recent attacks on networks?

Air Force Rome Lab (March 1994) - In the month of March, the Rome Lab in New York found themselves under attack so after sending out two Air Force teams, they found that the origin was first in New York then later in Seattle. The hacker was later found in the United Kingdom after boasting about his achievements. Officials later said that the hacker cause over 150 intrusions and from 100 different points of origin.

Solar Sunrise (February 1998) – This time, the Department of Defense was hit using a UNIX-based computer system known as Solaris. The attackers probed the Department of Defense to see if vulnerability existed then planted a program to record data to later be gathered. The probing originally started at Harvard University and was then reported at United Arab Emirates. More

activity was reported in Germany, Israel, France, and Taiwan, and all total, over 500 computer systems were attacked, including educational and governmental systems.

Estonian Cyber war (April 2007) – There were a series of attacks against the Estonian parliament and various Estonian organizations on April 27, 2007. A criminal investigation was opened a week after the attacks, and it was found that most of the attacks were just distributed denial of service to the users. Many attacks were used for spam distribution and expensive rentals of bot-nets. The Estonian Reform Party, however, had bigger spam news portals and defacements on their website. As of January of this year, one person has been convicted.

Taiwan vs. China (June 2006) – On June 17, 2006, a press release revealed a bribery in Taiwan's Defense Ministry Network, but it was later said to be false. The operation may have been on a much larger scale and the attack was originated in China. Once traced down, officials found out that the attack was of great precision because it was aimed to be so quick and aimed to cause massive amounts of damage to networks. Luckily for the Taiwanese government, there had been some leaks. Both countries have been fighting for quite some time though, with the stealing of data and manipulation of media. This shows that both countries have been hiring private hackers for years, and recently has shown that there are more web based attacks between the countries.

Israel and Hezbollah Cyber War – When fighting between Israel and Palestine turned over into cyberspace; hackers immobilized 15 Arab websites and 24 Israeli websites. Attacks were also launched through e-mail and discussion groups and the cyber war was initiated when the hackers abducted three Israeli soldiers. Hizbollah.org was then crippled by so many millions of American

and Israeli users and on the site, the hackers had one button to click before a chain reaction of hits crippled the website. Over a month later, Hezbollah recovered and retaliated by creating mirror sites on various different servers trying to confuse the hackers from further crippling their networks.

What weaknesses are these attackers exploiting?

First off, hackers are looking for an interconnected network, that is mutually joined networks, because once the hackers hinder the network, more people will be affected. These networks include public and private ones, which clearly has many more users than just one or the other. The problem with interconnected networks is that since they are so large, they normally don't have as much security behind their development. The second weakness that attackers exploit is weak boundaries. Many hackers try and find out who a domestic threat is, but also who a foreign threat is. If hackers know who their weak countries are, they will try that much harder to exploit their networks. Another weakness is the various different media outlets that each nation has. The media is involved in many different networks so if indeed a hacker could get into and cripple a media outlet, many others would be greatly affected.

Of course, unknown or misunderstood vulnerabilities are another type of weakness because if they are unknown, our programmers would not know how to solve the problem until after they were hacked into. There are various attacks that are made to look like accidents also making it that much harder for our security technicians to detect whether or not they should act upon a certain threat. Certain hackers know how to program an attack much faster than a reaction time, so some attacks can cause much damage. They cause so much damage because our defenses

don't have enough time to react to an attack and by the time we do fix the problem, many networks could have been already hit.

How much of a threat is cyber warfare?

Now, a natural question is, "how much of a threat is this?" There are some threats that have more serious consequences than others because of the potential damage that could be done. For example, there are physical attacks where our adversaries destroy buildings or bridges, or there are attacks where human lives are targeted. Buildings can be rebuilt and the attacks on human lives are usually relatively small. The difference between those attacks and cyber attacks is that information is compromised in the latter, which can be used to plan multiple attacks. Lani Kass, a senior adviser to U.S. Air Force Chief of Staff Gen. Michael Moseley said, "If we drop a bomb on a house, we have a pretty good idea of what the collateral damage will be; if we take down a server somewhere, the possible results are a lot less clear."

Our military makes use of the best technology we have, which includes sophisticated communication devices. During war, communication is essential, and if hackers compromise the communication lines, either our military cannot communicate with each other or sensitive information ends up in the wrong hands. Gen. Robert Elder, the military officer in charge of the U.S. Air Force's day-to-day cyberspace operations said, "When we talk about the speed range and flexibility of air power -- to deliver satellite-guided strikes to effect the outcome of a battle on the ground for example -- the thing that enables this for us is the fact of our cyber-dominance, the ability to move data and control signals through cyberspace -- which as the Air Force defines it is the entire electromagnetic spectrum."

Success of our military relies on secure lines of communication. For example, Lockheed Martin has recently developed the Space Based Infrared System (SBIRS) geosynchronous orbit (GEO) spacecraft (Figure 1 below), which is designed to warn us against missile launches earlier than we were capable of before. According to Space War newsletter, "An integral component of the spacecraft's command and data handling subsystem, the fault management system responds when an anomaly is detected in normal operations, putting the satellite into a safe state while operators on the ground analyze the situation and take corrective action." This is an innovative tool that could save millions of lives. However, if a hacker attempting a cyber attack compromises it, the SBIRS could be rendered useless or even somehow used against us.

Figure 1. SBIRS GEO spacecraft

What are the effects on other industries?

The government and military agencies are not the only ones at risk. Private industry is also a target of cyber attacks. The infamous computer hacking group Cult of the Dead Cow (CDC) has reportedly created a program called "Goolag Scanner," which supposedly allows anyone to

download the program and scan any website or Internet domain for weaknesses in the site's security that hackers can exploit. CDC spokesman Oxblood Ruffin said, "If I were a government, a large corporation, or anyone with a large web site, I'd be downloading this beast and aiming it at my site yesterday." Even with this warning, many security specialists warn users to check this program for malicious code, which many hackers use to mine information off of the very computer trying to use their program. The point is that cyber attacks can target anyone on the web, and they can come from anywhere.

Since there are so many kinds of hackers and cyber attacks, the consequence of a successful attack affects everyone: the military, government, private industry, and civilians. The government agencies are beginning to partner up with the private sector in order to gain the best advantage in preventing cyber attacks on crucial networks. Recently, the Department of Homeland Security (DHS) conducted its second biannual cyberwar exercise codenamed Cyber Storm II. This exercise is "designed to test the ability of federal agencies and their partners in state, local and foreign governments and the private sector to respond to and recover from cyberattacks on their computer networks," according to Cyber Wars newsletter on March 10, 2008. This exercise is said to simulate physical and cyberattacks on communication systems and various transportation infrastructure. In a past exercise, the "hackers" penetrated heath care databases and defaced newspaper websites, all of which are very plausible threats. The article said that as in the real world, the attackers are from "states, terrorist groups and criminal enterprises."

Even though the federal government and the private sector are trying to work together, communication between the two is often very difficult, and it is an obstacle that many are trying to overcome. Former DHS preparedness chief George Foresman said, "It's all about the information. The ability to communicate highly technical information in real-time between government officials without a common vocabulary had been a major challenge identified by Cyber Storm I. Collaboration between the government and the private sector was something planners continued to wrestle with. We haven't mastered that piece yet."

What can we do to eliminate the threat of cyber attacks?

We can never eliminate the threat because we cannot control everything that happens on the Internet or on networks. The hardest asset to control and keep safe is human activity. For example, people in important government positions still open attachments with viruses or fall for a phishing scam. The only way to prevent scams like phishing is to educate everyone who uses a computer, especially those computers with sensitive defense information, how phishing works. Many of the hackers are very clever in tricking people into giving up their personal information, such as recreating an e-mail that appears to come from the person's bank stating that he or she should type in his or her personal bank information in order to fix a problem with his or her account. It is surprising how easy it is to recreate an official looking e-mail and it is even more surprising how many times it works. For example, one can easily obtain Bank of America's HTML instructions used to display the bank's homepage (Figure 2 below). From this, the hacker can recreate an official looking e-mail to trick users. So conducting exercises and searching for vulnerabilities are necessary to do, but it is all-futile if the everyday people using the systems and networks are not educated and careful about information transfer over the Internet.

Figure 2. Bank of America HTML instructions

Educating users is a step in the right direction, but as mentioned before, we need new technology to help scan for attacks because the cyber war battlefield is so vast. In an attempt to reduce the threat of cyber attacks, researchers at George Mason University's Center for Secure Information Systems have been developing software called Couldron that provides real-time situational awareness, which allows users to see possible attack paths into a network in real-time. "Currently, network administrators must rely on labor-intensive processes for tracking network configurations and vulnerabilities, which requires a great deal of expertise and is error prone because of the complexity, volume and frequent changes in security data and network configurations," said Professor Sushil Jajodia. "This new software is an automated tool that can analyze and visualize vulnerabilities and attack paths, encouraging 'what-if analysis.'"

Another program recently developed, but still not completely error-free, is called Einstein, and is a result of the classified multibillion-dollar cybersecurity initiative President Bush signed in February 2008. This program, according to Cyber Wars newsletter is, "an intrusion detection system that will automatically monitor and analyze Internet traffic into and out of federal computer networks in real time -- allowing officials at the Department of Homeland Security to scan for anomalies that might represent hackers or other intruders trying to gain access or steal data." Many people are skeptical of the system and say it is too passive and the information Einstein delivers is not really in real-time. Others also argue that Einstein is nothing new in the private sector and this technology is useful, but not groundbreaking by any means. Casey Potenzone, chief information officer of computer security firm Uniloc, said that programs like Einstein "are absolutely standard in the private sector. It is not revolutionary or state of the art. [The program across federal networks is] very logical and something that should have been done a long time ago."

There is a lot of work to be done in creating a low-threat cyber environment. To get there, it will take a lot of manpower and cooperation between the government and the private sector. And we will also need a lot of money. President Bush has requested $154 billion in funding to track cyber threats on government and private networks, and that is just a taste of what we should expect in the future for this war in cyberspace.

Conclusion

We have studied cyberwarfare, when it has been used in the past, the weaknesses the hackers are exploiting, and new improvements attempting to reduce the threat of cyber attacks. If we intend to keep automating our information processes and creating new technologies to communicate, this war in cyberspace is truly inevitable. As long as we communicate sensitive information, there will always be someone trying to gain unauthorized access to the information. This is not new in our time, for Julius Caesar needed to encrypt his messages sent on paper to prevent his valuable information from falling into the wrong hands. Now, we are communicating through the internet and satellites and radio waves. We need to be aware that every time we use these devices, we are putting our information at risk of being compromised by a hacker. Because of this, we need to educate all users of intelligence or defense data of the risks in cyberspace. We also need to create new programs and systems that can monitor activity and reliably alert users when a network is not secure. We hope this paper will educate people on this issue and perhaps everyone will be more cautious when transferring information to each other.

References

Bishop, M. (2004). *Introduction to Computer Security*. New York: Addison-wesley

    Professional.

Carr, H., & Snyder, C. (2006). *Data Communications and Network Security*. New York:

    McGraw-Hill/Irwin.

Magnuson, S. (2006). *Cyber war: network vulnerabilities worry pentagon.(CYBER*

    SECURITY): An article from: National Defense. Chicago: Thomson Gale.

Swetnam, M. (1999). *Cyber Terrorism and Information Warfare (Terrorism: Documents*

    of International and Local Control, Second Series.Volumes 5-8.). New York:

    Oxford University Press, USA.

Antolin-Jenkins, V. (2005). Defining the Parameters of Cyberwar Operations: Looking

    for Law in All the Wrong Places. *Naval Law Review*, *10*(*51*), 132. Retrieved Apr.

    11, 2008, from

    http://scholar.google.com/scholar?hl=en&lr=&q=info:l1sZBQJ2eUQJ:scholar.go

    ogle.com/&output=viewport.

Kshetri , N. (2005). Pattern of global cyber war and crime: A conceptual framework .

Journal of International Management, *11*(*4*), 541-562. Retrieved Apr. 11, 2008,

from sciencedirect.com.

Lesk, M. (2007). The New Front Line: Estonia under Cyberassault. *Security & Privacy,*

IEEE, *5*(*4*), 76-79. Retrieved Apr. 11, 2008, from

http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=4288051.

Rowe, N. (2007). Ethics of Cyber War Attacks. *Cyber Warfare and Cyber Terrorism, 1.*

Retrieved Apr. 11, 2008, from

http://books.google.com/books?hl=en&lr=&id=6CJ-aV9Dh-

QC&oi=fnd&pg=PA105&dq=conference+articles-

+cyberwar&ots=qkXZhD_JSl&sig=IP3OOQCMtZgCxM-6JpvQgs0JBi0.

Cooper, M. (2006). Pre-empting Emergence: The Biological Turn in the War on Terror.

Theory Culture Society, *23*(*4*), 113-135.

Dowd, P., & Mchenry, J. (1998). Network security: it's time to take it seriously.

Computer, *31*(*9*), 24-28.

Hack attack.(Brief Article). ***New Scientist*** 168.2264 (Nov 11,

2000): p.27. (85 words) From *Academic OneFile*.

Update on the war against cyber crime. ***Computers & Security*** 23.5 (July

2004): p.356(2). From *General OneFile*.

2007 cyberattacks on Estonia - Wikipedia, the free encyclopedia. (n.d.). Retrieved Apr. 9,

2008, from http://en.wikipedia.org/wiki/Cyberattacks_on_Estonia_2007.

CRS Report for Congress. (n.d.). Retrieved Apr. 9, 2008, from

http://64.233.169.104/search?q=cache:u34dKl6-

gbsJ:www.fas.org/irp/crs/RL30735

Hackers use Google to find website vulnerabilities. (2008, Feb. 22). Retrieved Apr. 13,

2008, from

http://www.spacewar.com/reports/Hackers_use_Google_to_find_website_vulnera

bilities_999.html.

Lockheed Martin Team Completes Flight Software Design Review For Space-Based

Missile Warning System. (2008, Apr. 10). Retrieved Apr. 13, 2008, from

http://www.spacewar.com/reports/Lockheed_Martin_Team_Completes_Flight_So

ftware_Design_Review_For_Space_Based_Missile_Warning_System_999.html.

Posey , B. (2005, January 27). *How to Avoid Phishing Scams*. Retrieved Apr. 13, 2008,

from http://www.windowsecurity.com/articles/Avoid-Phishing.html?printversion.

Software protects against cyberattacks. (2008, Mar. 18). Retrieved Apr. 13, 2008, from

http://www.spacewar.com/reports/Software_protects_against_cyberattacks_999.ht

ml.

Waterman, S. (2007, October 17). *Analysis: A new USAF cyber-war doctrine*. Retrieved

Apr. 13, 2008, from

http://www.spacewar.com/reports/Analysis_A_new_USAF_cyber-

war_doctrine_999.html.

Waterman, S. (2008, Mar. 10). *Analysis: DHS stages cyberwar exercise*. Retrieved Apr.

13, 2008, from

http://www.spacewar.com/reports/Analysis_DHS_stages_cyberwar_exercise_999

.html.

Waterman, S. (2008, Mar. 3). *Analysis: Einstein and U.S. cybersecurity*. Retrieved Apr.

13, 2008, from

http://www.spacewar.com/reports/Analysis_Einstein_and_US_cybersecurity_999.

html.

MEETING STUDENT TRAINING OPPORTUNITIES IN DATA STORAGE TECHNOLOGY THROUGH COLLABORATION BETWEEN THE LOCAL TECHNOLOGY COMMUNITY AND THE LOCAL UNIVERSITY

Bob Gehling, School of Business, Auburn University Montgomery, Montgomery, AL 36124
(334) 244-3479, bgehling@aum.edu

Tom Griffin, School of Business, Auburn University Montgomery, Montgomery, AL 36124
(334) 244-3482, tgriffin@aum.edu

ABSTRACT

Electronic data is an essential and strategic asset for most organizations. The data these organizations maintain relates to their customers, suppliers, employees, products, inventories, equipment, policies, intellectual property, financial results, business processes and more. New image-oriented applications, particularly those used by healthcare and entertainment, are significantly increasing the demand for the storage of data [5]. This demand for data storage capacity is doubling every 18 to 24 months. Many analysts project that by 2012, the annual growth rate of data storage will be in the yottabyte range. Storage hardware vendors such as EMC and HP are investing heavily in the area of data storage because of the potential business opportunities in data storage systems over the next few years [3].

This paper addresses how a group of technology professionals and a university in one community have come together to develop a program in data storage technology management to meet the need for graduates with specific job skills.

INTRODUCTION

According to an EMC forecast of overall data growth, the overall size of digital universe in 2007 was 281 exabytes, or 281 billion gigabytes [2]. The study also reported that enterprises are responsible for the security, privacy, reliability, and compliance of 85% of the digital universe. Storage technologies such as Network-attached storage (NAS) and storage area networks (SANs) have evolved to meet this demand. However, scaling up capacity with these solutions almost inevitably leads to rising management complexity, user disruptions, and ever-increasing costs [1].

The traditional model for handling the continued growth in data storage capacity has been to add more disk capacity to individual servers or the desktop computers within an organization. The problem with this approach is that the internal storage capacity of some servers might be operating at capacity while other servers will be idle with much of their internal storage capacity going to waste. This server-based storage model can be a problem, no mater the size of the company. To complicate matters, no matter the size of the company, some may not have the staff with the expertise or the time to adequately perform data backup across multiple servers to avoid data loss. (Hitachi 11/20/07 podcast) This approach also does not take into account that

managing an increasing number of terabytes of data storage is far different from taking care of a few hundred gigabytes of storage on a server or an end user's computer [3].

Problem Situation

While it is not generally recognized, Montgomery, Alabama is considered one of the major technology centers in the southeastern United States (Forbes 2006). Montgomery is the capital of the State of Alabama, so the state has a number of large departmental data centers located there. In addition, until recently two of the southeast's regional financial and banking groups had their data center operations located in Montgomery (one of those centers was recently moved to Birmingham after a consolidation with another banking group).

Montgomery is the home of Maxwell Air Force base and the Gunter Annex. Gunter AFB houses one of the Defense Information Systems Agency's (DISA) main computing hubs for the U.S. Department of Defense (DoD). Gunter is also the home of the Air Force's 754th Electronic Systems Group, which deploys and provides global support for the Air Forces' high-tech logistics, financial, medical and personnel applications. The 754th is also responsible for deployment and support of the various Microsoft desktop applications that go on *every* PC in the Air Force and other DoD sites. The 754th has also recently been involved in one of the biggest Oracle rollouts in the DoD [4].

Montgomery is also the home of the offices of many of the technology companies that provide technical support for the activities at Gunter AFB, among them Oracle, BAE Systems, UNISYS and Dell [4]. According to the Montgomery chamber of commerce, DISA employs close to 1,800 military and civilian personnel, plus more than 600 technology contractors.

Most of these organizations, specifically the State of Alabama and Department of Defense, generate and manage massive amounts of data. This has increased the need in the area for individuals with advanced skills in the management of data storage technology. This demand for continues to grow as the DISA, local businesses and state agencies look to implement or expand existing data storage facilities.

The local IT community comes together to meet a need

A group of the IT contractors who specialized in the management of data storage systems found as the opportunities for their services expanded in the Montgomery market, they had an increasingly difficult time recruiting new personnel with even basic conceptual knowledge of data storage technologies, particularly Storage Area Networks (SANs). In 2006, the need had gotten so critical that some of them were recruiting new employees from outside of the state and the region.

In August 2006, a small representative group from these contractors met with one of the members of the faculty in the Information Systems and Decision Sciences (ISDS) department in Auburn – Montgomery's (AUM) School of Business. The purpose of the meeting was to see if he would incorporate an overview of data storage technology into one of his existing network management courses. To help the professor better understand storage technology he was about

to be presenting to his classes, he was invited to sit through some training SAN technology classes one of the contractors had scheduled for some of their staff in December 2006.

In order to better support the students taking these classes, it was acknowledged by all the parties that had become involved in the initial discussions that a storage technologies teaching lab needed to be created at AUM. To accomplish the, the technology contractors (UNISYS, Integrated Computer Solutions, Hewlett-Packard, among others) partnered with AUM's School of Business to build the necessary lab which was later named the AUM Storage Area Network Center of Excellence (SANCoE).

Creation of the Storage Area Network Center of Excellence

During the spring of 2007, the SAN training program grew faster than many of those originally involved envisioned or even expected. With the help of the Alabama Technology Foundation that had been created a few months prior, AUM was able to obtain gifts of new equipment and funds to establish SAN teaching and computer labs. Members of the local IT community provided their time and expertise in setting up and configuring the SAN and servers in the labs. Some of the foundation's corporate members provided funds to begin establishing scholarships for students taking the newly created data storage technology management courses. In addition, the university and the governor's office (through the state's department of economic development) also provided additional funding for scholarships for students in the data storage technology program track that had bee created.

Building the SANCoE involved purchasing or seeking donated equipment, preparing a site, obtaining software licenses, and installing and configuring the necessary equipment and applications. Site preparation involved converting a traditional classroom in the School of Business to a computer room/lab, part of it with raised flooring, Internet access and with additional electrical power capacity to support the new equipment and for future growth. The initial storage area was an HP EVA4000 storage array donated by HP. The servers, switches and additional racks were supplied by AUM's Information Technology Services department. In addition to the facility for housing the SAN and servers, an adjacent classroom was equipped with new PC's running Linux with VMWare for teaching server virtualization. To support other technology courses, the computers were also set up to run Windows and SOLARIS (via virtualization) and ORACLE.

Expanding the program

The first two semesters, the new data storage technology concepts course was scheduled as an elective course for students in the existing information technology program. Students were required to be classified as seniors and had already completed certain courses, such as data telecommunications and database management. However after a surprising demand by students to take the course, the Information Systems department decided to establish a specific degree track in data storage technology and, to that end, started development of an advanced data storage technology course. After teaching the basic concepts course twice, the professor found that it was difficult to present all the information on data storage technology that some of the local industry suggested be covered in one semester. One of the advantages of offering data

storage concepts track as part of an existing business degree program in Information Systems management is that after they graduate, the student will also have a Bachelor of Science degree in business administration with a specialization in Information Systems.

AUM recently entered into an agreement with EMC, one of the major data storage equipment vendors, to use their certification course curriculum in one of the courses. AUM is one of a few universities in the US using this curriculum for a college credit course. The agreement required the professor teaching the data storage courses to attend training at one of the EMC training sites. The advantage of this approach is that the students are now exposed to current technology and, if successfully completing the course, they are given a discount voucher for the EMC certification exam if they decide to take it.

AUM's Information Systems department is also an associate member of the Storage Network Industry Organization (SNIA.org). This association has provided opportunities for groups of students to attend the Storage Network World (SNWUSA.org) conferences in Orlando and Dallas. Prior to the start of the Orlando conference, the students attending helped set up the hands-on-training labs and worked with the corporate trainers to find problems with the training applications and training materials. The students were then given the opportunity to sit through actual training classes and later received certificates of training from some of the vendors.

Due to the demand for the courses, the department has recently started discussions on creating a for college credit certificate program in data storage management. This is due to the number of students who graduated before the start of the program who have come back to take the new courses in data storage management.

Formation of the Alabama Technology Foundation (ATF)

To expand on this collaboration between the local technology industry and educational community, the principle individuals and organizations involved with this project established a foundation entitled the "Alabama Technology Foundation" or ATF. Since its creation, the foundation has become directly and indirectly involved in programs geared toward developing a trained and skilled workforce by targeting business demand, growth opportunities and specialization in the field of information technology in Montgomery and around the state of Alabama. To accomplish this, ATF has partnered with local, state, and national economic development organizations. ATF also works to connect capital, human, and intellectual resources to IT training programs, and conducts outreach efforts to bring strong industry professionals into the classroom. They also promote career opportunities, such as working with the local IT industry to create internships and cooperative education programs in the local area for high school and college students. The foundation also supports universities involved in the training programs by providing funding and infrastructure contributions, scholarships and professorships, and establishing other Centers of Excellence in Alabama, the first being the Data Storage Center of Excellence at AUM. The foundation conducts annual Knowledge, Skills, and Abilities (KSA) reviews to document industry expectations of graduating students, and assists universities in the development of curriculum that meets current and future industry needs. The foundation also provides direct training and "Train-the-Trainer" programs to ensure what is taught in the classroom aligns with what is expected in the local job market.

CONCLUSIONS

As of August 2008, one of the contractors had hired six students who have completed the data storage program courses to go through their data management intern training program as is actively recruiting more. Those students who have already completed their internships have been hired into full-time positions. The contractor was also in the process of reviewing resumes for the next internship. Other technology contractors and the state's data center are in the process of developing similar data management internship programs.

While the program at AUM is in only in its second academic year, you can see that a collaborative effort between a local technology industry and university can provide a mechanism for expanding the knowledge of a specific new evolving technology, in this case data storage management, and in turn provide a way of training new employees to meet the needs of local businesses and government. Other similar programs, such as ones in security management and IT disaster planning and management, are currently under discussion.

REFERENCES

[1] Buczynski, Mark (2001) "Moving from SAN to NAS virtualization" InfoStor November, 2001 downloaded 041008 from http://www.infostor.com/Articles/Article_Display.cfm?Section=Articles&Subsection=Display&ARTICLE_ID=126591

[2] Gantz, J., Chute, C., Manfrediz, A., Minton, S., Reinsel, D., Schlichting, W., et. al. (2008). *The Diverse and Exploding Digital Universe: An Updated Forecast of Worldwide Information Growth Through 2011*, p. 2.

[3] Lawson, Stephen (2008) "HP brings storage, servers into one rack" downloaded 05-07-08 from http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=storage&articleId=9083198&taxonomyId=19&intsrc=kc_top

[4] Maidment, Paul (2006) "Where The Best-Paying High-Tech Jobs Are", *FORBES*, August 1, 2006.

[5] Mehta, Manjari and Ives, Blake (2004) "Storage Area Networks" *Communications of the Association for Information Systems* (Volume 14, 2004) pp 569-598

Enhancing Ethical Decision-Making through MIS Courses

Susan Light
School of Engineering and Computational Sciences
Liberty University

1971 University Blvd.
Lynchburg, VA 24502

Abstract

Information Systems graduates will most likely have access to confidential data at work. Training MIS students to make ethical decisions should be an important part of their education. We used to cover ethics in just the 100-level introductory and the 400-level capstone courses. Part of seeking ABET accreditation for our MIS program requires our students to have a good understanding of ethical responsibilities and to be able to make ethical decisions as one of the Information Systems program outcomes; therefore, we started covering ethics in other MIS courses. This paper covers how that can be achieved and points out the possibility of enhancing ethical decision-making through Information Systems courses.

Keywords
Ethics, ethical decision-making.

1. Introduction

MIS students gain a great deal of knowledge and skills in college, and after graduation, they may have access to huge amounts of confidential data and personal information as well as the responsibility to design information systems to be used by companies and the general public. How can they be prepared to make ethical decisions in their professions when faced with such tempting situations such as profiting from hacking, using unauthorized accounts or utilizing SPAM for marketing? This paper explains how to integrate ethics into all Information Systems courses without overloading faculty.

2. Ethics is the Glue That Holds Everything Together

As Baase said, new technology brings benefits and new risks. Computers, the Internet, and a whole array of digital devices, with their astounding increases in speed, storage space, and connectivity, make the collection, searching, analysis, storage, access, and distribution of huge amounts of information and images much easier, cheaper, and faster than ever before. These are great benefits, but, when the information is about us, the

same capabilities threaten our privacy (Baase, 2007). The more technology advances, the more we need to teach students in computing majors their professional and ethical responsibilities. Ethics is the glue that holds everything together and should be one of the core portions of an MIS student's education.

In our curriculum, we used to cover ethics in just two MIS courses, the 100-level intro and 400-level capstone courses. Since we started seeking ABET accreditation and emphasizing program outcomes, we revisited our approach in ethical education and found that it made sense to embed it in all Information Systems courses.

3. Embedding Ethics Components in All Information Systems Courses

3.1 Embedding the Ethics Component without Overburdening the Instructors

In the past semester, students were required to perform research on a code of ethics in computing, and prepare a short presentation. They were given resources, such as:

 ACM's "Software Engineering Code of Ethics and Professional Practice from http://www.acm.org/about/se-code

"Information Ethics" from http://cyberethics.cbi.msstate.edu/

and "Database Privacy" from http://ethics.csc.ncsu.edu/privacy/database/

They could choose from topics such as click streaming, SPAM, plagiarism, software piracy, freedom of speech in cyberspace, illegal downloading music files, invasion of privacy, or hacking.

3.2 Samples of Ethics Quiz Questions in MIS Courses

Students were asked to design questions based on their presentations. The instructor collected, modified, and gave some of the questions as a part of an exam. Following are samples of the questions.

True/False

1. Just because technology makes something possible doesn't mean it is ethical. (**True**/False)

2. If a company lets you go because of budget cuts and withholds your last paycheck, it's ethical for you to withhold information required for the normal business process. (True/**False**)

3. There is a quick network upgrade required, but should be done after hours to keep up-time. It's ethical to do it during business hours. (True/**False**)

4. The fair use of a copyrighted work, including such use by reproduction in copies or by any other means, for purposes such as criticism, commenting, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. (**True**/False)

5. There are laws about copyrights that someone who reverse-engineers software must take care of. The common approach of this problem is dividing the programmers into 2 groups:

> The first group disassembles the code of the program/firmware and writes the specifications.
> The second group makes a program using these specifications.

As long as the second group doesn't see the original work, it is not copyright infringement. (**True**/False)

Multiple Choice

6. While designing software, you realize that you're running out of time on your deadline for delivery of the system, you should:
   a. Cut corners, neglecting to implement a few "minor" security measures.
   b. Neglect to include certain information.
   c. **Keep working hard and ask for more time if necessary.**
   d. Hack into other companies' systems and copy their code.

7. Someone who realizes you work with a certain company propositions that you retrieve a handful of social security numbers and offers you money in exchange. You should:
   a. **Say no and report him to the proper authorities.**
   b. Take the money and donate half of it to missionaries.
   c. Say "sure" and glance over the information while doing a routine maintenance.
   d. Take his money and give half of it to the poor.

8. You work for a major hosting company. You receive an email from a random person informing you that your company is hosting a hate site. You should:
   a. Inform your employer about the email.

b. Investigate the site.
c. Contact the owners of the site to let them know they are violating the terms of agreement.
d. **All of the above.**

9. What can we do to prevent from being phished?
    a. Learn to recognize phishing attempts.
    b. Use SPAM filters in our email accounts.
    c. Don't post personal information on websites.
    d. **All of the above.**

10. When taking a music theory class in college, the teacher requires a certain CD to be purchased for the course. You don't have enough money at the time, you should:
    a. Burn a copy form a classmate.
    b. Steal it.
    c. Try to find it online and download it.
    d. **Ask for a loan from a friend or parents so that you can purchase the CD.**

11. An employee of a marketing company discovers that a coworker is emailing confidential company information to a competing company. What should the employee do?
    a. Hack into his coworker's computer himself to obtain evidence.
    b. Have a colleague hack into the person's computer for him in order to obtain evidence.
    c. Hire a cracker to hack into his coworker's computer in order to obtain evidence.
    d. **Inform his boss of the situation and allow upper management to hack into the person's computer to obtain evidence.**

12. A co-worker is posting obscene comments about you on a news group forum. You should:
    a. Start rumors about him in the work place.
    b. Hack into his computer and delete his vital files.
    c. Lie to your boss and say that he is stealing from the company.
    d. **Contact the administrator of the site to inform them that such harassment is occurring.**

13. An employee was treated unfairly by his company, which withheld earnings from his paycheck that were rightfully due him. What should he do?
    a. Hack into his company's financial department to electronically transfer the rest of the money that belongs to him.
    b. Hack into his bosses' computers and delete vital information.
    c. **Write a letter of complaint to upper management or, if necessary, the appropriate government agency.**
    d. Sell the company's confidential data to competitors.

14. What are some guidelines employers needs to follow before monitoring their employees?
    a. Make sure the employees know what is being monitored.
    b. Let the employees see data that is obtained through monitoring.
    c. Do not divulge personal information acquired through monitoring.
    d. **All of the above.**

15. An opportunity arises to get some new software for the programmers in the company. The software is priced differently depending on how many programmers will be using it at one time. Should the company:
    a. Find out just how many people will need to use the software.
    b. Figure out how many will need to use it at one time.
    c. Enforce the concurrent user license that they purchase
    d. **All of the above.**

3.3 Results
In additional to the exam on ethics, surveys were done at the end of the semester to check how students felt about their understanding of professional and ethical responsibilities. The following table shows the survey results in the author's classes.

Question		Strongly Agree	Agree	Disagree	Strongly Disagree	Does Not Apply	Un-answered	**Percent Agree**
I have a good understanding of professional and ethical responsibilities in computing.	CMIS 211	30.77%	53.85%	0%	7.69%	7.69%	0%	84.62%
	CMIS 212	91.67%	8.33%	0%	0%	0%	0%	100%
	CMIS 312	55.6%	44.4%	0%	0%	0%	0%	100.00%

4. Conclusion

It is crucial that MIS students know the codes of ethics in computing and be able to make ethical decisions accordingly. Students who download music illegally or commit plagiarism in school are likely to do the same after graduation. Students who are trained to make ethical decisions throughout their curriculum are more likely to make ethical decisions and be responsible professionals. There are different ways to embed ethics in all computing classes; the way discussed above is only one of the ways. In addition to having ethics as a major emphasis in the 100-level intro and 400-level capstone courses, embedding ethics components in all other information systems courses sends the message to students that ethics hold everything together, and teaches them not just how to make a living but also how to live.

References

1. Baase, Sarah., 2007. A Gift of Fire: Social, Legal and Ethical Issues for Computers and the Internet (3rd ed.), pp. 47
2. "Database Privacy" from http://ethics.csc.ncsu.edu/privacy/database/
3. "Information Ethics" from http://cyberethics.cbi.msstate.edu/
4. "Software Engineering Code of Ethics and Professional Practice from http://www.acm.org/about/se-code

KNOWLEDGE AND SKILL REQUIREMENTS FOR ENTRY-LEVEL INFORMATION TECHNOLOGY WORKERS: DO EMPLOYERS IN THE IT INDUSTRY VIEW THESE DIFFERENTLY THAN EMPLOYERS IN OTHER INDUSTRIES?

Cheryl L. Aasheim
Georgia Southern University
PO Box 8150
Statesboro, GA 30460-8150
caasheim@georgiasouthern.edu

Susan Williams
Georgia Southern University
PO Box 8153, Statesboro, GA 30460-8153
rebstock@georgiasouthern.edu

ABSTRACT

In order to determine how to prepare graduates in IT-related degree programs for entry-level jobs, employers in various industries were surveyed to determine whether there are differences in skills and knowledge requirements across industries. The results of the survey are reported and analyzed. Based on the findings of the survey, advising and curriculum recommendations are made.

INTRODUCTION

Enrollments in Information Technology (IT)-related academic programs have declined significantly in recent years, [8][20][21]. Several studies have investigated potential causes of the enrollment decline, attributing it most often to factors such as curriculum problems [1][8][19], issues that influence students to choose (or not choose) an IT-related major [27][29], lack of availability of accurate information about the IT industry and related employment opportunities to high school students[17], and offshore outsourcing of IT jobs [22][25].

The U.S. Department of Labor predicts that employment demand for IT-related professionals will grow much faster than the average for all occupations through the year 2016. For example, the Bureau of Labor Statistics projects that the number of jobs will increase 16% from 2006 to 2016 for the occupation entitled "computer and information systems managers", 37% for "computer scientists and database administrators", and 53% for "network systems and data communications analysts" [2][3]. It is also estimated that the United States will have only half of the qualified graduates needed to meet the rapidly increasing demand for IT professionals through 2012 because of the declining number of student enrollments [18].

To meet anticipated demand, it is urgent for IT-related academic programs to attract more students and prepare graduates with critical knowledge and skills. A number of studies have been conducted to determine the critical knowledge and skill sets that graduates need to perform IT-related jobs successfully [4][5][10][11][13][24][26].

The purpose of this paper is to investigate whether the importance of various skills differs for **entry-level** IT workers who seek employment in the IT sector as opposed to those who seek employment in other industry sectors. In other words, do organizations whose primary business is the creation and deployment of information technologies view the importance of entry-level skills differently than organizations whose primary business utilizes information technologies to create and deploy other types of products and services?

The approach of this study is to conduct a survey of IT managers and workers to examine their views on the knowledge and skills required of entry-level IT workers. A comparison of the results of surveys gathered from respondents working in organizations in the technology sector to the respondents working in other areas is presented. The results provide insights that may be helpful in designing curricula to better meet the entry-level needs of firms in the IT sector. The results may also aid IS/IT professors in designing plans of study for students who plan to seek employment with IT firms.

BACKGROUND

Despite the existence of model curricula for computing-related degree programs, several studies suggest that there is a gap between the skills achieved by Information Systems (IS)/Information Technology (IT) graduates and the skills required by employers [4][5][10][11][13][26][24]. These studies have examined this gap as it is perceived by IT professionals, academicians, students, and users. Some have made recommendations to improve the IS curriculum [11][12][14][26][28].

Lee and Han [11] studied skill requirements for entry-level programmers/analysts in Fortune 500 companies and investigated the gap between the IS 2002 model curriculum and the requirements of the industry. They found that application development, software, social and business skills were highly valued, and recommended that knowledge of technological trends, knowledge of business functions and general problem solving skills be taken into account by the designers of future IS curricula.

Surakka [23], who extended previous studies by Lethbridge [15][16], found that a decreased level of importance is being placed on continuous mathematics and basic science, and that new areas of emphasis, such as web-related skills, are emerging.

Fang, Lee and Koh [6] found that personal/interpersonal skills were more important in new hires than core IS/IT skills and organizational knowledge. Both Surakka [23] and Fang et al. [6] used a relatively small sample size, which leads to questions about the generalizability of their results.

Conversely, Abraham et al. [1] found that technical skills were the most desired in new hires. They also reported that these technical skills were more likely to be outsourced and that the skills associated with the "business content" found in IS curricula were more likely to be retained in-house. The sample in Abraham et al. [1] consisted of non-IT firms only and a proportionally larger share of Fortune 500 companies than is representative of the population of U.S. firms.

Kim et al. [10] sampled employees at one manufacturing firm in the northeast. They found that project management was the highest ranking skill, and that security, Enterprise Resource

Planning (ERP) systems, end-user computing, and the integration of soft skills should be given more emphasis in IS curricula.

Gallivan, et al. [7] examined skills listed in job advertisements and found that the skills listed there (mostly technical ones) were inconsistent with the "soft" skills organizations claimed were more important in new hires.

METHODOLOGY

The primary purpose of this study is to determine whether there is a difference in skill requirements for entry-level IT workers in the IT sector versus other sectors. To this end, a survey was designed and administered to IT managers and workers in various industries, including IT related industries.

The skill items in the survey were created by examining the Association for Computing Machinery (ACM) IT Curriculum (http://www.acm.org/education/curric_vols/IT_October_2005.pdf), the IS 2002 Curriculum from the Association of Information Systems (AIS) (www.aisnet.org/Curriculum/), and current empirical studies [1][6]. In addition, several demographic questions were added to the survey to gather information about the respondents and their respective organizations. The IT managers, CIOs (Chief Information Officers) and workers that participated in the survey were identified through an email list from a respected online survey company.

A pilot study was conducted to test the questionnaire. The survey was administered to faculty, students and IT staff at the authors' university. Approximately thirty people participated in the pilot study. Feedback was gathered, leading to an improved version of the survey that was used in the data collection.

The final survey consisted of thirty-two skills/traits that participants were asked to rank in terms of importance on a scale of 1 (not important) to 5 (very important). The survey was web-based and administered via email by a reputable online survey company. The survey was administered to IT managers/CIOs and workers in two separate data collection efforts. Responses were received from 391 IT managers and 299 IT workers. Of these, 348 responses from IT managers and 238 responses from IT workers were used for analysis. Responses were eliminated from the analysis if they were incomplete or if the respondent indicated that their organization did not employ an IT staff.

PROFILE OF RESPONDENTS

Responses were received from IT managers and workers from all states in the U.S. Thirty-two percent of the respondents were from organizations with 10,000 or more employees. Table 1 describes the size of the respondents' organizations in terms of the number of employees. Approximately forty-five percent of the respondents work for organizations that have an IT staff with more than 100 employees. Table 2 describes the size of the IT staff in the respondents' organizations.

Table 1: Number of employees in respondents' organizations

Number of Employees	Percent
Less than 100	10.6
100 – 499	12.6
500 – 999	10.1
1000 – 4999	18.5
5000 – 9999	12.1
10,000 or more	32.0
I do not know	3.9

Table 2: Number of IT employees in respondents' organizations

Number of IT Employees	Percent
0 – 10	21.7
11 – 25	9.5
26 – 50	10.3
51 – 100	9.2
Greater than 100	44.8
I do not know	5.5

The respondents represented a cross-section of industries with 28.7% working in the IT industry. The IT industry consisted of respondents working in organizations including consulting firms, computer technology vendors, and telecommunications. Education and health care were the most represented non-IT industry in the sample with 10.4% and 9.7% of the respondents working in those industries respectively. Table 3 provides a summary of the industries represented by the respondents.

Respondents were asked to identify IT areas or types of positions for which their organizations hire full-time entry-level IT workers. Respondents could check more than one area. The top three areas cited were help desk, programming and networking for the IT industry as well as the non IT-related industries. Non IT-related industries tend to have more help-desk and networking positions available for entry-level IT workers than the IT industry while the IT industry has more programming jobs. Table 4 summarizes the areas in which entry-level IT workers are hired.

DATA ANALYSIS AND RESULTS

To examine the degree to which mangers/workers in the IT industry differed with those in non IT-related industries in their perceptions about the importance of various skills/traits for entry-level IT workers an online survey was administered to both groups. The survey addressed thirty-two skills/traits. Respondents were asked to rank the importance of each skill/trait on a scale of 1 (not important) to 5 (very important). For each skill/trait, an independent samples t-test was conducted comparing the average importance of that skill/trait for respondents in the IT industry

to those working in non-IT related industries [9]. Table 5 provides a summary of the results derived using SPSS 16, a popular statistical software package.

Table 3: Respondents' industries

Industry	Percent
IT	28.7
Consulting (not in IT)	2.7
Delivery service related	1.0
Education	10.4
Engineering	1.0
Financial	6.5
Government /Military	8.3
Health care related	9.7
Insurance	4.6
Manufacturing	7.7
Non-profit	1.4
Retail	4.3
Transportation	2.4
Travel/Tourism	1.5
Utility	1.7
Other	8.1

Table 4: Summary of Areas in which Entry-Level IT Workers are Hired

Areas for which Full-Time Entry-Level IT Workers are Hired		
Job Type	Percent in IT-Industry	Percent in Non IT-related Industry
Clerical/Data Entry	27.5%	29.7%
Database Area	43.7%	45.7%
IT Help Desk	63.5%	71.3%
Networking	50.3%	59.8%
Programming	60.5%	56.0%
Systems Analysis & Design	51.5%	50.5%
Web Design & Development	46.7%	48.6%

There is a statistical difference ($p < 0.10$) in the average importance between the two groups for the following skills/traits: knowledge of specific industry, high IT GPA, programming languages, and systems development life cycle methodologies. Where the t-statistic is positive, respondents from the IT industry place more importance on the skill/trait than non IT-related industries. For all of the skills/traits in which the groups differ, the t-statistic is positive.

DISCUSSION AND CONCLUSION

The results of this study suggest that IT/IS programs that seek to tailor their curricula to better meet the entry-level needs of IT firms should focus on learning outcomes that support a higher level of competency in the areas of programming languages, systems development life cycle methodologies, and knowledge of the IT industry than programs that primarily seek to meet the entry-level needs of non-IT firms. Similarly, IT/IS students who plan to seek employment in the IT sector upon graduation should be advised to focus on developing skills in programming languages and systems development methodologies, as well as increasing their knowledge of the IT industry and attaining a high GPA in their IT/IS courses. These findings are not surprising given that IT firms rely heavily upon programming skills and systems development methodologies to create and deploy information technologies.

What is surprising, however, is that there is no significant difference between IT and non-IT employers with respect the importance of any of the other skills/traits including but not limited to networking, security, database, web development, analytical skills, creative thinking, interpersonal skills, ability to work in teams, knowledge of business functions, relevant work experience, packaged software, and so forth. This leads to a number of additional questions – particularly with respect to the technical skills for which no significant difference was found. For example, is the need for entry-level skills in the areas of networking, security, database, and web development so ubiquitous that IT and non-IT firms value them essentially equally? Would IT and non-IT firms value these skills differently for mid-level and senior-level workers? Do IT firms view entry-level workers as skilled enough in areas such as networking, security and database to contribute to the creation and deployment of these technologies? Additional research is needed to answer these questions.

Table 5: Independent Samples t-Test for Equality of Means

Skill/Trait	t-Statistic	p-value
Communication skills	0.205	0.837
Ability to work in teams	0.822	0.412
Interpersonal skills	-0.525	0.600
Creative thinking	0.952	0.342
Analytical skills	1.548	0.123
Honesty/integrity	-0.197	0.844
Flexibility/adaptability	-0.271	0.787
Leadership skills	0.647	0.518
Organizational skills	0.727	0.467
Entrepreneurial/risk taker	1.141	0.255
Motivation	-0.247	0.805
Knowledge of your company	1.211	0.227
Knowledge of primary business functions	1.166	0.244
Knowledge of specific industry	2.278	0.023
Awareness of IT technology trends	-0.165	0.869
High overall college GPA	0.851	0.395
High IT GPA	2.213	0.028
Extra-curricular activities	1.055	0.292
Programming languages	2.012	0.045
Web development programming languages	1.017	0.310
Database	-0.093	0.926
Telecommunications/Networking	1.371	0.171
Security	0.206	0.837
Systems development life cycle methodologies	1.756	0.080
Hardware concepts	-0.918	0.360
Packaged software	-1.430	0.154
Operating systems	0.735	0.463
Project management skills	-0.070	0.944
Relevant work experience	0.205	0.837
Internship experience	0.822	0.412
Any work experience	-0.525	0.600
Co-op experience	0.952	0.342

* Significant at 10%

REFERENCES

[1] Abraham, T., Beath, C., Bullen, C., Gallagher, K., Goles, T., Kaiser, K., and Simon, J. (2006). "IT Workforce Trends: Implications for IS Programs." *Communications of the Association for Information Systems*, 17, 1147-1170.

[2] Bureau. (2008a). "Computer and Information Systems Managers." Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2008-09 Edition, retrieved on April 23, 2008 from http://www.bls.gov/oco/ocos258.htm.

[3] Bureau. (2008b). "Computer Scientists and Database Administrators." Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2008-09 Edition, retrieved on April 23, 2008 from http://www.bls.gov/oco/ocos042.htm.

[4] Cappel, J. (2001/2002). "Entry-Level IS Job Skills: A Survey of Employers." *Journal of Computer Information Systems*, 42(2), 76-82.

[5] Doke, E. R., and Williams, S. (1999). "Knowledge and Skill Requirements for Information Systems Professionals: An Exploratory Study." *Journal of Information Systems Education*, 10(1), 10-18.

[6] Fang, X., Lee, S., and Koh, S. (2005). "Transition of Knowledge/Skills Requirement for Entry-Level IS Professionals: An Exploratory Study Based on Recruiters' Perception." *Journal of Computer Information Systems*, 46(1), 58-70.

[7] Gallivan, M., Truex III, D., and Kvasny, L. (2004). "Changing Patterns in IT Skill Sets 1988-2003: A Content Analysis of Classified Advertising." *Database for Advances in Information Systems*, 35(3), 64-87.

[8] Granger, M. J., Dick, G., Jacobson, C. M., and Slyke, C. V. (2007). "Information Systems Enrollments: Challenges and Strategies." *Journal of Information Systems Education*, 18(3), 303-311.

[9] Hair, J. F., Anderson, R. E., Tatham, R. L., and Black, W. C. (1998). *Multivariate Data Analysis*, Prentice Hall, Upper Saddle River, NJ.

[10] Kim, Y., Hsu, J., and Stern, M. (2006). "An Update on the IS/IT Skills Gap." *Journal of Information Systems Education*, 17(4), 395-402.

[11] Lee, C. K., and Han, H.-J. (2008). "Analysis of Skills Requirement for Entry-Level Programmer/Analysts in Fortune 500 Corporations." *Journal of Information Systems Education*, 19(1), 17-27.

[12] Lee, D., Trauth, E., and Farwell, D. (1995). "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation." *MIS Quarterly*, 19(3), 313-340.

[13] Lee, S., Koh, S., Yen, D., and Tang, H. (2002). "Perception Gaps between IS Academics and IS Practitioners: An Exploratory Study." *Information and Management*, 40, 51-61.

[14] Leitheiser, R. (1992). "MIS Skills for the 1990s: A Survey of MIS Managers' Perceptions." *Journal of Management Information Systems*, 9(1), 69-91.

[15] Lethbridge, T. (2000a). "Priorities for the Education and Training of Software Engineers." *Journal of Systems and Software*, 53(1), 53-71.

[16] Lethbridge, T. (2000b). "What Knowledge is Important to a Software Professional?" *Computer (May)*, 44-50.

[17] Lomerson, W. L., and Pollacia, L. (2006). "Declining CIS Enrollment: An Examination of Pre-College Factors." *Information Systems Education Journal*, 4(35), 3-13.

[18] Longo, G. (2006). "Attracting Top IT Students." University Business, Retrieved on April 23, 2008 from http://www2.universitybusiness.com/viewarticle.aspx?articleid=61.

[19] McGann, S. T., Frost, R. D., Matta, V., and Huang, W. (2007). "Meeting the Challenge of IS Curriculum Modernization: A Guide to Overhaul, Integration, and Continuous Improvement." *Journal of Information Systems Education*, 18(1), 49-62.

[20] Patterson, D. A. (2005). "Restoring the popularity of computer science." *Communications of the ACM*, 48(9), 25-28.

[21] Pollacia, L., and Russell, J. (2007). "Addressing the Decline in CIS Enrollment." *Issues in Information Systems*, 8(1), 97-102.

[22] Rossheim, J. (2006). "The great jobs migration." *Business Credit*, 108(4), 31.

[23] Surakka, S. (2007). "What Subjects and Skills are Important for Software Developers?" *Communications of the ACM*, 50(1), 73-78.

[24] Tang, H., Lee, S., and Koh, S. (2000/2001). "Educational Gaps as Perceived by IS Educators: A Survey of Knowledge and Skill Requirements." *Journal of Computer Information Systems*, 41(2), 76-84.

[25] Tastle, W. J., White, B. A., Valfells, A., and Shackleton, P. (2008). "Information Systems, Offshore Outsourcing, and Relevancy in the Business School Curriculum." *Journal of Information Technology Research*, 1(2), 61-77.

[26] Trauth, E., Farwell, D., and Lee, D. (1993). "The IS Expectation Gap: Industry Experience Versus Academic Preparation." *MIS Quarterly*, 17(3), 293-307.

[27] Walstrom, K. A., Schambach, T. P., Jones, K. T., and Crampton, W. J. (2008). "Why Are Students Not Majoring in Information Systems?" *Journal of Information Systems Education*, 19(1), 43-54.

[28] Young, D., and Lee, S. (1996). "The Relative Importance of Technical and Interpersonal Skills for New Information System Personnel." *Journal of Computer Information Systems*, 36(4), 66-71.

[29] Zhang, W. (2007). "Why IS: Understanding Undergraduate Students' Intentions to Choose an Information Systems Major." *Journal of Information Systems Education*, 18(4), 447-458.

EXAMINE THE VARIABLES OF COGNITIVE DISSONANCE

Y.B. Shin, Francis Marion University, Florence, SC 29506
A. Smith, Francis Marion University, Florence, SC 29506

ABSTRACT

This study identifies important variables that generate dissonance, and finds important variables that may reduce professionals' turnover in each source. A logit model is used to identify significant variables that affect the formulation of turnover intention.

Keywords: cognitive dissonance, turnover intention

Introduction

The current revolution in IT has served to efficiently and effectively provide valuable information, but it has also increased complexity. As this complexity rapidly expands, recruiting and training professionals has become increasingly difficult. The retention of qualified and motivated people is critical to the success of IT departments and the organization as a whole. [4] reported that more than 65% of chief information officers left their jobs between 1996 and 2004.

Turnover results in considerable costs to recruit, select, and train new employees before they become productive. This is particularly true in highly technical areas. A study by ComputerWorld reported that the cost of replacing an employee ranges from 65 to 120% of the first year's salary. The high replacement costs of IS professionals are attributable to the shortage of new qualified professionals and the difficulty of training them. Moreover, IT professionals' high turnover increases the risk of draining key information from the organization.

The analysis of turnover intention can exclude those who leave for organizationally unavoidable reasons such as moving to another spouse-imposed location or medical problems. The analysis of turnover intention can also include the perceptions of those employees who try to leave the organization sooner or later. By including them, the analysis of turnover intention can provide valuable information on how to keep qualified professionals.

Turnover intention can be used as a surrogate measure for organizational commitment and employee morale because it is closely related to those variables [3]. The survey performed by [3] reported that less than 20% of the variance in turnover could be explained. Consequently the major problem addressed by this research is that prior research has disregarded individual information processing in a turnover decision.

Information Processing

The present job can be regarded as the best among the alternatives which were available when the choice was made. When the changes produce a state of imbalance called disequilibrium, IS professionals try to revise their previous choices. When applied to a turnover decision, a discrepancy calls for a turnover decision which revises the previous choice of the current job.

If an employee experiences a high level of discrepancy, he/she will try to reduce the imbalanced situation. Because of the high level of dissonance, an adjustment process will be undertaken to reduce or remove the uncomfortable situation. Changing the current job can be one alternative to avoid the dissonance. A primary purpose of discrepancy theory in turnover analysis is to determine what factors create a discrepancy.

The input for the human information processing system is external stimuli. In the process of the turnover decision, changes in available alternatives, organizational situations, and demographic characteristics can be regarded as external stimuli. In turnover analysis, the perception subsystem evaluates the effects of changes and may produce discrepancies. The output for the human information processing is some observable activity. In turnover analysis, turnover intention or actual turnover can be considered as output.

Since the understanding of the turnover decision process is far from complete, [5] argued that much more emphasis should be placed on the psychology of the turnover process. [1] summarized Festinger's theory of cognitive dissonance as follows:

> Dissonance exists when an individual holds a cognition that is inconsistent with his or her other cognition in the same domain. Dissonance gives rise to measures to reduce, as well as to avoid increases in the dissonance. One way in which the individual can reduce dissonance is by altering the discrepant cognition to bring it in line with his or her other cognition.

Preference Changes

Preference changes resulting from changes in values can be one important source of discrepancy. [8] argued that each employee would have a somewhat different set of expectations depending upon his or her own values and needs at any given time. The changes in values result in the changes in preferences toward job features. The current job was the best alternative when the decision was made. Following the choice of the current job, however, an employee's preferences can change. The change may cause a discrepancy. Therefore, the current job no longer provides the best choice on the basis of the changed decision criteria.

Variables Related to a Job

[2] examined the process by which job characteristics influence turnover intention and job attitudes. The possibility of attaining outcomes can be replaced with the amount of input to get the outcomes. Therefore, choices about a job can be based on the interaction between input and

output job characteristics. System theory is useful to consider this interaction. To apply the system theory, decision variables are divided into two categories: input and output.

Research Framework and Hypotheses

This study is designed to find the variables that create the dissonance in the formulation of turnover intention. The following objectives are derived: 1) To identify possible factors that generate dissonance, 2) To measure the discriminant power of input and output sources.

The first objective examines what makes employees feel that they do not fit the current job. [6] reported that changes in consumer preferences due to the new knowledge of the health risk of cholesterol might increase the consumption of white meat in place of red meat. Thus, preference changes may cause employees to revise the previous choice.

The second objective aims at finding the relationship between variables and the level of dissonance. By examining the contribution of each variable in the formulation of turnover intention, relevant strategies can be specified to retain qualified professionals.

Two sets of hypotheses are addressed in this study. The first set of hypotheses is to find important variables that generate dissonance. The second hypothesis concerns the role of the variables in determining the level of satisfaction. It purposes to find important antecedents of job satisfaction. If the determinants of job satisfaction are different from those of turnover intention, job satisfaction can be considered as an intermediate variable which connects its determinants with turnover intention.

H1: High levels of dissonance display a higher chance of generating turnover intention.

H2: IS professionals who are dissatisfied with the current job display a higher chance of generating turnover intention

Data Analysis

The sampling frame used in this study was a listing of staff members who are non-government subscribers to Datamation. Data has been collected and being analyzed. The study results can be discussed at the meeting in Charleston.

REFERENCES

[1] Doran, L. I., V. K. Stone, A. P. Brief, and J. M. George. "Behavioral Intentions as Predictors of Job Attitudes: The Role of Economic Choice." <u>Journal of Applied Psychology</u>. 76.1 (1991): 40-45.

[2] Locke, E. A. "The Nature and Causes of Job Satisfaction." In M. D. Dunnette (Ed.)

Handbook of Industrial and Organizational Psychology. Chicago: Rand-McNally, 1976.

[3] Mobley, W. H., R. W. Griffeth, H. H. Hand, and B. M. Meglino. "Review and Conceptual Analysis of the Employee Turnover Process." Psychological Bulletin. 86.3 (1979): 493-522.

[4] Moore, J.E. "One Road to Turnover: An Examination of Work Exhaustion in Technology Professionals." MIS Quarterly. 24.1 (2000): 141-168.

[5] Powner, D. A. "Responsibilities, Reporting, Relationships, Tenure, and Challenges of Agency Chief Information Officers." GAO: 04-957T, July 2004.

[6] Porter, L. W., R. M. Steers, R. T. Mowday, and P. V. Boulian. "Organizational Commitment, Job Satisfaction, and Turnover among Psychiatric Technicians." Journal of Applied Psychology. 59. (1974): 603-609.

[7] Schkade, David A. and Eric J. Johnson (1989), "Cognitive Processes in Preference Reversals," Organizational Behavior and Human Decision Processes, 44, 203-31.

[8] Steers, R. M. and T. T. Mowday. "Employee Turnover and Post-decision Accommodation Processes." in L. L. Cummings and B. M. Staw, (Eds), Research in Organizational Behavior. Grenwich, CT: JAI Press, 1981.

Modern Storage Network Technology and Storage Virtualization: New Advantages, Barriers to Acceptance, and Possible Solutions

Michael Spenser, School of Business, Auburn University Montgomery, Montgomery, AL 36124
(334) 244-3482, spencermike7@gmail.com

Bob Gehling, School of Business, Auburn University Montgomery, Montgomery, AL 36124
(334) 244-3482, bgehling@aum.edu

ABSTRACT

This paper addresses the growing use of virtualized storage and storage network technology by organizations to manage growing amounts of data.

INTRODUCTION

There is no question that the requirements of data management, from personal to enterprise level, have exploded in recent years. According to an EMC forecast of overall data growth, the overall size of digital universe in 2007 was 281 exabytes, or 281 billion gigabytes [3]. The study also reported that enterprises are responsible for the security, privacy, reliability, and compliance of 85% of the digital universe. In order to meet the growing demand for storage capacity and availability, storage area networks have emerged to provide an attached storage solution to meet these needs.

Initially, the early adoption rate of storage area network technology was very slow and experienced difficulty in meeting the full potential of centralized storage due in part to "most components in SANs, despite vendors' interoperability claims to the contrary, have a tough time working with products from multiple vendors" [6]. Thus, initial adoption of new data storage technologies yielded many of the limitations, benefits, and similar problems of normal direct attached storage. Examples of this included loss of scalability (due to hardware conflicts and an increase in complexity, such as new hardware additions from different vendors), inability to pool capacity, and complexity barriers hindering centralized management.

As virtualization applications gained effectiveness in unlocking the potential of storage networks, the virtualization and data storage relationship yielded the true benefits in adoption and management of storage technologies. This relationship allowed the clustering of data storage, implementation of better provisioning strategies, and gains in true utilization of an entity's IT resources. Although both technologies are still relatively new, the convergence of storage virtualization and storage area networks provide a solution to the growing storage problems of many enterprise environments. Though adoption and implementation of modern storage strategies has been slowed by the individual difficulties associated with both technologies and new issues created by their combination, virtualized storage environments are finally becoming positioned for mainstream adoption by enterprise organizations. As reported by some industry observers, by 2009, 50% of those enterprises expect to adopt storage virtualization [4]. The new world of data storage administration in realization of its capabilities

creates new strengths and weaknesses in storage administration that are now beginning to emerge. The convergence of storage virtualization with dedicated storage networks not only provides a much needed solution to the growing worldwide data storage gap, but also exposes problems that hinder full realization of their potential in full utilization as an IT resource and as a sustainable growing industry.

Beneficial Attributes of the Storage Network/Storage Virtualization Relationship

The "storage management gap" - or storage management capability versus the total data to be managed - from an overall industry standpoint, has continued to widen since the birth of recent data storage technologies over the last decade. As the total data that had to be managed increased at a faster rate than that of the average management capability, the gap growth rate slowed from 2007 to 2008 [7]. It could be inferred that the gap itself, although still existent, has begun to shrink due to the relationship between storage technologies and storage virtualization offering new solutions to a constantly growing problem.

While virtualization generalized is not a new concept, storage virtualization is quickly becoming less theoretical in nature. Its growth could partially be characterized by server virtualization, a technology that has been widely accepted and employed in IT environments now for many years. As reported by Neeraj Gandhi (2008), where modern storage technologies have experienced a higher rate of adoption, "it is server virtualization that drives storage virtualization. Collectively though, both of them are aimed at better utilization of the available resources, reducing complexity and increasing productivity." In other words, not only do the two technologies complement each other, they need one another to fully utilize the potential of each to accomplish shared goals in hosting a number of virtual servers in a large storage environment of a SAN, a greater number of virtual servers can be deployed securely and management can be simplified. Storage virtualization in an enterprise data center allows for flexibility and better provisioning of resources for not only physical servers, but provides a better planning, implementation, and security solution to be used by the organization.

The grown in unstructured data, such as large media files, have been a driving force in adopting modern ways to manage, deduplicate, safely store, and move the large media files that are now commonplace in the enterprise environment. An example of tackling this problem is the use of clustered storage systems for virtualized storage with storage area networks to provide high speed connections between hosts and disks. For instance, in an example presented by *Government Computer News*, NASA and the Department of Defense currently films and produces multiple terabyte media files for spacecraft and missile intercept missions for study and research. Media files and digital content of that magnitude simply cannot be supported by traditional data storage methods.

To solve this problem, a clustered storage system was used in conjunction with an iSCSI SAN that provided high speed connections and simultaneous shared access to the data store. This approach allows users to add more storage and then have multiple clients access that same storage pool. Rutell Yasin (2007) reported that the advantage of this approach is that you have a single copy of the data and you have multiple parts of the workflow working on the same data. In this situation, virtualized storage not only enables the movement and management of

extremely large files containing unstructured data, but also provides hosting and resource utilization that can be simplified through the storage virtualization-SAN relationship.

To properly provision (allocate) storage space in an enterprise data solution, a clear picture of must be formed in order to properly assess the needs and limits of data resources to effectively meet the needs of an organization. Previously, the costly approach of fat provisioning, where data storage space is allocated beyond current needs in anticipation of future storage requirements, was often employed. The inability to combine storage resources, often due to interoperability and compatibility issues in heterogeneous equipment approaches, complicated the abilities of data administrators to formulate this clear picture. Fat provisioning also proved costly and poorly utilized available storage resources. Through the combination of storage virtualization with their storage resources, many organizations are implementing thin provisioning throughout their storage system to take better advantage and gain better utilization of these resources. Through the SAN-storage virtualization relationship, resources are better managed and scaled in accordance to business need better than without the combination.

With recent disasters such as Hurricane Katrina and the recent record floods in Kansas and Iowa, the need for contingency planning and implementation has quickly become a reality in order to achieve business continuity. During the recent floods in Iowa, many businesses failed to effectively plan for data recovery in the face of a catastrophic event. An example would be in Cedar Falls, Iowa, and the number of businesses who did not integrate redundant off-site storage of data and implement remote access of a secondary virtualized storage environment within their contingency planning. One data center in Cedar Falls that did have natural disaster safeguards in place became the primary provider for business continuity and access of data for organizations that were not prepared: "Team Technologies, which owns and manages a data center in Cedar Falls, provided expertise - and, in some cases, sanctuary - for hospitals, a local utility company, telephone systems and even cable-television service that were able to continue to function through the chaos that was the Flood of 2008 [8]. Through this, a software development firm in Cedar Springs, Iowa, experienced no degradation or disruption in continuity in its data operations during and after the disaster. This company located its data center, which houses 60 servers, source code repositories, and client projects in a third party facility 5.4 miles away from downtown Cedar Falls. They were also prepared to failover its systems to a secondary facility outside of Chicago if the floodwaters did cause the 18,000 sq. foot data center to shut down or lose power for a significant period of time [1]. In other words, modern storage environments enable organizations to persevere in the face of natural disaster or security threats and achieve maximum business continuity when combined with effective contingency planning. Without the combination of virtualization technologies and enterprise storage solutions, total loss of data assets can be prevented now like never before.

Finally, another great strength gained in the combination of large scale data storage and virtualization within the environment is tackling one of the greatest issues preventing adoption of the technology to date: hardware, software, and interoperability conflicts. It is now much easier for SAN hardware from different manufacturers to achieve simplified administration by bypassing the interfaces of the individual devices to create a virtual data pool managed by a single interface. From a scalability and cost perspective, it accomplishes the selling point that has been pushed by SAN providers all along: a simplified, large scale storage solution that

simplifies the administration of an enterprise environment's data assets. This returns purchasing power back to the data administrator without forcing the hardware requirement of purchasing from a single manufacturer. It is now possible to host a cluster of virtual web servers, production database servers, and provisioned storage space for multiple business areas under the same umbrella in a much easier manor. With the data storage technology and storage virtualization, the combinations of manageable, large scale modern storage is no longer a prospect of the future; it is now possible and a reality.

Barriers and Fears Hindering Utilization & Adoption of the Data Storage/Storage Virtualization Relationship

Although there are many reasons that adoption of virtualization and storage area networks is now a cost effective and realistic solution to meeting the storage challenges faced in many enterprise environments, there are still problems and barriers to adoption that hinder widespread acceptance of the two technologies. With advances and gains in the modern storage field growing almost daily, combination and implementation of storage virtualization and large scale storage systems is still relatively new. Storage requirements, in their own right, have accelerated at such an alarming rate that some IT managers are "caught off guard" in identifying and accepting realistic storage needs. With server virtualization now facing dawning security threats to exploit flaws in software, virtualized storage volumes face the possibility of dealing with the spread of malicious attacks within a storage network. In addition to the inherent compatibility difficulties of complex storage systems such as heterogeneous fiber mesh SANs, more frustration can emerge as some interfaces and software gain popularity and deny compatibility with competitors to protect proprietary interests.

Furthermore, with the rapid growth of data technologies and conventional philosophy of network storage needs merely being another part of network administration, many organizations are left with dependency on service providers and vendors to implement solutions and conduct administration of data operations. With competition within all segments of the storage market so fierce (with declining investor faith in many respects), it's hard to determine exactly what is fact and what is spin. To make matters worse, storage administrators are new specialists that organizations have difficulty in locating, recruiting, and training.

Security Risks in the New World of Virtualized Storage

Server virtualization and storage virtualization are separate things; however, if server virtualization is one of the primary driving factors in advances for storage virtualization, security weaknesses in one could severely impact the other. In addition, a virtualized storage environment comprising of separate physical storage arrays could theoretically serve as a "bridge" for an attack to propagate throughout other parts or even an entire virtual volume. Given the popularity of virtualized servers on shared storage, security concerns for virtualized storage on storage area networks should take the flaws of individual virtual servers into consideration as a likely point of entry and launch pad for a possible attack.

One possible exploit comes from the tools that simply virtual network administration on storage volumes: virtual machine monitoring software itself. Vijayan (2007) reported that virtual

machine monitors use consoles to manage the resources of the hardware hosting the virtual machines and to act as an interface between the hardware and various virtual machines hosted on it. He indicated that depending on the interaction between monitoring software and a storage virtualization software solution, attacks on virtual machines could essentially be the "skeleton key" to unlock the possibilities of a larger security threat.

An example of a way that attacks can utilize virtualization engines to spread throughout a storage environment can be seen in one of the industry leaders in all things virtualization: VMWare. With increasing pressures for storage hardware manufacturers to support virtualization, virtual storage controllers are being manufactured to support VMWare's Infrastructure software platform. In combination with VMWare's other virtualization products that could all share similar vulnerability issues, preference to use VMWare for all virtualization needs could extend exposure to a possible threat. "The VMWare platform, with its rights and privileges to the host operating system and hardware, makes a tempting target for malware writers... That makes it a question of when—not if—virtual machine specific malware will start jumping between virtual machines, down the stack to the host operating system or even to the virtual machine monitor layer" [9].

Another key point in such vulnerability is the monitoring software usually sits just one level above the hardware and can be used to launch virtually undetectable attacks against the operating system and application layers above it [11]. In other words, monitoring software deployed over a large virtual storage volume might open doors for large-scale attacks that may prove difficult to detect. Although only a single scenario in an infinite arena of possibilities, it is a snapshot of how the simplification gained through the SAN-virtual storage relationship increases concerns for storage and security administration.

Such attacks are unlikely in most environments, as there are a number of defense mechanisms or safeguards (depending upon the design of each individual storage solution) that can prevent many security exploitations in the storage environment. Virtual switches can be deployed between virtual servers, as well as strategic decisions on what virtualized elements exist inside and outside the DMZ of a virtual network to prevent many exploits on devices within specific LUNs. Furthermore, in a fibre channel environment, LUN masking and zoning strategies can isolate vulnerable volumes to isolate attacks. However, with more pressure for utilization of storage virtualization in storage area network technology and compromises made to accommodate for its advantages (such as choosing soft zoning in a heterogeneous fibre channel storage environment to achieve interconnectivity), future security threats could add consequences and complication in pursuing virtualized volumes. Any security threat, theoretical or proven, can prevent adoption and utilization of modern storage solutions by organizations unwilling to fully commit to good security practices and expertise required for proper deployment of either virtual storage or dedicated storage networks.

Economic and Industry Barriers to Mainstream Virtualized Storage Acceptance

Investor faith in data storage products and services seems to be mixed. Excluding market factors that influence stock prices for each individual firm, hardware vendors that manufacture storage products (such as HP, Dell, IBM, Hitachi, EMC, etc.) have overall experienced greater

profitability and growth from the year 2000 to present. It could be inferred that the effect of storage virtualization to deliver better value from SAN technology has pulled storage through the early adoption phase and into better positioning for mainstream acceptance. However, other hardware vendors, virtualization firms, and service providers have experienced very mixed results. Virtualization software developers, for example, are highly competitive with one another to gain market share. In regards to adoption and utilization of storage technologies and storage virtualization, two factors can be seen as barriers: value creation achieved in using large scale storage and ethical and political dilemmas in upper management of storage technology firms creating negative impact upon the entire industry.

In the early adoption stage of storage area networks, vendors promised things that the technology aimed to achieve but had varying degrees of difficulty in turning into a beneficial reality: simplified, secure, cost effective, and centralized data management. Since then, these goals are now achievable with the combination of virtualization solutions implemented into a firm's overall data infrastructure. Although adoption of storage technologies has increased, it is still moving at a slow rate as a lack of understanding still creates the fear of the unknown. Furthermore, in a business making the purchasing decision, relevance is placed on the bottom line benefits, return on investment, and business need for these solutions. All stakeholders in storage technologies, from small NAS and FAN vendors to the sellers of large scale virtualized fibre channel or iSCSI SANs, need to deliver factual value creation benefits and eliminate industry "fear of the unknown." Currently, this is not occurring in many situations. Staimer (2005) reported that a "few vendors actually articulate clear, quantifiable value propositions for their products… Most vendors assume their customers will understand the value proposition intuitively or that it does not matter." The need for a general understanding of the value in buying into these modern technologies does matter when an economic decision maker within a firm makes the decision to purchase.

A second negative influence that could hinder adoption is the ethical and political dilemmas occurring in the boardrooms of storage firms. From an ethical standpoint, many service providers and vendors have encountered ethical issues in the boardroom. For example, Brocade is an industry leader in fibre channel switching technologies that are used heavily in mesh fibre storage area networks. In 2007, its former CEO and other executives were found guilty of stock options fraud (thus painting a negative picture on the firm). Another example would be VMWare, in which it lost some investor faith in what some may call a mysterious resignation of its CEO and cofounder, Dianne Green, in early July of this year. Stock price fell approximately 30% in response.

Boardroom shakeups, lacking delivery in communication of the benefits of adoption of storage technologies, and ethically questionable business practices further cloud the confusion in the decision making process of IT and business managers alike. Although the long-term benefit usually outweighs the high initial cost of implementing a large scale storage solution (especially during today's recession and volatile economic climate), many factors come to play in establishment of the vendor-customer relationship. While gains are being made now at a faster pace than ever before, all players in storage and virtualization technologies need to consider that all facets of modern storage are still in an early adoption stage and at the verge of reaching mainstream acceptance. It is possible to remain an individually competitive firm in earning a

"piece of the pie" in the technology market, while pursuing professional and ethically responsibility in that everyone involved in the new world of storage is a stakeholder.

The Standardization and Professional Barriers to Utilization of the Storage Networking-Storage Virtualization Relationship

Data storage administration, with advances in utilizing storage networks and storage virtualization, has emerged as a specialized role in the enterprise storage environment. Proof of this fact can be seen in the rapid increase of scale in all things storage, the very complicated methodologies and changes in elements available in data administration today, and the need for understanding for the broad spectrum of possibilities and available products and uses for storage solutions that can meet the needs to protect and manage hardware and data assets of an enterprise. In some ways, the rapid growth of and need for storage technologies has increased this confusion faster than the identification and understanding of many IT departments within organizations. Three factors can help visualize some of the professional and standardization barriers to understanding and implementing modern storage technologies: the lack of industry standards and conformity to them by stakeholders, internal conflicts preventing the empowering of data administrators within a firm, and the slow increase of professional and specialized data administrators in the labor market.

Storage Networking Industry Association (SNIA) is working to create a good foundation for which data storage standards can be built. However, it still faces a very difficult challenge in gaining the support and strength it needs to advance acceptance of standardization. In describing the standards battle, [5] reported that part of the problem: "As with many fast evolving industries, little attention has been paid to standards, resulting in a flood of proprietary implementations." In other words, the industry has grown so quickly that the structure of standards beneficial to other IT industries have been replaced in the storage arena by a high expectation of support and use of specific vendor features. Gsoedl [5] also reported that in addition to slowly evolving standards, the adoption of existing standards has been hampered by incomplete implementations of SMI-S and vendors trying to protect their turfs. With such vendor protectionism and resistance to adoption of standards, interoperability and advancement of storage technologies as a whole are hindered.

Another important factor hindering full utilization of storage technologies can be identified in the lack of realization that the storage administrator (or storage administration team) is truly a specialized role that has a primary goal of fully utilizing the advantages by implementing their own storage strategy, and having the ability to make a business' storage strategy efficient, effective, and secure. In other words, IT departments may not fully understand the need to empower their storage administrator and relinquish control they once felt entitled to under older conventional wisdom. In a special report on Enterprise Storage Forum:

> "In [a] Gartner poll, while 70 percent of respondents had a dedicated storage team in place, the teams were typically not empowered to address broad storage issues, nor were they able to deliver the potential benefits…Departments and lines of business are reluctant to yield control of their environments to meet broad cross-enterprise storage initiatives. The brittleness and complexity of traditional and

legacy storage infrastructures has taught them that desired service levels and cost optimization are compromised by attempting to 'share' these infrastructures with others, perpetuating silos of infrastructure" [12]

In not recognizing the need of a dedicated storage administrator or data storage administration team, organizations can quickly lose benefits reaped by adoption and utilization of a storage solution. Also, a data administrator's ability to properly provision storage resources to best fit an organization's need greatly diminishes when having to conform to the pressures and will of other IT departments' requests for their allocated stake in the overall storage space. This also strains the administrator's ability to enforce data deduplication, and greatly reduces the ability to gain the simplification in managing storage resources.

A third need in the storage industry (and in battling the storage gap in general) is the creation of storage administrators that are educated, trained, and specialized to manage and implement storage resources. Not only is it important to accept the need to specialized storage administrators, but also for a firm to have their own in-house storage expertise in order to implement a storage solution that best fits the organization's need. With a global shortage in storage administrators and individuals with the variety of disciplines needed for their roles, in-house storage expertise is quickly becoming more difficult to obtain. Thus, organizations are forced to turn to vendors and service providers for storage solutions, which can diminish purchasing power and overall control of a company's own IT department. All stakeholders in the storage industry, from manufacturers to individual IT managers, face the growing need in educating the public on the benefits and knowledge of modern storage technologies to break down communication barriers among one another caused by confusion in rapid growth of the industry.

Breaking Down the Walls: Overcoming Barriers to Acceptance of Storage Networking and Storage Virtualization

Although there are identifiable fears and gaps in acceptance and understanding of modern storage needs and solutions, new opportunities are rising to diminish these threats. However, in order to battle these shortcomings, all stakeholders in storage technologies need to contribute to the development of standards and creation of resources to enable full utilization, adoption, and beneficial growth of large scale storage environments. Without adherence to standards and communication among storage stakeholders, the gap of understanding and productive industry growth will continue to grow out of control.

One such example can be seen in the empowerment, support, and adherence to SNIA itself. With industry leaders now providing support to the organization, vendor-neutral development and achievement of standards is now beginning to emerge. SNIA certifications help develop expertise in the field of storage technology, while guiding professional development to create qualified data professionals. Now with a worldwide scope and reach, SNIA has increased communications across the storage industry and strengthened the areas of storage technology and virtualization while providing valuable resources to all industry stakeholders through education and establishment of vender-neutral programs.

Currently, there are very few actual dedicated data storage academic programs to develop interest and professionals for data storage technologies and storage virtualization at both the two and four year traditional education level. Understanding of storage area networks, storage virtualization, and important industry trends is something difficult to groom and educate in the current landscape of information technology. There are a wide variety of possible solutions and methods in order to build awareness in the storage industry; however, a successful example of how to overcome many of the barriers and challenges faced by modern storage technologies can be found in a case study of Auburn University of Montgomery in Montgomery, Alabama.

Unisys Corporation is a successful storage technology provider in the central Alabama region. Unisys holds several defense, government, and commercial contracts in the area as a service provider for data storage solutions. As the difficulty in obtaining trained data storage professionals regionally became apparent, steps were made to meet the need of its customers in developing storage expertise. The Alabama Technology Foundation was formed as an outreach organization to further the advancement in education of data storage technologies in the region. Partnered with hardware providers such as Hitachi Data Systems, Hewlett Packard, and EMC, data storage service contractors such as Unisys, and non profit organizations such as the Armed Forces Communications and Electronics Association, ATF founded the Data Storage Center of Excellence at Auburn University Montgomery.

Through this combination of industry stakeholders, funding and equipment has been donated at the school to produce graduates of a dedicated data storage degree program. Students can achieve a dedicated academic data storage management degree with a curriculum focusing on the adherence to SNIA principals, with donated fibre channel storage area network equipment, to receive a rounded education in storage technologies and storage virtualization to produce graduates with a modern understanding of the requirements of storage administration. The Alabama Technology Foundation will then contribute to professional development of graduates by assisting with job placement with organizational partners to build experience in the arena of storage technologies. These contributions have brought a understanding of concepts and interest in storage administration that was once absent in both the business and academic community on the regional level; thus overcoming many barriers to utilization of storage technologies that will help meet the storage needs locally and regionally in the future.

CONCLUSION

Storage virtualization has helped storage area network technologies realize the goals of simplification in storage management that were initially unable to fully be realized due to the administration conflicts existing in first generation hardware. The relationship between networked storage and storage virtualization is not only a possibility, but now an industry accepted reality that is pushing acceptance as a fully realized solution into the IT industry. Although security risks exist in the rapid acceptance and deployment of virtualization technologies that may yet be fully identifiable, exposure can be minimized by following sound security practices to prevent exposure to attack.

However, fighting the storage gap with modern and simplified virtualized enterprise storage is something that everyone has a stake in. The industry as a whole, while fighting to obtain

competitive advantage within their respective markets, must also invest in the education, standardization, and proliferation of modern storage solutions to sustain the industry as a whole. Storage administrators must not only be trained to identify the best solution to fit their in-house needs, but also be abreast of all the inherent risks and rewards in deployment and proper management of their data storage environment. By conforming to industry-wide accepted SNIA standards, with industry stakeholders pursuing establishment of those standards over a proprietary-centric approach, virtualized storage can become more accessible to all IT organizations with a need to securely and effectively manage their data assets with specialized and empowered storage administration professionals. Therefore, by having a view of the "bigger picture" of threats to mainstream acceptance of large and simplified mass storage, all industry stakeholders can gain from having an interest in sustaining the advancement of the industry as a whole. Networked storage and storage virtualization not only influence growth of one another; instead, they are now complimentary technologies that coexist effectively.

REFERENCES

[1] Fonseca, Brian. (2008) "Iowa Floods Forcing Firms to Race to Keep IT Afloat, Massive Damage Prompts Executives to Take a New Look at Disaster Recovery Plans" *ComputerWorld.* Retrieved July 21, 2008 from http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=9099558

[2] Gandhi, Neeraj. (2008) "Storage Virtualization Takes Shape." *Express Computer.* Retreived July 21, 2008 from http://www.expresscomputeronline.com

[3] Gantz, J., Chute, C., Manfrediz, A., Minton, S., Reinsel, D., Schlichting, W., et. al. (2008). *The Diverse and Exploding Digital Universe: An Updated Forecast of Worldwide Information Growth Through 2011*, p. 2.

[4] Gruman, Galen. (2007) "How to do storage virtualization right" *CIO.* Retrieved July 23, 2008 from http://www.cio.com/article/136600/How_To_Do_Storage_Virtualization_Right

[5] Gsoedl, Jacob (2006). "Single-pane storage management" *Storage Magazine.* Retrieved July 21, 2008 from http://searchStorage.techtarget.com/magItem/0,291266,sid5_gci1258285,00.html

[6] Karp, Mike (2002) "The Values of Virtualization" *Network World Storage Newsletter.* Retrieved July 21, 2008 from http://www.networkworld.com/newsletters/stor/2002/01175599.html

[7] Moore, Fred. (2006) *Storage Virtualization for IT Flexibility*. Sun Microsystems. Retrieved July 21, 2008 from www.sun.com/storage/virtualization/StgVirtWP.pdf

[8] Offner, Jim. (2008) "Cedar Falls Technology Firm Helps Keep Hospital System, Utility Humming During Flood Chaos" *Waterloo-Cedar Falls Courier.* Retrieved July 21, 2008, from http://www.wcfcourier.com/articles

[9] Radcliff, Deb.(2007) "Virtual System, Real Risk" *Network World Magazine*, 8/20/07, p. 32

[10] Staimer, Marc. (2005) "Storage Vendors: Where's the Value Proposition?" Retrieved July 30, 2008 from
http://searchstorage.techtarget.com/news/column/0,294698,sid5_gci1113024,00.html

[11] Vijayan, Jaikumar. (2007) "Virtualization Increases IT Security Pressures" *ComputerWorld*. Retrieved July 22, 2008 from
http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=301232

[12] Wood, Leslie. (2006) "Storage Teams Grow in Popularity" Retrieved July 22, 2008 from
http://www.enterprisestorageforum.com/management/features/article.php/3576071

[13] Yasin, Rutrell.(2007) "What's In Store" *Government Computer News*, 10/22/2007. pps. 24-25.

A Dynamic Analysis of Good and Poor Performing
Open Source Software Projects using Artificial Neural Networks

Barry A. Wray

Department of Information Systems and Operations Management
University of North Carolina at Wilmington
Wilmington, NC 28403
(910)-962-3515
wrayb@uncw.edu

Justification of the Research Question

The purpose of this research is to develop and test a dynamic model to predict the performance of Open Source Software (OSS) based projects. The empirical study will be based on the analysis of publicly available data from a repository of OSS projects at *sourceforge.net*. Currently *sourceforge.net* contains a repository of 137,580 OSS projects.

Open source software (OSS) projects permit users the freedom to use the software code for any purpose. The code can be studied, modified, and freely redistributed. Even though OSS will be free, the profit potential of OSS projects will be becoming very attractive to software development companies. Venture capitalists have pumped nearly $400 million into 50 open-source companies in the last 18 months -- and more are on the way [Lacy, 2005]. These products are satisfying business customer needs and giving birth to for-profit companies like SugarCRM, Greenplum, and Pentaho. These companies are building a new generation of business applications for managing Web content, customer relations, and enterprise resources that are cheaper and may be more dynamic than their commercial counterparts [Greenemeier, 2005]. The basic marketing approach for OSS projects is to provide a virtual storefront for OSS code on publicly assessable websites and to develop a social network of users who promote the software through an online community that uses mailing lists, newsgroups, blogs, forums and wikis. These websites are critical in providing a central and free supply chain aggregator for OSS developers to market their products. The primary marketing tool is "project success". Project success for a developer in the OSS realm leads to increased exposure for that developer. Companies searching for software solutions through non-traditional sources such as OSS code will be more inclined to rely on successful developers for their software needs. The success of a developer's project brings opportunities for potential financial gain through support/maintenance and proprietary add-on features they can provide for their product.

The success of OSS projects has been attributed to the quality, portability and scalability of the software product [Stemelos et al., 2002; Crowston et al., 2003; Kalina and Czyzycki, 2005] and to the commitment, expertise and speed of development of the software developers [Scacchi, 2002; Crowston et al., 2003]. Mathieu and Wray [2008] evaluated the performance of OSS projects using data envelopment analysis. However, there is currently no research on dynamically predicting the success/failure of OSS projects based on dynamically changing determinants.

Despite the success of many OSS projects, large numbers of these projects become inactive over time and are eventually abandoned. A critical question for potential users and developers of OSS projects is how the future success of a project is affected over time. If a project is successful developers will continue to enhance, support, and maintain the product. A successful project will

develop a larger, more active user group. Discussion forums for user groups allow users to expose, discuss, and provide suggestions for potential problems and issues with a project. Unsuccessful projects can leave an adopter with an unsupported, antiquated product that could end up very costly or impossible to use. Developers will tend to spend less time and effort on unsuccessful projects accelerating the decline of a project. Therefore predicting the success or failure of an OSS project over time is critical for both developers and users and an important area for research.

Research Methodology

From a project management perspective, there are significant differences between an open source software project and a traditional software project. First, since labor will be typically donated by project contributors there are typically no monetary measures of labor cost or project expense. Rather the 'labor' that goes into an OSS project can be viewed as the number of people that contribute to the project. Hahn and Zang [2005] adjust their input through an assessment of 'project age'. Mathieu and Wray [2008] found an indirect source of labor would be the "software bug" contributors. These contributors are typically not on the development team but are users of the software making valuable contributors to the success of the project.

The output of an Open Source software project should certainly contain a measure of project size. Hahn and Zang [2005] measured the size of all files in the project and included a measure of 'development status'. This study takes a user oriented approach to project size by including a measure or project size per download. Two measures of project quality are used: number of downloads and project rank (as determined by sourceforge.net).

An Overview of Artificial Neural Networks

The purpose of an artificial neural network (ANN) model is to capture all essential relationships in the data. Once developed, this model is used to generalize these relationships by interpolating from a set of inputs to corresponding outputs. Success or failure of an OSS project over time is a likely candidate for the application of ANN because it is a problem where the data depend on the uncertainties of a non-tradition economic model of a freely distribution product. The ability of an ANN to generalize and incorporate hidden relationships in the data makes this an appropriate technique.

The software used for this research is NeuralSIM by NeuralWare. This ANN is based on a constructive approach to building networks developed by Scott Fahlman of Carnegie Mellon University. This technique is referred to as Cascade Correlation. The "Cascade" part of this title refers to the architecture and its mode of construction that entails adding hidden units (network nodes lying between the input and output) one at a time, and always connecting all the previous units to the current unit. The "Correlation" part of the title refers to the way hidden nodes are trained by trying to maximize the correlation between output of the hidden node and the desired output of the network across the training data. The ANN model used in this research uses an adaptive gradient learning rule. The output layer uses a SoftMax evaluation function based on average classification rate for evaluation. The hidden layer starts at 3 and cascades up to 30 nodes to determine the best performing network.

This research will predict the success/failure of OSS projects by evaluating multiple project inputs and multiple project outputs. Data will be collected on 500 security-based OSS software

2

projects on Sourcefore.net. The data will be retrieved from the *Sourceforge.net* website using the website query tool and entered into an Excel spreadsheet.

As a preliminary example, data have been collected for only one OSS project. This data is given in table 3 (data for the remaining projects will be similar). The inputs considered for all projects are the total number of people (developers) for the project and the number of unique users that have submitted software bugs. The outputs for each project are the *Sourceforge.net* rank for the project, the number of downloads from *Sourceforge.net*, and the number of Kilobytes per download.

Table 3: Preliminary data for 1 OSS Project for two 12 month time periods

Open Computers and Software Inventory	Bug {IN}	people {I}	rank {O}	downloads {O}	Kperdownload {O}
Fall 2006-2007	66	7	4	39,425	35,510
Fall 2007-2008	32	12	180	8,092	15,237,271

The number of developers is a controllable input while the number of unique bug submitters will be a "non-discretionary" input (i.e., data which are not directly controlled by a project). The ANN model will evaluate and compare these inputs and predict the outputs for each project based on the learned interrelationships of input and output variables.

Timetable for Research with Expected Outcomes

- *January 2009*– identify 500 (or more) OSS security projects; develop scripts for data extraction from developer logs; begin data collection process

- *February through August 2009*– additional data collection; assemble and analyze data, write research, submit for conference proceedings publication

- September 2009 through December 2009 – finalize data collection, validate success model, submit paper to journal.

- Targeted journals include: Information Management & Computer Security, Information Systems Journal; IEEE Transactions on Software Engineering

References

Crowston, K., Annabi, H., and Howison, J., "Defining Open Source Software Project Success", *Twenty-Fourth International Conference on Information Systems (ICIS)*, 2003.

Greenemeier, L., "OPEN-SOURCE EXUBERANCE -- Hot-shot entrepreneurs, VC money, even paradigm shifts. Dot-coms revisited? No, it's today's flood of open-source startups", 2005, Information Week, July 11.

Hahn, J. and Zhang, C., 'An Exploratory Study of Open Source Projects from a Project Management Perspective', MIS Research Workshop, Purdue University, Fall 2005.

Kalina, I., and Czyzycki, A., "The Ins and Outs of Open Source", *Consulting to Management,* Vol. 16, No. 3, September 2005, pp 41-47.

Lacy, S., "Open **Source:** Now It's an Ecosystem", Business Week Online, October 3, 2005.

Mathieu, R., and Wray, B., "Evaluating the Performance of Open Source Software Projects using Data Envelopment Analysis", Journal of Information Management and Computer Security, Volume 16, Issue 5, 2008.

Scacchi, W., "Is Open Source Software Development Faster, Better and Cheaper than Software Engineering", *2nd ICSE Workshop on Open Source Software Engineering*, Orlando, FL, May, 2002.

Stemelos, I., Angelis, L., Oikonomou, A. and Bleris, G., "Code Quality Analysis in Open Source Software Development", *Information Systems Journal*, Vol. 12, 2002, pg. 43-60.

COMMUNICATION ON VIRTUAL AND CO-LOCATED SOFTWARE PROJECT TEAMS

April H. Reed
College of Business
East Carolina University
reeda@ecu.edu

Linda V. Knight,
School of Computing and Digital Media
DePaul University
lknight@edm.edu

ABSTRACT

Communication plays an important role on project teams. This paper examines differences in communication issues on virtual as opposed to co-located software development project teams. A survey of over 150 IT practitioners was conducted to explore three specific communication-related project risk factors and their impact on the successful completion of software projects. Responses revealed that, while inadequate communication plagues all projects, the largest communication-related risk distinction between virtual and co-located teams lies in knowledge transfer. A plausible explanation is an inability to transfer certain types of implicit knowledge or expertise successfully without face-to-face communication or via electronic communication methods.

KEYWORDS: Virtual Teams, Communication, Co-located Teams, Knowledge Transfer

INTRODUCTION

Several forces such as outsourcing, offshoring, availability of high-bandwidth communications and reduced business travel due to cost and security concerns have increased the reliance on virtual software development project teams[1]. Project teams are defined as groups of people working together to accomplish an overall goal while using electronic communication methods[5]. Virtual project teams involve team members who are not co-located, i.e. residing at different sites, cities, states or even countries. The prevalence of virtual teams raises questions about differences in performance on virtual versus co-located teams. One area of potential difference is the degree of impact caused by various risk factors.

Project risk is linked to project failure or success because risk factors on projects can evolve into issues [2]. Those issues can result in problems ranging from loss of dollars, loss of work effort

- 1 -

or lost opportunities as well as complete project failure. Identification and knowledge of project risk factors has been cited as a method of decreasing the severity and the impact of risk [2]. One risk factor that has been identified as a top risk factor is communication [9].

This paper will explore the differences in some specific communication-related risks on virtual versus co-located software project teams. The main purpose will be to answer the following questions: 1) Are there significant differences between the two types of teams and; 2) what are the implications of any such differences.

Previous research has focused on the complexities of communication on teams. Three specific project risk factors relating to communication were distilled from this past research, along with a combination of focus groups and pilot studies. Note that the focus group and pilot studies are described later in the methodology section.

One project risk factor that emerged from this background work, *Lack of or inadequate communication,* focuses on a low level of communication frequency or communication at the wrong level of detail for the audience. For example, a project dealing with familiar processes and well known work might require a low level of communication frequency since team members are experienced. On the other hand, innovative or technically challenging projects might need a high level of communication frequency to deal with many unknowns. Jones, et al. (2004) indicate "effective communication" is the most critical component of teamwork [5]. Wallace et al. (2004) in their research on outsourced projects, which is a type of virtual project, indicated team risk may be due to greater challenges in team communication and coordination, especially when at least two organizations were involved [10].

The second risk factor studied here, *Technical connectivity issues hinder communication,* focuses on technical issues with communication tools used by virtual teams. Since those teams are dependent on electronic communication, any down time could effectively isolate members of the team. This risk factor was identified from face-to-face interviews and a focus group, as detailed in the methodology section.

The third risk factor studied here, *Insufficient knowledge transfer,* refers to a more complex aspect of communication. Knowledge transfer is defined as the "unidirectional exchange" of knowledge. These transfers generally have a clear objective and are geared toward a specific recipient[6]. However, knowledge transfer is much more complex than the definition indicates. There are two distinct methods of knowledge transfer, explicit and implicit. Explicit transfer is more formal and uses methods such as documentation, training and interviews. Implicit transfer is very informal and involves methods such as storytelling, mentoring or coaching, and communities of practice[4]. Wallace (1999) identified this risk as an important part of "team" risk dimensions in her research on traditional software project risk [5].

METHODOLOGY

A survey of over 150 experienced IT industry practitioners was conducted to identify the degree of impact specific risk factors had on the successful completion of software development projects. Fifty-five risk factors, three of them centering on communication, were identified through the literature, face-to-face interviews, and a focus group of practitioners. Once identified, the risk factors became part of a survey questionnaire, where participants were asked to focus on a recent specific virtual software project on which to base their answers. Those who had not participated in a recent virtual software project were asked to answer based on a recent co-located software project. Survey participants were asked to respond to each risk factor using a three-point Likert scale to indicate the degree of impact each risk factor had on the successful completion of their specific project. In the three-point Likert scale the possible selections were "major impact", "minor impact" or "no impact/ did not occur".

Overall, about two-thirds of the projects on which the survey was based were virtual software development projects with the remaining third being co-located software projects. A majority of the projects were new development types (48%) with the remainder being software upgrades and package upgrades. The duration of a majority of the projects (61%) was under 2 years. About a third of the project teams each (31% and 30%) contained more than 20 people or 6 to 10 people respectively. Project costs varied widely with a third (33%) of the projects in the over $1 million range and approximately another third (30%) in the $100,000 to $500,000 range. Finally, participants were practitioners such as IT project managers, systems analysts and IT project leaders, but not end users who came from a wide variety of industries.

RESULTS AND DISCUSSION

The communication related hypothesis is as follows: Risk factors related to inadequate communication will be significantly higher on virtual software projects than on co-located software projects [8].

Three of the fifty-five risk factors in the survey were communication related and are listed in Table 1 below. Also included in the Table 1 are the participant response percentages which were collected for each of these three communication-related risk factors.

Risk Factors	VIRTUAL PROJECTS			CO-LOCATED PROJECTS			
	No Impact or Did Not Occur	Minor Impact	Major Impact	No Impact or Did Not Occur	Minor Impact	Major Impact	p-value
Lack of or inadequate communication	17.76	34.58	47.66	23.40	36.17	40.43	0.6267
Technical connectivity issues hinder communication	31.78	53.27	14.95	34.04	48.94	17.02	0.8783
Insufficient knowledge transfer	31.78	40.19	28.04	61.70	23.40	14.89	*0.0023

Table 1: Communication-related Risk Factor Survey Response Percentages

The participant response percentages from the first communication-related risk factor indicated the risk of *Lack of or inadequate communication* was thought to have an impact on the successful completion of both virtual and co-located projects. Almost half (48%) of virtual project participants and 40% of co-located project participants indicated this type of risk had a major impact on their project. About a third (35%) of virtual project participants and 36% of co-located project participants felt this risk caused a minor impact. Additionally, this risk factor scored the highest on major impact of the fifty-five risk factors in the survey. These results are understandable and are in line with other literature which indicates communication is an important risk on a project [7]. What is surprising is the insignificant difference indicated by a p-value greater than 0.05 (0.6267) between virtual and co-located projects for this first communication-related risk factor.

The lack of significant differences for this risk factor may be due to several things. First, it was thought that the physical distances between project team members could understandably create communication lapses. Instead, it appears lack of communication or inadequate communication is a major problem regardless of the proximity of the team members. However, the major impact was higher on virtual projects than co-located projects. This may occur if virtual projects are managed using the same methods as are used on co-located projects where face-to-face meetings are often used as a more common form of communication. The lack of face-to-face communication on virtual projects may be unsatisfactory to the team members who are used to that method. It is also possible that some team members will never develop a comfort level with dependence on electronic communication to run a project. A new model of communication may be needed for virtual teams which addresses the richness of the content and a variety of communication methods depending on the frequency and goal of the communication.

The participant response percentages to the second communication-related risk factor indicated *Technical connectivity issues hindering communication* did not have a major impact on the surveyed projects. Only 15% of virtual project participants felt the impact of connectivity issues was major, while 53% felt the impact was minor. On co-located projects only 17% of participants felt the impact was major, while 49% felt the impact was minor. This spread of percentages may be an indication that connectivity issues have stabilized over time and now are rarely a cause of major impact on a project. Both the availability of cheap telecommunication bandwidth and the expertise to maintain its stability may be the cause of the lower level of impact. It is possible that technical connectivity issues still occur, but the expertise to correct them is prevalent and the availability of backup systems exists. It is not surprising that the differences in participant responses between virtual and co-located projects for this risk factor are not significant with a p-value greater than 0.05 (0.8783). This lack of significance is probably also due to the widespread availability of cheap telecommunications bandwidth. Technology problems no longer appear to be a major factor in hindering project communication.

The participant response percentages to the third communication-related risk factor, *Insufficient knowledge transfer,* widely varied. Figure 1 below shows the participant response percentages for each impact level and for both virtual and co-located or traditional projects.
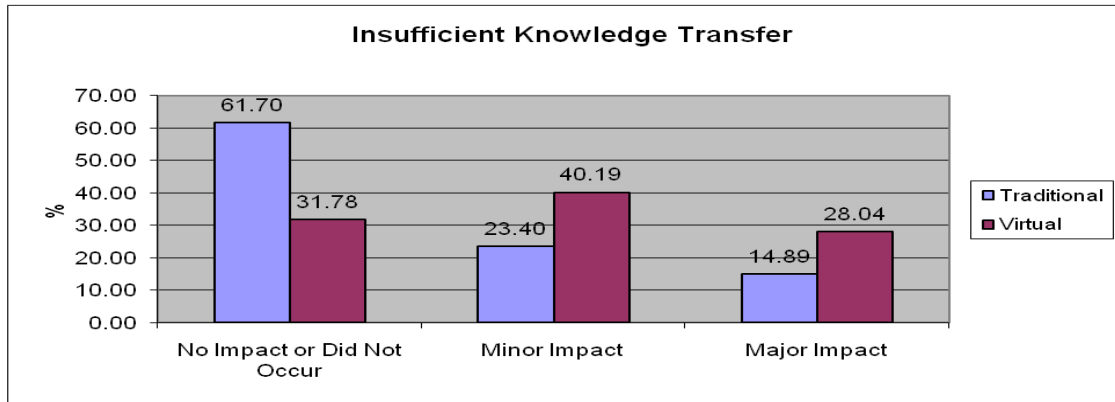.

- 4 -

Figure 1: Impact on Project of Insufficient Knowledge Transfer

This risk factor had more of a minor impact than a major impact according to the responses of all participants. However; the impact of insufficient knowledge transfer was significantly greater on virtual software projects than co-located software projects with a p-value well below 0.05 (0.0023). Almost twice as many (62%) co-located project participants felt this risk factor either did not impact the project at all or did not occur on their projects. Only 32% of virtual project participants concurred. Unlike the other two communication risk factors, where no significant differences were found between virtual and co-located project groups, the differences between the two groups for this risk factor are significant, with a p-value of 0.0023.

These results indicate knowledge transfer is more of an issue on virtual projects than on co-located projects. To understand why this may be the case we need added research comparing knowledge transfer on virtual and co-located projects. Knowledge transfer often centers on the sharing of expertise gained from years of experience[3]. It is likely some of this information is not documented, but exists in the minds of seasoned employees. A common formal method of transferring knowledge is through cross-training or shadowing of an experienced employee through the use of face-to-face communication and meetings. In addition, knowledge sharing on co-located projects that is implicit undoubtedly takes place informally, through water cooler or over-the-cubicle remarks. This type of casual knowledge sharing does not really have a clear virtual equivalent.

Sharing of undocumented knowledge and face-to-face exchange of information can be difficult to accomplish in a virtual environment. A possible solution is to convert more information into explicit knowledge and to emphasize documentation, which can then be exchanged electronically. However, this does not resolve the exchange of implicit knowledge, which will always exist and may be just as important as the explicit knowledge.

CONCLUSION

In conclusion, a comparison of three communication-related risk factors has revealed some significant differences between communication on virtual and co-located software projects. In the cases of inadequate communication and technological problems hindering communication, the location of the employees appeared to have little influence on the occurrence of the risk. In

other words, being a virtual project did not prevent the risk from occurring. However, knowledge transfer was found to have a significantly stronger negative impact on virtual software projects than on co-located software projects. A plausible explanation is an inability to transfer certain types of implicit knowledge or expertise successfully without face-to-face communication or via electronic communication methods. This is exacerbated by the failure of the virtual environment to provide substantial opportunities to provide for the casual exchange of knowledge.

More research is needed specifically on differences in knowledge transfer between virtual and co-located project teams, and in ways to enhance implicit knowledge sharing on virtual projects.

[1].   Aspray, W., et al., *Globalization and Offshoring of Software: A Report of the ACM Job Migration Task Force*, W. Aspray, F. Mayadas, and M.Y. Vardi, Editors. 2006, Association for Computing Machinery (ACM). p. 1-7.

[2].   Boehm, B.W., *Software Risk Management: Principles and Practices.* IEEE Software, 1991(January 1991): p. 32-41.

[3].   Choi, C.J. and S.W. Kim, *Women and Globalization: Ethical Dimensions of Knowledge Transfer in Global Organizations.* Journal of Business Ethics, 2008. **81**: p. 53-61.

[4].   DeLong, D., *Lost Knowledge: Confronting the Threat of an Aging Workforce*. 2004: Oxford University Press. 269.

[5].   Jones, R., R. Oyung, and L. Pace, *Working Virtually: Challenges of Virtual Teams*. 2005: Idea Group Inc.

[6].   King, W.R., *Knowledge Transfer*. Encyclopedia of Knowledge Management, ed. D. Schwartz. 2006: Idea Group Publishing. 945.

[7].   Pare, G. and L. Dube. *Virtual Teams: An Exploratory Study of Key Challenges and Strategies*. in *Proceeding of the 20th International Conference on Information Systems*. 1999. Charlottee, North Carolina: Association for Information Systems.

[8]   Reed, A., *Differences in Critical Risk Factors on Virtual Versus Traditional Software Projects,* 2008, Depaul University, College of Computer Science, Telecommunications and Information Systems, Chicago, IL

[9].   Wallace, L., *The Development of an Instrument to Measure Software Project Risk*, in *Computer Information Systems*. 1999, Georgia State University College of Business Administration: Atlanta, GA. p. 283.

[10].   Wallace, L. and M. Keil, *Software Project Risks and Their Effect on Outcomes.* Communications of the ACM, 2004. **47**(4): p. 68-73.

A WEBSITE ANALYSIS OF ETHICAL CODES FOR COMPUTING PROGRAMS

Adrian Gardiner, Department of Information Systems, Georgia Southern University, Statesboro, GA, 30460, 912-478-7479, agardine@georgiasouthern.edu
Lance A. Matheson, Department of Business Information Technology, Virginia Tech University, Blacksburg, VA 24061, 540-231-5804, lance@vt.edu
J. Harrison McCraw, Department of Accounting and Finance, University of West Georgia, Carrollton, GA 30118, 678-839-4817, jmccraw@westga.edu
John R. O'Malley, Department of Information Technology, Georgia Southern University, Statesboro, GA 30460, 912-478-7251, jomalley@georgiasouthern.edu

ABSTRACT

Ethical issues are not new to the computing profession. Computing technology by itself is neutral, that is, it is neither ethical nor unethical. It is the decision to design and implement this technology in an unlawful or harmful fashion that constitutes unethical behavior. Computing technology can be an enabler of such behavior. A case in point is the "pretexting" scandal at HP that led to the resignation of Chairperson Patricia Dunn. The ability of technology to quickly query a database to retrieve phone records and then to supply those records to unauthorized parties is an example of improper use of technology. These actions stem from a conscious decision by an individual. The computer did not make the decision. If the records had been paper-based, it would have taken a considerable amount of time to locate, copy and distribute them. This type of unethical behavior might have been detected given the time required to manually supply requested information. It is not difficult to find many examples of similar unethical behavior within the literature.

It is assumed that such decisions are made as a function of risk and reward and/or individual values. Given the role computing technology plays in today's society, it is therefore important that students in computing curriculums are aware of the professional and societal as well as the personal consequences of their actions vis-à-vis technology.

Students majoring in the computing disciplines (computer science, information technology, information systems, software engineering, and hardware engineering) need to understand behavioral expectations. ABET, the major accreditation organization for computing disciplines, and AACSBI, the major accreditation organization for colleges of business which often include Information System departments, explicitly require ethics education by their accredited programs. The purpose of this research is to investigate the emphasis educational programs put on ethical awareness within computing disciplines.

MOBILE WEB USABILITY DEVELOPMENT AND MAINTENANCE

Caroline Collier, Georgia College & State University,
Campus Box 012 Milledgeville, GA 31061
(478) 445-5721 caroline.collier@gcsu.edu

Ajantha Dahanayake, Georgia College & State University
Campus Box 012 Milledgeville, GA 31061
(478) 445-5721 ajantha.dahanayake@gcsu.edu

ABSTRACT

Web designers have to manage the design of new mobile Web sites or new versions of existing mobile Web sites in very short time periods. Due to these very short time periods, mobile Web usability is often not considered in the Web site development process. Even when the issue is considered, the usability of the mobile Web site is usually evaluated in the latter phases of the development process, when its implementation is almost complete.
Therefore, correcting the detected usability errors implies a complete redesign of the application which cannot usually be afforded. This paper proposes a methodology for mobile Web usability development and maintenance. This methodology incorporates mobile Web usability throughout the mobile Web site lifecycle. Mobile Web usability appears then as a fundamental property of the mobile Web site, itself.

INTRODUCTION

In recent years, the Internet has become an essential means of communication. The World Wide Web is particularly used to carry out many different activities in areas such as business, leisure, learning, and so forth, causing a tremendous growth in the total number of Web sites in existence [11]. However, most of the currently existing Web sites are not usable to varying degrees by mobile device users. For this reason, mobile device users are unable to use a significant part of the information included in the Web [3]. The mobile device either cannot display the Web site at all, or cannot display the Web site in a size that fits the mobile device screen or can display the Web site, but it is difficult to interact with the Web site itself (such as difficult navigation through the Web pages of the Web site).

The lifecycle of Web sites is currently very short [8]. In fact, Web designers have to manage the design of new Web sites or new versions of existing Web sites in very short time periods. This has a detrimental effect on the quality and usability of the final product. Although some research studies are being carried out on mobile Web services and mobile Web security, mobile Web usability is not being considered in the Web site development process. Moreover, when the issue is considered, the usability of a Web application is usually evaluated in the latter phases of the development process, when its implementation is almost complete. As a result, correcting the detected usability errors implies a complete redesign of the application which cannot usually be afforded. To avoid these situations, developers should consider mobile Web usability from the very beginning of the product development process.

However, a shortage of development methodologies, which incorporate mobile Web usability as a fundamental property of the product, exists. Such methodologies should be designed and implemented within organizations to increase the mobile Web usability awareness of Web developers. As a result, this should facilitate the development of usable mobile Web sites. These methodologies lead to the production of usable applications, but they would also lead to the development of higher quality products and facilitate their maintenance.

In this paper, we propose a methodology for the mobile Web usability development and maintenance process. The establishment of this methodology in an organization will ensure that mobile Web usability is incorporated throughout the development of the mobile Web site. It will also increase awareness of the importance of mobile Web usability.

MOBILE WEB USABILITY OVERVIEW

Mobile Web Usability and Web Usability

One could argue that mobile Web usability should follow the same methodology as Web usability. However, mobile Web usability diverges from Web usability, as both have different characteristics. Mobile Web users utilize mobile devices to access some Web sites whereas "typical" Web users utilize their desktop computers or laptops to surf the Web. This fundamental difference has several consequences including the fact that mobile device users face limited input and output capabilities [12]. Other consequences encompass the importance of context and goal-oriented intentions of the mobile Web users.

Most desktop computers are equipped with a large keyboard including 104 keys (PC English keyboard) and a mouse, whereas the input devices vary greatly from one mobile device to another one. A mobile phone uses a limited 12 button keypad and a PDA can include a touchscreen and a stylus which works in combination with the touchscreen but provides higher precision. Despite the creation of new and innovative input devices for mobile devices, it is generally easier to work with input devices designed for a desktop computer than it is with the ones for a mobile device. This has an impact on Web usability. For example, if a Web site requires many "clicks" to navigate through its Web pages, this Web site may not be user friendly or not "usable" for a mobile device user.
Table 1 presents a list of input devices and their descriptions.

Input devices	Description
Keypad	Classic 12 button mobile keypad
Touchscreen	Touchscreen that allows pointing to an area of the screen
Stylus	A stylus normally works in combination with a touchscreen. The stylus provides higher precision.
Trackball	A little sphere that acts like a trackball mouse.
Clickwheel	A wheel that is normally placed either below the screen or on the side of the device that lets the user quickly move up and down as well as clicks on link or items on the screen.

Table 1: List of input devices used by mobile devices

The output capabilities of mobile devices are determined by their screen, which can range from small monochrome to VGA/SVGA size displays. The screen limits the amount of information for simultaneous display and therefore, the bandwidth for user interaction. Applications need to consider this limitation, for example, by distributing information across multiple pages or adapting the content of the application. Desktop computers and mobile devices differ in screen sizes. On one hand, while buying a desktop computer, a person looks for purchasing the largest screen his or her budget allows. On the other hand, the mobile device buyer is looking for portability and accepts a small screen size to ensure the device portability. Due to this diversity in screen size and resolution, a Web page can have different displays on a desktop computer and on a mobile device.

The concept of context plays a major role in mobile Web usability. Desktop users surf the Web while seated in front of a desk. For example, they can be at home, at work, or even at a cyber café. The context can then provide diverse levels of noise and distraction. However, mobile users are more likely to use their mobile devices in "uncomfortable" and "noisy" places. This can include a bus while traveling to their workplace, at lunch in a restaurant, or even between two meetings on a business trip. The mobile devices are usually used in a context where concentration is not easy because of the level of noise, the presence of other people around the users, and the position of the user (one can be standing up in a bus while using the mobile device) [19].

Mobile users typically have different interests than users of desktop computers. Mobile users are likely to have more immediate and goal-directed intentions than desktop Web users. Their intentions are often to find out specific pieces of information that are relevant to their context. An example of such a goal-directed application might be the user requiring specific information about schedules for a journey he/she is currently undertaking. Equally, mobile users are typically less interested in lengthy documents or in browsing. The ergonomics of the device are frequently unsuitable for reading lengthy documents; users will often only access such information from mobile devices as a last resort because more convenient access is not available. The content of the mobile Web site needs to be adapted. This includes summarizing the text to reduce the text length, but keeping the main idea. It also involves shortening the words themselves. For instance, on a mobile Web site, the word "Entertainment" could be replaced by a shorter word such as "Fun" [12].
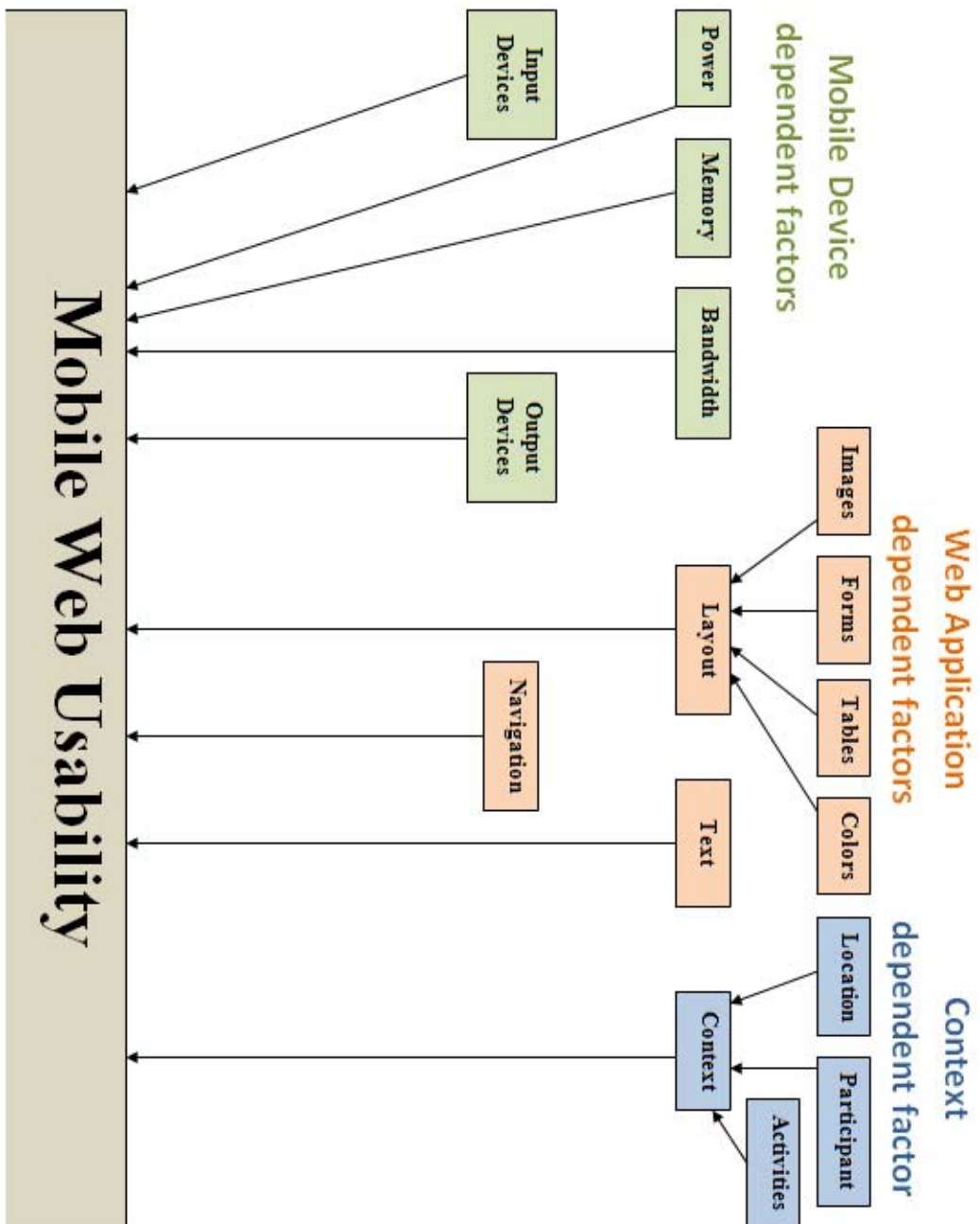
Figure 1: Mobile Web Usability - Influencing Factors

Mobile Web Initiatives

As a first step towards mobile Web usability, the W3C has published the Mobile Web Best Practices 1.0 on November 2, 2006 [20]. A later version was released on July 29, 2008. The document was created by the Mobile Web Best Practices Working Group as part of the Mobile Web Initiative. The scope is based on the fact that the quality of the user's Web experience via a mobile device depends significantly on the usability of Web sites, the browsers, and the device itself. Although the document recognizes that browser usability and device usability are important (for reading, navigating, and interacting with content), it focuses primarily on Best Practices for improving site usability. It presents 60 recommendations for delivering Web content to mobile devices. The Mobile Web Best Practices Working Group briefly describes each recommendation and answer succinctly to how to do it and how to test it. In the "how to test" section, the Group differentiates human test from machine test.

These recommendations are an important part of mobile Web usability. However, nowadays, Web engineers have to manage the creation of new Web sites or new versions of existing Web sites in very short time periods. Consequently, the conformance to these recommendations is often overlooked, which has a detrimental effect on the quality of the final product.

MOBILE WEB IN REAL LIFE: TWO CASE STUDIES

Two case studies are used to investigate mobile Web usability in practice. The underlying motives for this investigation are to derive starting points for the development and maintenance of mobile Web usability. The research method is exploratory in nature. We use interviews (by phone and emails), review Web sites, and search the Internet.

Alpha University

Alpha University is a state university located in the southern region of the United States. The competition between universities in this region is fierce. Each university wants to attract and retain the brightest students and faculty, as well as raise donations from private companies and alumni to support their expansion and improvements. Therefore, Web sites are powerful promotional tools. Alpha University understood the power of the Web and did a major redesign of its own Web site in 2006. The Alpha University Web site attempts to reach a diverse audience. It is seen as a promotional tool to attract new potential students (and their parents), as well as new faculty and staff members to fill open positions. It is also an informational tool to inform its current students, faculty, and staff. Finally, it is a communication tool to keep in touch with alumni and friends as the university needs to rely more and more on external donations. As a result, there are 17,000 Web pages (including Internet and Intranet sites) and almost 60,000 files in the Alpha University Web site.

The Alpha University Webmaster, along with the team of the University Communication division, supervises the updates of the University Web sites. To make sure that the Web site stays updated, the Webmaster delegates the updates of several parts of the Web site to 158 content managers. A content manager is a person who works in a specific school or department and is aware of changes at the school or department level which impacts the content of the Web

site. Content Managers update the HTML documents they are responsible for and post the modified Web pages to a development server. They then email the University Webmaster who checks the updated files on a development site for proper HTML contents, respect of the University style guidelines, and proper content. Once the University Webmaster approves the updated files, he/she transfers them from the development site to the public site.

While the interest in Web accessibility has been a concern for Alpha University since 2005, the interest to make their Web site usable on mobile devices is very recent and is still at a very early stage. One staff member (M.M.) working with the Webmaster attended an Apple conference in November 2006. Part of the conference was dedicated to the mobile Web and how to create a Web site that is accessible and usable on mobile devices. M.M. gained awareness of the importance of mobile Web and how it is different from the original World Wide Web. As a consequence, he started to share his new knowledge with the Webmaster and built a prototype of the Alpha University employee directory as a separate mobile Web site. The Web site was developed using an application based on AJAX open source code. M.M. transformed the static application into a dynamic application in order to use the existing database of employee's contact information which is also used for the Web version of the employee directory. For testing and evaluation, the following was performed:

- M.M. tested the Web site using his own iPhone and his co-worker's HP IPAQ.
- M.M. sent a message to the Alpha University iDreamer list serv. The iDreamer list serv groups Alpha University faculty and staff that have an interest in iPod and other mobile devices. M.M. did receive feedback from three different iDreamers. They were positive and appreciated the mobile Web site. However, the testing has been limited to these three positive comments.

M.M. recognizes the feedback from only three different iDreamers is very restricted and that then more testing is needed. Moreover, the informal feedback did not mention crucial information such as the types of mobile device and browser used. He identifies the following challenges in the quest for mobile Web usability:

- *Lack of awareness*: Staff needs to be aware of the mobile Web and its possibilities. M.M. is so far the only Alpha University staff member who attended a mobile Web conference. Awareness is still an issue for the mobile Web.
- *Lack of training*: Staff needs to be trained to create usable mobile Web application. As the University Communication staff masters the traditional Web technology and concepts, this expertise is limited to this area and doesn't include the mobile Web area.
- *Lack of methodologies*: A precise methodology needs to be established to develop usable mobile Web applications and maintain them. Mobile Web usability evaluation should provide accurate results so a methodology needs to establish how and when the evaluation needs to take place.
- *Lack of time*: The lifecycle of a Web site should be short and ensuring the mobile Web usability should not be a lengthy process. The staff is busy with the original Web site.

C University

C University (CU) is a private Christian University located in the United States. CU students may choose from 61 baccalaureate majors that include more than 100 areas of study, 26 master's

degree programs, and one doctoral program. CU accounts 4,800 students including 630 graduate students from across the U.S. and 60 nations. As it states in its vision, CU will build distinctive and innovative programs. One of these innovative programs is the CU Connected program. Thanks to this program, CU has provided an iPhone or iPod Touch to all incoming freshmen starting Fall semester 2008. This is the beginning of a large project. The mobile devices will ultimately be used to provide:

- Interactive campus map (3-D map that will progress as you walk)
- University Calendar
- Course Registration
- Food order (including payment online)
- Social networking such as Facebook
- Weather
- Voice reporter
- Podcasts from professors
- Entertainment Web sites (i.e. buy a concert ticket online)
- Class conversations (Hybrid classes)
- Class Syllabus
- Possibility to answer online surveys posted by professors

CU has adopted the idea proposed by the 2008 Horizon Report which states: "As new devices… are released that make content almost as easy to access and view on a mobile as on a computer, the demand for mobile content will continue to grow. This is more than merely an expectation to provide content: this is an opportunity for higher education to reach its constituents wherever they may be."
Almost all of these project goals require making mobile Web applications usable.
The ideas to feed this project initiate from a group of eight teams:

- The Administrative & Infrastructure Team: It examines ways university administrators can leverage converged devices for standard administrative tasks and revenue development;
- The Application & Programming Team: It develops front-end and middleware applications to help users take full advantage of the new capabilities offered by converged devices;
- The Digital Media Interaction Team: It explores ways that campus media can use new strategies to inform the university population about news and events;
- The Living & Learning Team: It considers the social applications of converged devices for residence life and student affairs;
- The Pedagogical Innovations Team: It develops new teaching and active-learning strategies based on ubiquitous deployment of converged devices;
- The Podcasting Group: It is a separate university initiative, which is in charge of coordinating its efforts with the other mLearning teams to think about mobile devices as a platform for educational media;
- The Social Interactions Team: It seeks ways to use converged devices to strengthen student and faculty community;

- The Student Research Team: It gathers requests for features and applications from students and also relays student responses to applications being developed by the other teams;
- The Study Coordination & Invention Team: It offers synthesis and coherence among the teams and providing broad theoretical direction.

As the teams have specific assignments, none of the team is officially in charge of the mobile Web usability. One of the Web programmer leaders (J.L.) has been instrumental in the development and implementation of this project. He is part of the Application & Programming Team. This team gets the requirements from the other teams and is in charge of their ultimate development and maintenance. The mobile Web applications are tested by the experts of the team first. They are then demonstrated to the team which provided the requirements for the application and from which the idea was initiated. Comments and feedback are reported and potential modifications are made. If modifications occur, a new version of the application is developed and each version is presented to the initial team until acceptance. Once the application is approved, the application is tested on a group of CU students. Comments and feedback are recorded and potential modifications are made here again before releasing the application to the entire university population. J.L. considers that the process works well but also mentions the process faces some challenges:

- *Lengthy and chaotic process:* The development process can be lengthy and chaotic. J.L. agrees that a formal methodology will be helpful to organize the development process itself.
- *Lack of reporting standards:* J.L. recognizes that there are some reporting issues since comments and feedback are open and sometimes unclear. A more detailed and standardized reporting method is needed. These reporting standards should be incorporated in the methodology.

Conclusion

In both case studies, the lack of methodology for the development and maintenance of mobile Web usability constitutes a challenge. Both case studies would benefit from a methodology which could incorporate mobile Web usability throughout the lifecycle of the Web site and streamline the development and maintenance processes.

ENGINEERING MOBILE WEB USABILITY

Software Engineering Methodologies

Developing Web applications is a complex process which requires adherence to a particular framework or methodology in order to produce good quality products. These methodologies define concrete steps of the development process in order to reduce its complexity. Software engineering methodologies describe the phases required for software application development, as well as the way in which these phases are integrated into the process model [13]. The most commonly applied software engineering models are the following:

- Waterfall model
- Prototyping model

- Spiral model

The *waterfall model* [1] is a sequential methodology which establishes a fixed order for the development process. This specific methodology divides the software methodology into six activities:
1. system engineering
2. analysis
3. design
4. coding
5. testing
6. maintenance

The *prototyping model* [16] is based on producing prototypes of the software application in a short period of time. The prototypes are then tested and the results are used to produce subsequent enhanced prototypes until all the requirements are fulfilled.

The *spiral model* [16] integrates features from the waterfall and the prototyping models and adds an element of risk analysis in the development process. The process model is configured as a spiral where each iteration consists of four major activities:
1. planning
2. risk analysis
3. engineering
4. customer evaluation

In all these different models, three main phases are always included:
1. definition
2. development
3. maintenance

The definition phase consists of requirements definition and application analysis whereas the development phase covers the design and implementation of the application [16]. Together, these phases constitute the lifecycle of the application. Selecting one or other methodologies depends on the size and complexity of the software application to be developed, as well as on time constraints.
However, software engineering methods cannot be directly applied to Web application development due to the special features of hypermedia. In order to overcome this situation, some new methods have been proposed. These include hypertext design model (HDM) [2] and relationship management methodologies (RMM) [5]. In addition, different methodologies (frequently sharing some features such as some lifecycle stages) have been produced: sequential, iterative, prototype-based, and so forth.

Incorporating Mobile Web Usability into the Lifecycle

We suggest adopting the following lifecycle phases for a Web application: requirements, analysis, design, implementation, and maintenance. This section describes each lifecycle phase and explains the decisions to be made within each lifecycle phase.

A preliminary evaluation of the company must be performed in the product *requirements phase*. This preliminary evaluation will determine whether the company is able to proceed to the design of usable mobile Web applications. It aims to detect any limitations regarding the company's staff, technical, and economical resources in the mobile Web usability area. As a result, the company's ability to deal with upcoming problems is measured and the most deficient areas are identified. One of the main obstacles in this stage is the lack of trained staff. Solving this problem may require additional financial resources, and the company would have to weigh the benefits of a usable mobile Web site with the financial burden associated with it. In addition, the available of the trained staff to conduct manual evaluations need to be taken into account. Besides, the company needs to recruit mobile users to perform mobile Web usability evaluation. Thus, it is desirable to include groups of users with different mobile devices, various browsers, and diverse levels of familiarity with the Web site. It is also important to make the users interact with their mobile devices in different contexts.

Adopting the Mobile Best Practices 1.0 helps identifying usability obstacles in the *analysis phase*. These guidelines are aimed at avoiding unnecessary design barriers and promoting the application of user characteristic specifications and their operational environment in a positive way.

The results obtained in the analysis phase are formalized in the *design phase*. Applying techniques related to the previously adopted Mobile Best Practices 1.0 is advisable at this stage, as it gives some orientation to build the mobile Web site and avoids pitfalls that will be source of a non-usable Web site. These techniques are intended to be independent from the development technology used.

The next activity to be addressed is the *implementation phase*. It is essential to remember the universal design principles in order to make appropriate decisions. When producing content in this phase such as images, tables, and forms, it is necessary to provide equivalent content if appropriate. This requirement leads to the fulfillment of some of the most relevant requirements in the Mobile Best Practices. For instance, in the case of forms, entering data and text is a very time consuming and error-prone task for mobile device users. Everything possible should be done to minimize the amount of clicks required by users. This may imply having to do extra effort on the application back-end to collect user-preferences and use the information to provide reasonable defaults and pre-filled forms [12]. The idea is to produce equivalent content that provides the user with the same functionality as the original.

The *evaluation phase* is one of the most relevant phases in the usable mobile Web application lifecycle. Results of the design and implementation phases are checked to evaluate the fulfillment of the specifications. In order to reach a reliable conclusion, manual evaluation by experts, mobile device and browser emulators, and Mobile Web Best Practices checkers must all be applied. After removing all usability barriers detected by automatic evaluation tools and by experts, evaluations with users will help to detect the remaining user-specific obstacles. All these evaluation methods are complementary and necessary. However, evaluations with mobile device users should not be carried out as frequently as automatic ones. In this stage, it is useful to document process and results in a report in order to avoid repeating the same mistakes. A detailed report aimed at improving the development process. Producing good quality products should also be an objective of the development process.

Maintenance is a critical phase in any Web site lifecycle. As the Web is essentially dynamic, its contents change frequently. From the mobile Web usability point of view, the *maintenance phase* is understood as the phase where usability is monitored in order to measure its evolution.

When the content of a mobile Web application is updated, it is difficult to say whether its usability level has increased or decreased since up to now only qualitative metrics have been used. It is advisable to use quantitative metrics, in order to measure more accurately the usability level and its evolution through time. Whatever the evolution is (positive or negative), the decisions made and the factors involved must be reported and reviewed. An application which reports these facts and evaluates mobile Web usability quantitatively with a predetermined frequency is a powerful and essential tool within the context of this lifecycle. The main objective of taking into account mobile Web usability issues during the whole lifecycle is to improve mobile Web usability so a broader range of end users can be reached.

PROCESS MODEL FOR USABLE MOBILE WEB APPLICATION DEVELOPMENT AND MAINTENANCE

Mobile Web applications tend to be implemented in short time frames and due to this feature a specific development methodology is necessary. This methodology should clearly define the decisions to be made in each phase. The lifecycle is frequently defined as a group of phases that do not have to follow a determined sequence. However, a process model defines the sequence followed by the phases of the lifecycle [17], and it is important to select an appropriate one for the development of usable mobile Web applications.

As it is the case for Web accessibility [7], iterative methodologies fit better when developing usable mobile Web applications. The iterative process model, in contrast to the classical waterfall model, enables the development of first prototypes in the earlier phases of the process. This feature facilitates mobile Web usability during the whole development process. Consequently, usability errors are easier to find and repair. As a result, errors are not passed to subsequent phases and similar errors are avoided in the rest of the process. It is beneficial to use a platform for the reporting of errors detected. In this way, keeping track of errors improves the development process as it avoids the same errors being made again.

In order to determine the appropriate process model it is necessary to take into account that a company may face two possible scenarios: (1) development of a new Web application or (2) mobile Web usability improvement of an existing application.

An initial evaluation has to be performed in order to improve the mobile Web usability of an existing Web application. In this way, usability problems will be detected in order to analyze and correct them and avoid passing them on to subsequent phases. Solutions to the errors detected will be implemented in an iterative way, allowing the correction of errors and the "cleansing" of the application.

Both scenarios (creation of a new application or improvement of an existing application) need to predict and plan mobile Web usability evaluations during the development process. Once the application has been implemented, an evaluation is performed. According to the results, if the objective proposed in the specifications is not met, a re-analysis is carried out. The application will then be redesigned. Following this methodology implies the improvement of the prototype with each iteration. When the required usability level has been fulfilled, the development phase will finish and the maintenance phase will start.

In the maintenance phase, periodical usability evaluations have to be made in order to know whether the updates made to the application have a detrimental effect on the required usability level. If these updates have decreased the overall application usability level, the evaluation report must be analyzed and the detected errors fixed by designing and implementing new solutions.
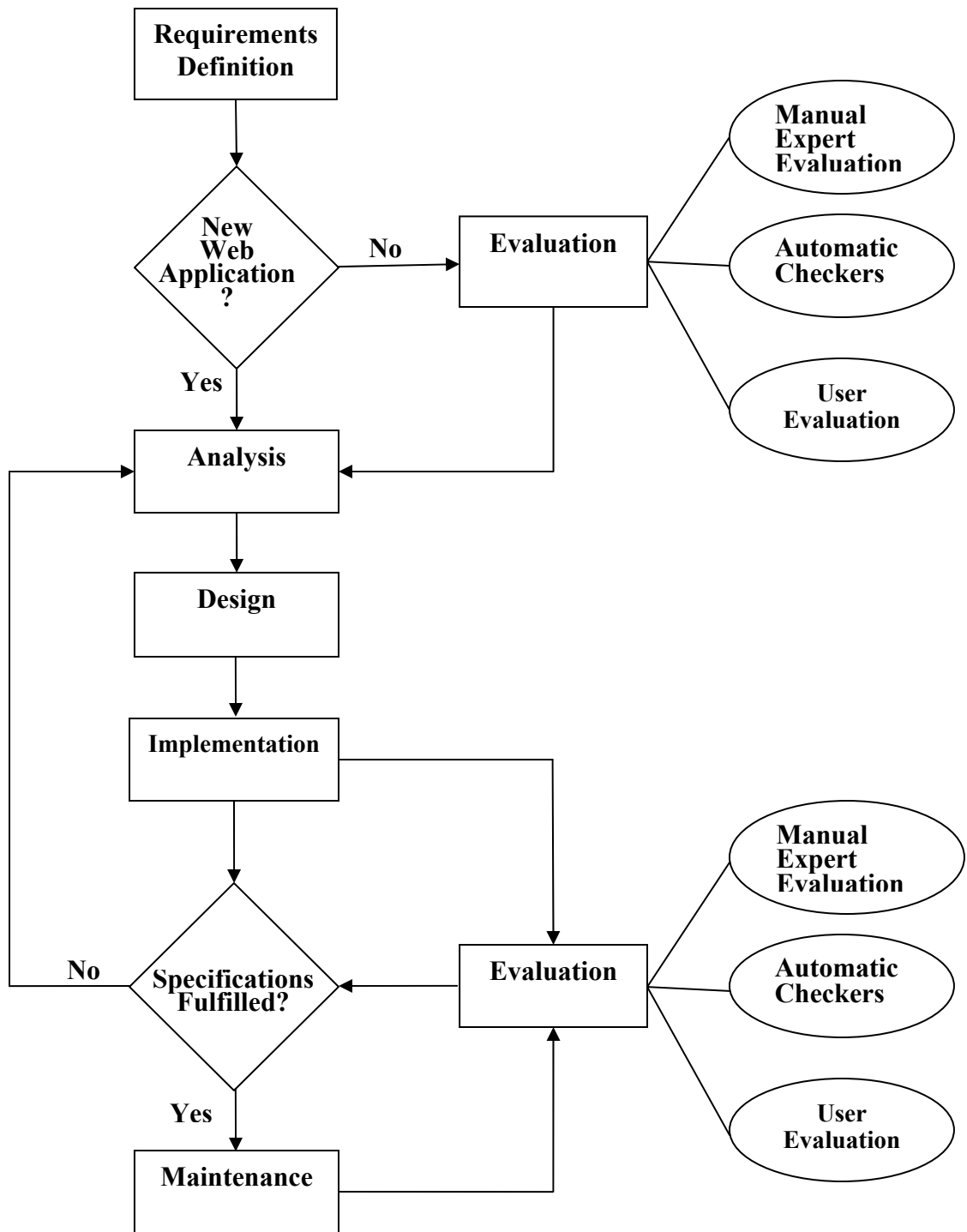
Figure 2: Mobile Web Usability - Process Model

MOBILE WEB USABILITY EVALUATION

Mobile Web usability evaluation is an essential component of the usable mobile Web development process. Mobile Web usability evaluations should be performed frequently throughout the development process as described in the previous section.

Different methods can be used to carry out these usability evaluations, such as manual evaluation by experts, automatic validation of the mobile best practices, and mobile usability testing with users. A valid mobile Web usability evaluation methodology should combine all these methods. However, the most widespread practice in the Web developer community is to perform a manual evaluation by the Web developers themselves. The developers may use a few mobile devices (frequently their own mobile devices) and check on a few browsers (the browsers they usually used on their own mobile devices). At Alpha University, two mobile devices and two different browsers were used to perform the evaluation of the employee directory mobile Web site. The evaluation appears to be incomplete and subjective as it was performed by the Web application developer himself. This incomplete evaluation resulted in products with poor usability levels.

Manual Evaluation by Experts

As with Web usability (by this term, we mean the usability of Web sites created in the attempt of being seen through desktop computers), mobile Web usability evaluation requires performing inspection methods. In this way, heuristic evaluation can be extremely useful as experts are able to evaluate mobile Web applications according to sets of mobile best practices [4]. Some of these practices can not be automatically tested as they require human judgment. For instance, Mobile Web Best Practice # 7: BALANCE – "Take into account the trade-off between having too many links on a page and asking the user to follow too many links to reach what they are looking for" [20]. The idea behind this practice is to design the mobile Web application so that frequently accessed information is easily reached with a minimum number of page retrievals. Navigation to less frequently accessed information may take more retrieval as a result. A guideline is that users become frustrated if it takes more than four retrievals to reach their objective. Whether this can be achieved depends on the nature of the site and, in particular, how items in menus are grouped together to provide understandable themes. This practice requires human judgment to decide what a good balance is for a particular Web site.

Another convenient technique is performing a walk-through in order to detect any usability barrier which obstructs the completion of specific tasks [9]. In this way, experts are able to determine the main executable tasks in a Web site and browse all the particular solution paths by using different types of mobile devices such as iPhone, Nokia, etc. It is possible to use the mobile devices themselves but also, experts could rely on device and browser emulators. As this list is not complete, it constitutes a start and addresses the most popular mobile devices emulators and their browsers simulators.

Simulators/Emulators	URL
Windows Mobile Emulator	http://www.microsoft.com/downloads/details.aspx?FamilyId=C62D54A5-183A-4A1E-A7E2-CC500ED1F19A&displaylang=en
iPhoney: iPhone Emulator	http://www.marketcircle.com/iphoney/
Opera Mini Emulator	http://www.operamini.com/
Blackberry Emulator	http://na.blackberry.com/eng/developers/downloads/simulators.jsp
ACCESS NetFront	http://www.access-company.com/products/netfrontsdk/index.html
OpenWave Simulators	http://developer.openwave.com/dvl/tools_and_sdk/phone_simulator/
Nokia Simulators	http://www.forum.nokia.com/info/sw.nokia.com/id/db2c69a2-4066-46ff-81c4-caac8872a7c5/NMB40_install.zip.html

Table 2: Mobile Devices and Browsers Simulators/Emulators

Automatic Mobile Web Best Practices Validation

The advantages of this method are several in terms of cost effectiveness since free automatic mobile Web Best Practices evaluation tools, which obtain the evaluation results in a short period of time, are used.

Currently, there are a few mobile Web checkers with diverse characteristics.

Checker	URL	Characteristics
MobileOK Basic Checker	http://validator.w3.org/mobile/	MobileOK Basic Checker tests the compliance of a Web site to the Mobile Web Best Practices published by the W3C Mobile Web Best Practices Working Group. The current checker is at its beta stage and is asking for comments from the public. There are 2 levels of conformance, basic and pro.
TAW mobileOK Basic	http://validadores.tawdis.net/mobileok/en/	TAW OK Basic is a tool for analyzing mobile web best practices. Specifically it checks mobileOK Basic conformance as described in W3C mobileOK Basic Tests 1.0 based on W3C Mobile Web Best Practices 1.0.
Ready.mobi	http://ready.mobi/	This testing tool evaluates mobile-readiness using industry best practices & standards. The free report provides both a score (from 1 to 5) to determine how well your site performs on a mobile device.

Table 3: Mobile Best Practices Checkers

The checkers execute their validation online on a Web server. However, the lack of methods for validating these tools creates a number of problems and a number of experts criticize the Mobile Best Practices 1.0 and the associated checkers. These experts define the practices as "compromises" [6] [12].

The main objective of these mobile Web checkers is to verify the content of a Web page or Web site according to a set of guidelines and to return a report, detailing all errors discovered. They offer guidance on error correction by providing the Mobile Best Practices associated with the detected errors. However, the guidance is limited to the display of the guidelines as shown in the W3C's Mobile Best Practices document and sometimes is illustrated by an example on how to correct the error. The "repair" service doesn't provide a custom solution for repairing the specific error of the tested Web site.

Mobile Web Usability Testing with Users

An accurate mobile Web usability evaluation methodology requires testing the Web application with different groups of users. This method will detect real usability barriers for the end users. This process is even more significant for achieving the overall goal of mobile Web usability when expert evaluation has been performed by people involved in the development of the Web application, as they will be accustomed to the interface features.

A typical usability test is usually carried out in controlled environments such as testing laboratories where experts can observe and collect data from users. The thinking-aloud technique, consisting of users continuously vocalizing their thoughts, feelings, and opinions while interacting with the site, is very useful since it allows the detection of barriers found by users in real time. However, we argue that in the case of mobile Web usability testing, a laboratory test is not appropriate. Mobile Web applications are used in very different environments For instance, the user may be travelling. In fact, the user accesses the application whenever and wherever required to perform a certain task. As a result, a mobile Web application is in prone of continuous context changes. The context influences the application, which needs to adapt to those context changes [18]. The term context should be understood as extending beyond simple geographical location to include the physical environment, users or participants, the activities in which they are involved, and the interaction between the three [15] [19]. Figure 3 provides a graphical representation of the context model and show how the environment, the participants and the activities interact with each other as well as with themselves respectively. In addition, Table 1 offers a better understanding of these three categories by presenting their characteristics.
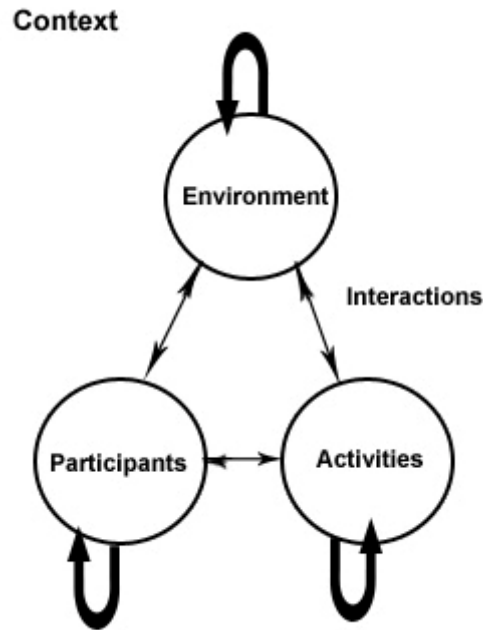
Figure 3: Graphical Representation of Context Model (adapted from [19])

Category	Representative Characteristics
Environment	Location, Orientation (of objects) Physical properties, Brightness and noise levels Availability, quality (of devices and communications)
Participants	Location, Orientation Personal properties (e.g., age, gender, education, preferences) Mental state, Physical health, Expectations
Activities	Tasks and goals (of participants) Events in the environment (e.g., weather)
Interactions	Co-location, Group dynamics, Social situations Participant/environment relationships (e.g., worker/workplace) Season, time-of-day, day-of-the-week In mobile and ubiquitous computing, the notion of context is often equated

Table 4: Representative Characteristics for the Context Model [19]

Context in mobile Web usability evaluation is a primordial concept in mobile Web usability as it influences the user's attention level. The mobile Web application may not be the primary focus of the user's activities as the user may be trying to juggle interaction with a mobile device along with other elements in the environment (e.g., riding a bicycle with friends on a busy street while receiving directions from a navigation system). The amount of attention that a user can give to a mobile application will vary over time, and a user's priorities can also change unpredictably. Moreover, various tasks can be set up in order to encourage users to browse the system, and it may be useful to collect data from this interaction so that usability parameters, such as effectiveness in completing the tasks, can be calculated. If the effectiveness value in performing

a specific task is low, its solution paths should be analyzed in order to detect any existing usability barrier.

Enquiry methods such as questionnaires and interviews are broadly used in usability testing and can also be applied to mobile Web usability testing. The questions within these questionnaires should be designed in such a way that users' answers help evaluators to determine the most significant mobile Web usability barriers in the system.

The results of the complete mobile Web usability evaluation must be summarized and documented in a report. This report should contain all the detected errors, clearly identifying the method used for the validation as well as the list of the evaluated Web pages. If an area of the Web site was not part of the evaluation, it needs to be mentioned in the report. The more detailed the evaluation report is, the easier the detection and corrections of future mobile Web usability will be. A standard organizational template for developing this report can be useful and facilitate the production of accurate results for the evaluation process. The organization is faced with two options. The first option consists on the creation of a customized organizational template. The organization then decides to create its own template. The second option consists on the adoption of an existing template such as the Common Industry Format (CIF) for Usability Test Reports [10].

CONCLUSION

Nowadays, as the number of mobile device users increases, Web engineers cannot ignore the importance of mobile Web usability. Our mobile Web usability development and maintenance methodology proposes a process model for usable mobile application development and maintenance. The mobile Web usability is incorporated throughout the mobile Web site lifecycle. It becomes a fundamental property of the mobile Web site itself. The methodology also describes the components of a complete mobile Web usability evaluation: manual expert evaluation, automatic checker evaluation, and user evaluation.

At a larger scale, our research attempts to educate and build outreach materials to help Web engineers achieve a better understanding of the complimentary aspects of an effective mobile Web usability solution. However, this is only one step and other steps are needed to lead a more widespread development and maintenance of usable mobile Web sites.

REFERENCES

[1] Boehm, B.; Port, D.; and Al-Said, M. (2000). Avoiding the Software Model Clash Spiderweb. Volume 33, Issue 11 (November 2000). Pp. 120-122.

[2] Garzotto, T.; Paolini, P.; and Schwbe, D. (1993). HDM-a model-based approach to hypertext application design. ACM Transactions on Information Systems. Volume 11, Issue 1. Pp. 1-26.

[3] Harper, S. (2008). Mobile web: reinventing the wheel? ACM SIGACCESS Accessibility and Computing. Issue 90. Pp. 16-18.

[4] Hvannberg, E.; Law, E.; and Larusdottir, M. (2007). Heuristic evaluation: Comparing ways of finding and reporting usability problems. Interacting with Computers. Volume 9, Issue 2. Pp. 225-240.

[5] Isakowitz, T.; Storh, E., and Balasubramanian, P. (1995). RMM: A methodology for structured hypermedia design. Communications of the ACM. Volume 38, Issue 8. Pp. 34-44.

[6] Moll, C. (2007). Mobile Web Design. Cameron Moll. First Edition.

[7] Nielsen, J. (2001). The usability lifecycle. Retrieved on April 12, 2008, from http://www-128.ibm.com/developerworks/library/it-nielsen3/

[8] Nielsen, J. and Loranger, H. (2006). Prioritizing Web Usability. New Riders Press, Berkeley CA.

[9] Nielsen, J. and Mack, R. (1994). Usability inspection methods. New York: John Wiley & Sons.

[10] NIST Industry USability Reporting (2001). Common Industry Format for Usability Test Reports. Retrieved on May 12, 2008, from http://www.idemployee.id.tue.nl/g.w.m.rauterberg/lecturenotes/Common-Industry-Format.pdf

[11] Olssen, C. (2000). To measure or not to measure: Why web usability is different from traditional usability. Proceeding of WebNet2000.

[12] Passani, L. (2008). Global Authoring Practices for the Mobile Web. Retrieved in April 5, 2008 from http://www.passani.it/gap/.

[13] Pressman, R. S. (1992). Software engineering: A practitioner's approach. New York: McGraw-Hill.

[14] Rubin, J. (1994). Handbook of usability testing: How to plan, design and conduct effective tests. New York: John Wiley & Sons.

[15] Ryan, C. and Gonsalves, A. (2005). The Effect of Context and Application Type on Mobile Usability: An Empirical Study. The 28th Australasian Computer Science Conference. Volume 38.

[16] Sommerville, I. (2004). Software Engineering. Boston : Pearson/Addison-Wesley, 2004.

[17] Scacchi, W. (2001). Process Models in Software Engineering. Final version appeared in Marciniak, J. (Ed.) Encyclopedia of Software Engineering 2nd Edition. John Wiley and Sons, Inc. New York.

[18] Spriestersbach, A. and Springer, T. (2004). Quality Attributes in mobile Web Application Development. Lecture Notes in Computer Science (LNCS). Volume 3009. Pp. 120-130.

[19] Tarasewich, P. (2003). Mobile commerce opportunities and challenges: Designing mobile commerce applications. Communications of the ACM. Volume 46, Issue 12. Pp. 57-60.

[20] W3C (2008). Mobile Web Best Practices 1.0. Retrieved in August12, 2008, from http://www.w3.org/TR/mobile-bp/

Comparing the Characteristics of Principle Online Training and Assessment Products for Introductory Computer Instruction

Session Organizer and Moderator

Wilma M. Andrews,
Virginia Commonwealth University, **Department of Information Systems**
Richmond, VA. 23284-4000, 804-827-0956, wandrews@vcu.edu

ABSTRACT

The moderator will present relevant information and lead a discussion of four products: SAM2007 (Cengage), MyITLab (Pearson), SimNet (McGraw Hill) and SNAP (EMC/Paradigm). Characteristics discussed include: cost, easy of use by students and faculty, content coverage, product support for students and faculty, linkage to text materials, effectiveness of training modules, types of exam questions supported, time required to become familiar with the product for students and faculty, pricing flexibility, online help support for students and faculty, time duration of student accounts. Session participants will be invited to ask questions and provide their experience with these products and vendors.

IMPROVING THE EFFICIENCY OF ONLINE ADVERTISEMENT TARGETING VIA ARTIFICIAL INTELLIGENCE ANALYSIS OF USER'S WEB SURF HISTORY

Jason K. Deane
Department of Business Information Technology
Pamplin College of Business
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
540.231.4535 (voice)
540.231.3752 (fax)
jason.deane@vt.edu

Terry R. Rakes
Department of Business Information Technology
Pamplin College of Business
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
540.231.4636 (voice)
540.231.3752 (fax)
trakes@vt.edu

Loren Paul Rees
Department of Business Information Technology
Pamplin College of Business
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
540.231.5050 (voice)
540.231.3752 (fax)
loren@vt.edu

ABSTRACT

The demand and popularity of on-line advertising has never been higher. As a result, the industry has experienced an enormous influx of capital resulting in a highly competitive environment. The difference between success and failure in this market often depends on an ad publisher's ability to successfully deliver advertisements that match the interests of their users.   We propose and test a new ad targeting technique which utilizes artificial intelligence techniques to leverage the highly unstructured textual data which makes up a user's web surf history to develop an estimate of a user's affinity for particular products or services.

INTRODUCTION

Online marketing is very rapidly growing in popularity as companies continue to migrate larger and larger portions of their advertising budget to the online medium [7]. Motivated by this upward trend in Internet advertising demand, many companies (e.g., Google, Yahoo, AOL, etc.) have adopted a business model which is heavily dependent upon the revenue stream generated from publishing online advertisements [4]. This online advertising environment offers some very unique opportunities and challenges. An enormous amount of customer data is available, which continues to drive the popularity and the importance of the behavioral targeting [9]. According to Kessler and Acohido of the USA Today, "Microsoft is one of many companies collecting and aggregating data in new ways so sophisticated that many customers may not even realize that they're being watched." Congress has recently taken up this issue and promises to institute regulations that will ensure that the ad publishers do not violate basic consumer privacy; however, the consensus is that this process will certainly not eliminate behavioral ad targeting, but simply place limitations on how it is practiced. In a prior work, Deane and Pathak [5] proposed and tested an online ad targeting technique which is based upon the analysis of a user's web surfing habits. This technique, which shows great promise, is based on the application of the vector space model which utilizes the raw html of a user's web surfing history to select the appropriate advertisements for a given user. In this work, we expand on this basic model by exploring the utilization of several artificial intelligence techniques and alternative structural representation ideas in an effort to extract additional information from the user's web surfing history. We hypothesize that this more powerful method of feature extraction and utilization will provide us a more proficient ad targeting model.

The paper is organized as follows. The next section provides some background information with respect to the online advertising industry and discusses the relevant literature. The following section provides an introduction to the base model and discusses the proposed adaptations. The final section provides a very brief conclusion.

BACKGROUND INFORMATION

There are three primary participants in the online advertising process. At the top of the chain is the *Advertiser*. This is a company that enters into an agreement with a publisher in order to enlist the publisher's assistance in the serving of their online advertisements. The associated ads are delivered to users of the publisher's Web pages. The *Publisher* is a company that expends resources in an effort to publish online advertisements in order to generate revenue. The *Customer/User* is the individual who browses Web pages and is exposed to advertisements to which they may or may not respond. In its infancy, the online advertisement publishing industry adopted the CPM (cost per mille) pricing model which was developed by and is very popular in the traditional print and television media industries. The payment structure of the CPM model is based solely on the number of ad impressions served. The publisher is paid a set fee for each ad impression which is served to a user, regardless of its effectiveness. Under this model, the financial reward mechanism motivates the publisher to focus primarily on only one thing; serving as many ad impressions as possible. Eager to improve their marketing ROI, it didn't take long for advertisers to question the appropriateness of this model.

In the print and television mediums, unlike the online medium, it is very difficult to determine the effectiveness of a particular advertisement; therefore, the CPM model, from a risk

sharing/motivational standpoint, seems to make sense. However, this is not the case within the online setting. In the online medium, immediate post-ad exposure behavior by the user is often easily tracked. For instance, the advertiser and the publisher can normally tell instantaneously if the user clicks on the advertisement, sets up an account with the advertiser, makes a purchase from the advertiser, etc. This behavioral transparency has led many advertisers to question the efficacy of application of the CPM pricing model for the online industry. The belief of many is that, based on the more open, bidirectional flow of information, it may be in everyone's best interest to instead have pricing directly tied to one or more of these user behaviors. As a result, several performance based pricing models such as CPC (cost per click), CPS (cost per sale) and CPA (cost per acquisition) have been developed and are extremely popular. These models are generally considered to provide a more equitable risk sharing relationship.

As a result of the migration towards performance based pricing models, many publishers now find that a large portion of their revenue stream is dictated by the actions of the users. Accordingly, in an effort to maximize revenue, they are eager to increase the probability of occurrence of these targeted actions/behaviors (click, purchase, account set up, etc.). Unfortunately for publishers, estimating a user's affinity for certain products and services can be a very challenging and controversial task. It is safe to assume that users and publishers have a common interest in that most users would also prefer to be exposed to ads for products and services for which they have an interest than to those that they do not. This certainly makes for a more enjoyable surfing experience. The real challenge comes in getting from point A to point B. How does a publisher gain an understanding of a user's interests? Extant literature in this area falls under the umbrella of personalization [12]. Personalization consists of three broad stages: 1. consumer preferences learning, 2. matching consumers with an appropriate offering, and 3. evaluation of such a matching process. Typically the literature on personalized advertisements has focused on segmenting consumers. A logit model was used by Bhatnagar and Papatla [1] to segment customers using their search behavior to present personalized advertisements. Raghu et al. [13] presented a model that dynamically profiles consumers' preferences using the theory of questionnaires. Using simulation they showed that information acquisition and search processes show a nonlinear behavior in information gained. Shahabi and Banaei-Kashani [14] developed a distributed user tracking approach for accurate, scalable, and implicit collection of data. In the specific area of advertisement targeting, users' click streams have been used. Such clickthroughs capture users internet browsing habits in terms of keywords used for search, URL's clicked, time spent on a web page, geographical location of the user, user's browser and so on. Chatterjee et al. [2] used click stream data to develop an analytical approach to modeling consumer response to banner advertisement. They showed that the effect of repeated exposure to a particular banner advertisement is negative and non linear. Karuga et al. [10] developed an algorithm for customizing advertisements by changing content, copy, placement, animation, and other attributes. They used conjoint analysis and genetic algorithms for optimization. Langheinrich et al. [11] assume that every customer has recently entered search keyword(s) into a search engine and that the publisher has access to this list of keywords. They propose a simple iterative method to estimate the probability of click through c_{ij} for each ad/keyword pair based on historical click behavior. Chickering and Heckerman [3] propose a system which maximizes the click through rate given only advertisement frequency quotas. Instead of using keywords, they partition the ad slots into "predictive segments or clusters". Each cluster/ad combination has an associated probability of click through. This is a very promising technique assuming that the keyword data is available. Deane and Pathak [5] propose a framework to analyze the raw html

which makes up a potential customer's recent web click history using WordNet, a lexical database, and several information retrieval techniques. Based on the analysis of this clickstream data, a characteristic array of interests for each user is created and utilized to develop an associated ad targeting strategy. The results are very promising for this technique. In this work, we attempt to build on and improve upon this model by: incorporating the part of speech into our lexical analysis and using artificial intelligence techniques to identify previously undiscovered feature combinations/weights in the data set.

BASE MODEL INTRODUCTION

A primary goal of traditional information retrieval is to select, from a corpus of documents, the subset which is most relevant to a user's stated topics of interest or query. A very powerful and popular method for achieving this task is the Vector Space Model introduced by G. Salton in 1968 [15, 16, 17]. The process begins by transforming the documents and the query into a series of vectors, one vector for each document and one for the query. These vectors are then normalized and fed into a similarity measure to determine the relevance of each document. The power of this process is rooted in its ability to transform the textual aspects of the documents and queries into a series of quantitative representations. The vector space model is a theoretically well-grounded model which is easily interpreted based on its geometric properties. Initially a corpus of 'n' key terms is created based on the contents of the documents and the query. Subsequently for each document and the query, a weight is assigned for every term that appears in this corpus (this weight assignment process is very important and is therefore discussed in much more detail in the following section). This allows for each document and query to be represented as a vector of key term weights in n dimensional space. A query q_j and a document d_k would be represented

as:
$$\vec{q_j} = (w_{1,j}, w_{2,j}, ..., w_{n,j})$$
$$\vec{d_k} = (w_{1,k}, w_{2,k}, ..., w_{n,k})$$

where n is the total number of terms in the collection and $w_{i,k}$ represents the weight which is assigned to the term i for document k. Next, the vector space model evaluates the relative importance of document d_k to query q_j based on the degree of similarity between the two corresponding n dimensional vectors, $\vec{q_j}$ and $\vec{d_k}$ [16]. There are a number of different ways to measure this similarity, but one simple, well grounded similarity measure is the dot product of the two vectors. This technique gives the cosine of the angle θ between the vectors, and can be computed as follows:

$$sim(q_j, d_k) = \frac{\sum_{i=1}^{n} w_{i,j} w_{i,k}}{\sqrt{\sum_{i=1}^{n} (w_{i,j})^2} \sqrt{\sum_{i=1}^{n} (w_{i,k})^2}} \qquad (1)$$

The chosen similarity score, also called the retrieval status value (RSV) is calculated for each document query combination and is used to rank the documents. A document's RSV score is

used as a proxy measure of its relevance for a given query. The documents are ranked based on their RSV score and served to the user in descending order.

Weight Identification

One of the most important steps in the vector space model is finding a good set of index term weights, w_i. The index term weights are responsible for providing an accurate estimation of the relative importance of the keywords within the collection. Without a good set of index term weights, the VSM loses its effectiveness very quickly. In his seminal work on this problem, Sparck-Jones [18] introduced the TF-IDF function which is still the most widely used, and is considered by many to be the most useful, index weighting function. Although many content based features are available within the vector space model that may be used to compute the index term weights, the two that are most common, and the ones that are used in the TF-IDF function are the *term frequency (tf)* and the *inverse document frequency (idf)*. The basic TF-IDF function is as follows:

$$w_{ij} = (tf)_{ij} * \log \frac{N}{df}. \tag{2}$$

The term frequency, tf_{ij}, is calculated by counting the frequency of occurrence of term i in document j. The larger the *tf*, the more important the term is considered to be in describing the document or query. The inverse document frequency is calculated as

$$(idf)_{ij} = \log \frac{N}{df} \tag{3}$$

where N represents the total number of documents in the collection and df represents the total number of documents within which term j appears. The basic intuition behind the *idf* is that a keyword which appears in very few documents is likely to be of greater value in classifying those documents than would be a keyword which appears in all of the documents. The *idf* scores are assigned accordingly. The keyword which appears in every document is assigned an *idf* score of 0 while a keyword appearing in very few documents would receive a much higher *idf* score. By combining the two, the TF-IDF function gives the greatest weight to terms which occur with high frequency within a very small number of documents.

Structural Representation

The traditional VSM considers each document as a simple 'bag of words' leveraging only the resulting textual representation. This method has proven to be very useful and effective, but many researchers including Halasaz [8] hypothesized that there might be additional information which is overlooked by the basic VSM. This additional information is found in the basic structure of the document. The fundamental idea is that the 'location' in a document where a term appears may provide additional information as to how valuable that term may be in developing a characteristic representational vector for the document. Consider the basic structure of an HTML document as an example. An HTML document commonly consists of a series of independent sections such as the *header, keywords, title, body, anchor*, and *abstract*. From a structural representation point of view, a term which appears in the *header* might be

more important than one which appears in the *anchor*. Alternatively, a term which appears in the *body* and in the *anchor* may be more important than one which just appears in the *title*. In the base model, this type of information is incorporated by assigning different weights to different sections of the html document. Several weight distribution combinations were tested in an effort to find an acceptable one. In this work, we will explore the utilization of artificial intelligence techniques (including neural networks) in an effort to identify an improved combination of structural weights.

In the previous section, we describe the potential value of including structural information within the VSM model. Similarly, lexical information may also be very useful. The primary goal of a lexical reference system is to provide its users with word relationships. One such system which incorporates lexical analysis is WordNet. "WordNet is an online lexical reference system whose design is inspired by current psycholinguistic theories of human lexical memory. English nouns, verbs, adjectives and adverbs are organized into synonym sets, each representing one underlying lexical concept. Different relations link the synonym sets [19]." The most basic semantic relation upon which WordNet is built is the synonym [6]. Synsets, or sets of synonyms, form the basic building blocks for the system. For example, *hat* is included in the same synset (also called concepts within this work) with *lid* and *chapeau*. The current version of WordNet, version 2.1, includes 117,597 synsets [19]. The original model pools synonyms together into their respective 'concepts' instead of treating them independently. Researchers have shown that this process of combining synonyms enhances the performance of the traditional vector space model. This is accomplished by expanding the keyword indexing space to include synsets instead of being limited to just the terms. In addition to the utilization of synsets, in this research project, we will explore the power of analyzing the part of speech for each term. The basic intuition being that in the process of analyzing a person's web surfing history, certain parts of speech, such as nouns or pronouns, might be more efficient in identifying that individual's areas of interest. We will test the application of different weights to different parts of speech in an effort to test out this theory.

CONCLUSION

As we previously discussed, in this work we propose to improve upon the base model which was introduced by Deane and Pathak [5] by incorporating the part of speech into our lexical analysis and using artificial intelligence techniques to identify previously undiscovered feature combinations/weights in the data set. We are currently in the development/data collection phase of the project; therefore, we do not have any proven results to support our intuition, but we are very optimistic that the model enhancements will result in substantial efficiency improvements over the previously introduced base model.

REFERENCES

1. Bhatnagar, A., P. Papatla. Identifying locations for targeted advertisements on the Internet. *International Journal of Electronic Commerce, 2001,* 5(3) , 23-44.

2. Chatterjee, P., D.L. Hoffman, and T.P. Novak, Modeling the Clickstream: Implications for Web-Based Advertising Efforts. *Marketing Science*, 2003,**22**(4), 520-541.

3. Chickering, D. and D. Heckerman, Targeted Advertising on the Web with Inventory Management. *Interfaces*, 2003. **33**(5), 71-77.

4. Dawande, M., S. Kumar, and C. Sriskandarajah, Performance Bounds of Algorithms for Scheduling Advertisements On A Web Page. *Journal of Scheduling*, 2003. **6**, 373-393.

5. Deane, J. and P. Pathak, Ontological Analysis of Web Surf History to Maximize the Click-Through Probability of Web Advertisements, working paper.

6. Fellbaum, C., WordNet: An Electronic Lexical Database (MIT Press, 1999).

7. IAB Internet Advertising Revenue Report, http://www.iab.net/media/file/IAB_PwC_2007_full_year.pdf, last accessed 8/2008.

8. Halasaz, F., Reflections on Notecards: Seven Issues for the NExt Generation of Hypermedia Systems. *Communications of the ACM*, 1988.

9. Kessler, M. and B. Acohido, Data Miners Dig a Little Deeper, USA Today (2006).

10. Karuga, G., A. Khraban and S. Nair, AdPalette: An Algorithm for Customizing Online Advertisementson the Fly. *Decision Support Systems*, 2001, **32**, 85-106.

11. Langheinrich, M., A. Nakamura, N. Abe, T. Kamba and Y. Koseki, Unintrusive customization techniques for Web advertising. *Computer Networks*, 1999. **31**, 1259-1272.

12. Murthi, B. and S. Sarkar, The Role of the Management Sciences in Research on Personalization. *Management Science*, 2003, 49(10), 1344-1362.

13. Raghu, T.S., P. Kannan, H. Rao and A. Whinston, Dynamic Profiling of Consumers for Customized Offerings Over the Internet: A Model and Analysis. *Decision Support Systems* 2001, **32**, 117-134.

14. Shahabi, C. and F. Banaei-Kashani, Efficient and Anonymous Web-Usage Mining for Web Personalization. *INFORMS Journal on Computing**, 2003, 15**(2), 123-147.

15. Salton, G. and M.E. Lesk, Computer Evaluation of Indexing and Text Processing. *Journal of the ACM*, 1968. **15**(1), 8-36.

16. Salton, G.B., C., *Automatic Text Processing*. 1989, Reading, MA: Addison Wesley.

17. Salton, G. and C. Buckley, Term Weighting Approaches in Automatic Text Retrieval. *Information Processing and Management*, 1988. **24,** 513-523.

18. Sparck-Jones, K., A Statistical Interpretation of Term Specificity and its Application in Retrieval. *Journal of Documentation*, 1972. **28**(1): p. 11-21.

19. http://wordnet.princeton.edu/

A Strategic Assessment of
The Higher Education Industry:
Applying the Porter's Five Forces for Industry Analysis

Michael A. King, Business Information Technology Department
The R.B. Pamplin College of Business, Virginia Polytechnic Institute and State University
1007 Pamplin Hall, Blacksburg, VA 24061, 540.231.5051, michael.king@vt.edu

A Strategic Assessment of
The Higher Education Industry:
Applying the Porter's Five Forces for Industry Analysis

EXECUTIVE SUMMARY

The higher education industry is changing at a dramatic pace. Numerous trends are at work influencing this rapid change such as, population demographics, work force requirements, global competition and new higher education delivery methods. One additional and fortunate trend is that higher education is a growing industry. Industry incumbents, whether public, private, non-profit, or for-profit must constantly scan the competitive horizon for positive as well as negative structural changes to the industry. Michael Porter, a professor from the Harvard Business School, developed a very powerful industry analysis framework in the late 1970s and the key principles are introduced. The intent of this paper is to introduce these strategic concepts to the non-profit higher education segment, who can then utilize them in competitive strategy formulation and long term planning, If done successfully, the analysis could greatly strengthen the non-profit segment position especially in respect to the prosperous for-profit sector of the higher education industry.

Keywords: higher education industry, for-profit higher education, non-profit universities, higher education trends, Porter's Five Forces, business strategy.

An Illustrative Education Story

Carol Keese graduated from the University of Virginia, with a B.S. in Business Administration from the McIntire School of Commerce. In the following years, she worked for several large publicly held companies in their investor relations departments, putting her marketing education and skills to work. Working for these well-recognized companies, she gained self-confidence and extensive experience in marketing and advertising.

She eventually made the decision to acknowledge her latent entrepreneurial dreams and goals, opened, and successfully managed her own marketing firm for over five years. "I was quite proud of the fact that we ran for five years, and made money, because most businesses fail within two years," Carol indicated. She also added that it was very difficult at times being a small business and competing against the large agencies, "but it was exciting learning business from the real world business school."

As the years passed, Carol noticed other personal goals starting to compete for her time and energy. "Family, life balance, income predictability and additional education goals started to cloud my managerial vision," Carol said. The excitement and unpredictability of being an entrepreneur was beginning to wane. Carol laughed, "the challenge of making payroll each Friday had become almost drudgery." She was 35 at this personal nexus and it was time to make some career changes that were complimentary with her life goals.

Carol went back to her undergraduate alma mater where she accepted a marketing position in the department of strategic marketing for the University of Virginia Health Systems. "It actually felt good working back on the client side after so more years," Carol explained. At this point, she has worked in the department for over seven years and was originally hired because she had worn so "many hats at her own business." She accepted an increasing progression of responsibility and today is the director of strategic marketing within the department. "I wanted to leverage my real world experience in the strategic marketing department, which I have done, and have been successful. But also I noticed that I was not getting all the credit." What Carol meant was she was being "overlooked" at times due to the fact she did not have a Masters in Business Administration. She described being very frustrated at times, because she had extensive real world experience, but not the seemingly prerequisite academic credentials.

Carol began researching and evaluating graduate business schools. The University of Virginia has one of the top ranked business schools in the United States and she would most certainly been accepted based on her business background and her undergraduate degree from the University of Virginia. Carol pointed out that, "at the time, I had an extensive list of constraints about going back to school. UVA was a full time program and that just wouldn't work." Carol detailed the following constraints:

- No overnight travel because of new family responsibilities
- No moving
- No executive format
- No campus stay requirements

Carol maintained that most of all she needed flexibility with a program. Carol and her husband had a new born, and the responsibilities of parenthood were her top priority. A forced time restricted curriculum, even limited travel and leaving her career were not negotiable items as relating to education pursuits.

Carol continued her research and came across a U.S. News and Reporting article ranking for-profit and online business schools (http://www.usnews.com). The article discussed course content delivery options (such as complete online, or partial on campus), student satisfaction ratings, job placement services, and program costs. She was able to narrow down her search to an MBA program offered by the University of Phoenix. Although Carol was essentially searching for a completely online program, she was impressed by the fact that the MBA program offered by the University of Phoenix did have live classes she could visit if she wanted. This opportunity is possible because the University of Phoenix academic administration centrally designs and tightly controls the course curriculum, which provides consistency at any class location. Capella University was a close runner up despite the fact that, Carol was surrounded by excellent non-profit schools such as James Madison, Virginia Commonwealth and the University of Richmond.

Carol's selection criteria for university options that met her previously described attendance constraints were:

- A proven online course delivery system

- Team based learning and project development
- Applied problem solving opportunities
- Small class sizes
- Standard MBA curriculum

Later she discovered additional benefits including a lock step program with courses taken one at a time, older adult students, 24/7 class availability, and actual real time class participation provided by a propriety collaboration system. The complete program tuition of $35,000 was half what the University of Virginia's MBA program costs. For-profit universities do structure their tuition at a strategic price point, between the cost of a private college degree and the cost of receiving a graduate degree from a public university. "The decision all came down to a cost-time tradeoff. I was not going to Wall Street so why did I need a degree from a big name school," Carol explained. She graduated from the University of Phoenix in 27 months and has continued to succeed and prosper in the business environment.

Current Impressions of the Higher Education Industry

The Carol Keese story is an example of current trends prevalent within the higher education industry. It is common knowledge that demand for higher education has increased significantly over the last decade. There is a Baby Boom Bubble in progress. The Baby Boomer's children are now going to college, along with a greater diversity of students including adults, women, part-time students, commuters, international students and minorities such as Hispanics and Afro-Americans. These demographics have pushed demand for public higher education beyond most practical capacity limits (Stamats, Inc., 2007). New information technologies, outsourcing pressures, and specific skill set deficient, all contribute this rising demand (Shareowners, 2004). The for-profit sector has noticed these trends and marketed to individual such as Carol Keese, seeing very profitable growth opportunities targeting adults, women and part-time students. An additional interesting observation that is somewhat masked, is a trend of declining enrollment in full time residential undergraduate and graduate programs (Breneman, D., et. al., 2006).

These trends, on the surface, might sound contradictory to the casual observer. How can residential or traditional student enrollment be decreasing while total demand for higher education has outpaced supply? The for-profit sector has recognized these market changes and developed business strategies to take advantage of them, by offering numerous programs targeted at profitable niche markets. This increases supply, but concurrently, small private liberal arts colleges are closing their doors at an alarming rate, decreasing supply and leaving the public universities to act as a supplier of last resort (Van der Werf, M., 1999). One could argue that non-profit universities are keenly aware of these trends and have formally incorporated them into their long range planning, but are not changing their current business models and marketing strategies. Why you may ask? They do not have to, because they are "producing" at capacity.

Laureate Education, Inc. (www.laureate-inc.com), a leading for-profit provider of higher education, predicts all industry members stand to gain over the long run because demand for higher education will continue to increase. Laureate bases their prediction on a growing youth population, a growing middle class that understands that education is the key to social mobility, and global industry's demand for a technically educated work force. Following that same line of thought, Richard S. Ruch, says in his book, Higher Ed, Inc., "the combination of public and

corporate dissatisfaction with traditional education, favorable demographic trends, and the infusion of a new kind of endowment – private investment capital – into the for-profit segment suggests that the for-profits will probably continue to take an increasing share of the education market" (Ruch, 2001).

Higher Education Industry Definitions

Any analysis of an industry requires a description, with specific attributes, of its participants or members. Possibly the key distinction within the higher education industry is whether a university, college or other organization is a non-profit entity or a for-profit corporation. Nevertheless, what do these terms actually mean? In the rapidly changing academic environment, these lines of distinction between non-profits and for-profits are increasingly blurred. According to Ruch, "the difference between for-profit and non-profit higher education will eventually become so indistinct as to be largely meaningless to all but tax accountants" (Ruch, 2001). For example, a controversial trend is public universities' declining reliance on state allocated support. Over the last several years, the percentage of University of Virginia's annual budget consisting of state appropriations has dropped from 28 percent to 8 percent. According to a survey developed and managed by the Economist magazine, one university president was quoted as saying, "his university has evolved from being a state institution to being state supported, then state assisted, next state located and now state annoyed" (The Economist, 2005).

One effective method to defining an object or entity, with the goal of making the distinctions easier to understand, is to compare and to contrast. The Futures Project conducted by Brown University provides an excellent delineation of seven distinct functions or purposes of a non-profit university and argues that these public purposes should be incorporated into these organizations' mission (Couturier, 2005). The Futures Project describes these functions as:

- Providing social mobility to students, faculty, employees, as well as the community
- Providing high quality teaching and learning
- Providing higher education in an efficient and value conscious process
- Conducting basic and applied research and scholarship in numerous fields
- Providing community outreach services to distribute knowledge and skills
- Providing assessable forums for open and equal debates
- Providing assistance and support to K-12 teaching and administrative curriculums

These are certainly admirable goals but in some respects, there is a risk the public could construe them as overly conceptual and abstract. Fortunately, the Futures Project anticipated this possible reaction and included metrics that are the observable results from the specific research constructs. For example, social mobility could be measured by direct access to higher education, which in turn is the result of adequate financial aid, diversity ratios, and graduation attainment percentages. Teaching quality could be evaluated by accreditation board assessments, course surveys, achieved learning objectives and the growth in the use of new instructional technologies. Lastly, financial efficiency metrics, tuition level trends, and aggregate public allocation as a percentage of budget, are examples of higher education fiscal measurements.

As a comparison, for-profit universities and colleges do provide social mobility, a quality

education product and follow efficient operating practices. However, they do not engage in the remaining four public functions. Generally, for-profit higher education institutions employ adjunct faculty to teach classes and contract these academic professionals on an as needed basis. Scholarship and research are not part of these adjunct faculty members' job description. Community outreach, public forums, and most certainly K-12 education support, are far from the for-profit sector's corporate mission.

Strategic Industry Analysis

Now that specific distinctions between for-profit and non-profit higher education segments have been described, it is important for the non-profit sector to acknowledge the reality that publicly traded or privately held for-profit higher education organizations are now mature, rationalized industry participants. Conducting a strategic industry analysis is a revealing method in understanding the mission and motivations underlying the for-profit sector and can result in additional industry insight. A classic business tool and probably the mostly widely used framework for strategic industry analysis is commonly known as Porter's Five Forces. The framework is based on Michael Porter's seminal work published in 1976 and recently updated in January 2008 (Porter, 2008). An industry member or security analyst, utilizing this framework, can model an industry with five controlling economic processes:

- Degree of industry rivalry and competitive intensity
- Barriers to entry into the industry
- Threats of available product or service substitutes
- Degree of buyer power to negotiate
- Degree of supplier power to negotiate
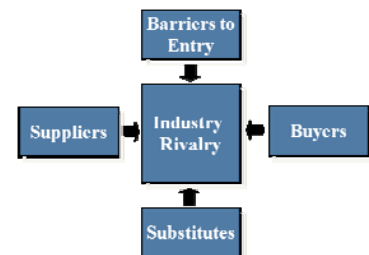
Although there are numerous facets associated with each industry force, for the sake of brevity I will illustrate each force by discussing only three characteristic factors.

Degree of Industry Rivalry

The following industry characteristics determine or at least influence the degree of rivalry between incumbent firms:
- Industry concentration: As the number of firms within an industry increases, competition and rivalry among these firms also increases as a result of protecting or to growing market share.
- Cost structure of the industry: An industry characterized by a high fixed cost structure requires firms to produce at maximum levels to obtain the lowest unit cost per product or service. Of course, firms must sell these large product inventories, which in turn increase competitive intensity.
- Market growth rate: In a slow growing or mature market, firms compete head to head for each tenth of a percent of market share. In comparison, in a rapidly growing market, revenue grows as a tangential effect of overall market growth.

Barriers to Entry

Barriers to entry act as protection for incumbent firms and operate by reducing the rate of new entrants. Typical barriers to entry are:
- Patents, proprietary processes and knowledge: A competitive advantage is encouraged by,

public policy and the enforcement of patent and copyright laws by the United State government.

- Government policy: Government often enforces policies that preserve and increase market place competition, but at times makes exceptions in the publics' best interest, to allow or mandate certain monopolies. Classic examples of government-sanctioned monopolies are utilities, cable TV franchises, and the United States Postal Service.
- Economies of scale: In most industries, there exists a minimum level of production that achieves the optimal cost efficiencies for that industry. The higher the level of minimum efficient production, the more difficult it is for new entrants to reach that specific production level. It is quite possible that new entrants will never reach this crucial economic level of production and leave the industry (Porter, 2008).

Threat of Product or Service Substitution

The existence of economic substitutions highly associated with the availability and competitive effect of products or services from other industries on the demand of incumbent products and services. The number of economic substitutes influences competition by:

- The availability of price-performance alternatives: The existence of products and services that are functionally equivalent increases consumer selection options thereby weakening any competitive advantage accruing to an incumbent firm.
- Switching cost associated with other products and services: If switching costs, such as relearning costs, termination fees, installation fees, and obsolete inventory costs are high, consumers will be less motivated to change to a new product or service.
- Buyer's propensity to substitute: The existence of generic alternatives as well as product for product proxies influences a consumer's propensity to substitute. Personality traits, demographics, and cultural value are additional predictive variables (Walker, 2004).

Degree of Buyer Power

The aggregate buyer power within an industry is the extent of impact and the level of negotiation this group has over an industry. Industry members can measure buyer power by:

- Buyer concentration: Buyer power is high when this group is concentrated and it represents a majority market share.
- Available information: The more well informed consumers are the more asymmetrical control they will have in any given exchange.
- Standardization of products: If an incumbent firm supplies a generic or commodity product or service, buyer power is higher relative to other industries. Conversely, if unique features and benefits differentiate the incumbent firm's products or services, buyer power will be much lower.

Degree of Supplier Power

Operating on the opposing side of the economic power scale from buyer power, supplier power is the amount of impact the group has on an industry and characterized by:

- Supplier concentration: Suppliers will have greater control and power when there are many buyers and few dominate suppliers.
- Threat of forward integration: Although usually difficult, suppliers can increase their influence over an industry by vertically integrating and competing directly at the retail level adjacent to their existing buyers.

- Supplier importance to the industry: When the incumbent industry members are not essential customers of the supplier, then supplier power will be higher relative to other industries.

Applying Porter's Five Forces

Although probably one of the most widely taught frameworks for industry analysis, Porter's Five Forces still rarely leaves the business school domain and thus the need for the rather lengthy discussion. Each of the five forces will be applied to the specifics of the higher education industry.

Degree of Industry Rivalry

The U.S. higher education industry includes approximately 4000 degree granting colleges and universities. The adjacent pie chart illustrates the industry breakdown by sector. Although, higher education may appear fragmented with over 4000 competing entities, the industry is actually quite concentrated due to over 50 percent of the approximately 17.7 million students being enrolled in only 400 of these colleges or universities. The resulting consequence of this enrollment pattern is that 10 percent of the industry has over 50 percent of the market share (Hoovers, 2008).

The US Higher Education Industry

Private, 43% — For-profit, 15% — Public, 42%
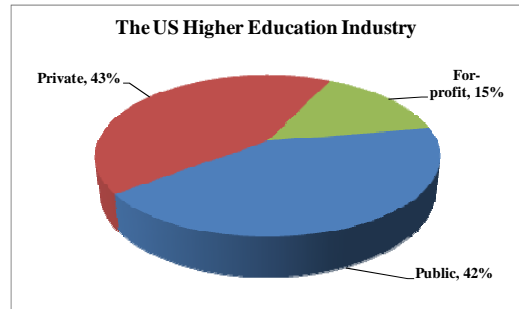
In 2007, the industry's combined revenue was approximately $200 billion (Hoovers, 2008). Although the for-profit sector only earned $13 billion, this sector represents the fastest growing segment of higher education and revenues for the top 10 for-profit universities are predicted to double over the next five years (Gallagher, 2004). This growth trend appears to be long term and predictable, with 17.7 million students currently enrolled in U.S. universities, and projected to grow to 19.5 million by 2014 (Gilde, 2007). As demand for higher education escalates, state supported universities and community colleges will most likely cap enrollments with the for-profit sector quickly responding to the increased demand with a corresponding increase in supply. The for-profit segment is much more flexible, agile to market conditions, and eager to accept change than the traditional state supported universities, essentially due to its governance structure (Ruch, 2001).

Generally, organizations within the higher education industry have an exceedingly high fixed cost to total cost ratio. This financial structure requires these organizations to operate at full or near capacity, as measured by enrollment, to have a chance of realizing competitive economies of scale. The for-profit segment is an exception here. Most of these organizations lease classroom space, do not provide residential accommodations, have limited library resources, and do not provide tenure tracks for faculty employees, so consequently, have substantially lower fixed costs.

Degree of Industry Rivalry Assessment

The higher education industry has a high fixed cost ratio and is effectively concentrated, which makes competitive rivalry predictably high. To some extent, the benefits of being a growth industry offset the high degree of rivalry. Overall rivalry is mitigated because large non-

profit universities have capacity enrollments, and are content seeing for-profit colleges satisfy growing demand by targeting niche markets. An overall competitive rivalry assessment is moderate.

Barriers to Entry

Public universities and colleges are usually very large organizations with extensive administrative operations, pervasive facilities and grounds, invaluable brands and a alumni base that can have a legacy well over a hundred years old. These characteristics, the capital and endowments required to support these long-term assets, including land grant entitlements, almost per se define large economies of scale, which certainly represent formidable barriers to entry. Federal and state governments also regulate the establishment of publicly supported schools based on policy needs and budget constraints.

While public sources of student loans continue to decline, one unintended consequence is mounting barriers to entry as related to the for-profit sector. Approximately 93 percent of for-profit institutions' cash flow consists of tuition and fees. The crucial point is 64 percent of the tuition and fees consist of federally backed student loans. Please review Exhibit 1 in the appendix for details. As the federal backed student loan industry continues to spiral towards crisis, for-profit higher education firms have noticed weaker earnings, sporadic enrollment drops, and falling stock prices, all of which signal extreme caution to any potential new entrant (Value Line, 2008).

An additional barrier to entry, although tangential, is the existence of intellectual property and technology transfer offices within most university systems. These offices protect and monetize university research, which represents addition cash flow, and benefit from existing economies of scale and departmental synergies.

Probably one of the most controversial barriers to entry into specific areas of higher education is the requirements and restrictions imposed by accrediting associations. These organizations, while promoting curriculum standards, affinity group branding and visible education outcome metrics, also cleverly protect the incumbent members with an "accredited by" license. The success and reputations of business schools, medical colleges and law schools are critically interwoven with certification and accreditation (see www.aacsb.edu for example). Surprisingly, incumbent universities control most accreditation boards. An example of the control that an industry managed accreditation board has is where the Association to Advance Collegiate Schools of Business, the most influential business school accreditation board, will not accredit the business school of the University of Phoenix.

Barriers to Entry Assessment

A high fixed cost structure, extensive federal and state regulation, enormous economies of scale and restrictive curriculum accrediting processes, all act as higher barriers to entry and serve the incumbent schools well by protecting their current market shares.

Threat of Product or Service Substitution

At first, one may think that the options or alternatives related to earning a college degree or obtaining additional higher education would be constrained by location, level of income or

possibly cultural influences. Although possibly true 20 years ago, these limitations to higher education are significantly less relevant today. At present, the variety of educational "products" is extensive and continues to increase as influenced by the exponential advances in information technology. Classic economic theory classifies information technology as product compliment, because the existence of the product or service augments the features and benefits of an incumbent's product offering (Walker, 2004).

An additional economic process that measures the threat of substitution is the availability of price-performing product alternatives. As an example, most state supported universities within a specific state have similar tuition rates and largely, the state tuition structure is equivalent for potential students. Thus, it essentially costs the same to attend Virginia Polytechnic Institute and State University as to attend the University of Virginia. Potential students or even transfer students could view these two universities as proxies (Heaven forbid!).

Switching costs between products and services are a concrete aspect of the abstract concept of product substitution. As an example, the process of transferring between universities or colleges is relatively fluid within the United States. More specifically, moving between one business school and another is an example where the tangible and intangible switching costs are low because of the availability of compatible curriculums. Obviously, one could get caught in the details of transfer credits, course descriptions, and degree requirements, but as compared to the cumbersome tasks of transferring to a new school in the EU (the positive benefits of the Bologna Process aside), U.S. students probably only have a slight emotional cost involved.

Not to over generalizing but, younger adults are more disposed to change than older adults. Youth brings out the attitude of "what do I have to lose" as contrasted to the "anchors of age" associated with older adults. It is not a stretch to conclude that younger adults have a higher propensity to substitute than older adults do, within the same population of higher education students. Of course, these examples are hypothetical and best measured by transfer rates and graduation rates.

Threat of Product or Service Substitution Assessment
There are an estimated 4000 universities and colleges in the United States and that quantity alone would arguably indicate a wide variety of higher education options. Although the majority of students attend only 10 percent of the schools, it can be argued that the selection opportunities are high. This is in stark contrast to rapidly growing Middle Eastern countries where perhaps there is only one viable public or private university. Capacity limits and escalating admissions requirements do to some extent decrease the available alternatives.

Price points widely differ between the public, private and for-profit higher education segments. For-profit universities deliberately price their degree programs between the public and private tuition schedules. In economic terms, the for-profit sector overall, prices at the price elastic point of the higher education demand curve. However, this strategy does have some weaknesses, including the unintended consequence of effectively minimizing switching cost between a public university and a for-profit institution. In addition, since for-profit tuitions are high relative to public universities, the student is already price conditioned which makes transferring to a more expensive private school a realistic option. The overall assessment of the

threat to substitute is high and not beneficial to the industry incumbent.

Degree of Buyer Power

With roughly 17.5 million currently enrolled students in higher education institutions in the United States, without any specific target groups representing a majority market share, buyers are fragmented and diffused across the market. This buyer characteristic limits the effective power any one specific student may have in terms of negotiating tuition rates, admission requirements and other amenities. There is one acceptation to this observation. Public and private universities are targeting and aggressively recruiting the standout 15-25 percent of high school classes with the predictable, but unintended consequence of giving this market segment generous power to choose their options and to negotiate (Symonds, 2003).

In today's information age, the contents of an undergraduate record of course descriptions is only a mouse click away. School search and evaluation data is a frictionless, symmetrical and essentially free process. Of course, this not was always the case. Twenty years ago, a high school student had to patiently wait weeks to receive an university record by mail to assist with college evaluations. It is axiomatic that the more information a buyer has, the more balanced the transaction or exchange will be.

Two additional components that influence the degree of buyer power are the rate of growth for the specific industry and the strategic value of the buyer to the industry as a whole. A growing market diminishes buyer power relative to a market with an average growth rate and along that same argument, the more distributed buyers are over a given geographic location, the less power they accrue (Walker, 2004).

Degree of Buyer Power Assessment

Buyers are widely fragmented across the market and in general, these potential students have limited influence on the higher education industry. As discussed previously, this observation does not hold for the top 25 percent of high school seniors graduating from the most respected high schools across the United States. Universities, whether public or private, feverishly recruit this target market in anticipation of sustaining high SAT, GPA admission averages, and consistent graduation rates, all of which enhance and distinguish their brand. In contrast, the for-profit sector heavily recruits from the underserved inter-quartile of graduating seniors and is generously rewarded for its efforts (Symonds, 2003).

The role of freely available and instantaneous information relating to course descriptions, college amenities, and school rankings most certainly shifts the information asymmetries of a generation ago, giving potential students more power of choice. This shift, to a degree, offsets the effect of market fragmentation and consequently gives buyer power an overall neutral assessment.

Degree of Supplier Power

The degrees of supplier concentration and supplier importance, in respect to the higher education industry are essentially the same side of the economic coin. If there are few suppliers to an industry and these suppliers sell an essential component or service to the industry, then supplier power will be high relative to other industries. A classic example of this principle is the

clout and influence Intel has over the personal computer manufacturing industry. There are effectively only two CPU manufacturers supplying the most important component to the industry. Within the higher education industry, there are numerous suppliers of a variety of products and services, fragmented across the industry. Even highly regarded textbook publishers, clamor for faculty time and compete for each text approval and unit sold.

Degree of Supplier Power Assessment

Universities and colleges frequently represent large stable contracts to vendors, so the ensuing competition for bids among these vendors is typically frenzied. Based on the observation of numerous vendors selling essentially generic products and services, and low motivation by these suppliers to vertically integrate into higher education "delivery," suppliers' ability to influence the industry is low.

An Overall Higher Education Industry Assessment

From the perspective of a higher education industry incumbent, a synthesis of Porter's Five Forces is invaluable in gaining and maintaining an overall strategic plan. The analysis helps managers have a wider competitive horizon than a day-to-day myopic operational outlook. According to Michael Porter, "the extended rivalry that results from all five forces defines an industry's structure and shapes the nature of competitive interaction within an industry" (Porter, 2008). Industry outsiders, attempting to determine the probabilities of a successful move into the industry, can also use this synthesis.

As illustrated in the adjacent diagram, industry rivalry is moderate meaning it represents a worry or nuisance to industry members. This moderate assessment is the result of the tradeoff between the disadvantages of industry fragmentation with the accruing benefits of a growth industry. The barriers to entry such as high capital and high fixed cost are quite high and act as the strongest protecting force for the higher education industry. Low supplier power, based on low concentration and fragmentation, is also beneficial to industry incumbents. The threat of substitution is high with numerous forms of higher education and from the incumbent's perspective, it probably represents the most adversarial force to incumbents. Buyer power is neutral, which on the surface appears to be relatively benign, but buyer power is growing at a much higher rate as compared to the remaining competitive forces and over the long term will probably become the most threatening economic force for incumbents to monitor.
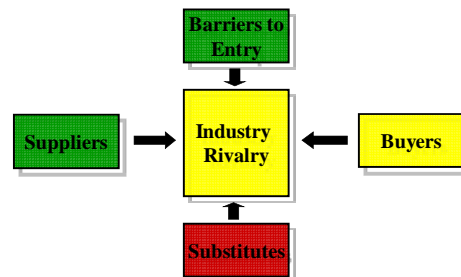
From the preceding industry analysis, based on the Porter's Five Force framework, the overall assessment of the higher education industry for both the incumbents and potential entrants is neutral. While the overall higher education industry analysis may seem ambiguous and not of standout significance, by being in the middle of the competitive road, most industry strategist would argue that industries with a neutral competitive assessment represent some of the greatest challenges to managers. There are no clear road signs to follow while navigating the ever changing direction to sustainability and profits.

Appendix:

Exhibit 1:

DIFFERENCES IN REVENUES AND SPENDING

How income sources and spending vary among nonprofit and for-profit four-year colleges as a proportion of their overall budget.

NOTE: Samuel C. Wood developed this chart for a class at Stanford U. using data on four-year colleges supplied by the institutions to the U.S. Department of Education, from corporate reports of higher-education companies, from various analyses of nonprofit and for-profit colleges conducted by consulting companies and Wall Street analysts, and from interviews with people in the industry. The model excludes revenues and expenses related to hospitals, and auxiliary services like housing and dining.

Exhibit 2:

Profitability of Selected U.S. Industries
ROIC

Industry	ROIC
	40.9%
Prepackage Software	37.6%
	37.6%
Pharmaceuticals	31.7%
	28.6%
Adverting Agencies	27.3%
	26.4%
Semiconductors	21.3%
	21.0%
Higher Education	20.5%
	19.5%
Men's Clothing	19.5%
	19.2%
Malted Beverages	19.0%
	17.6%
Household Furniture	17.0%
	16.5%
Grocery Stores	16.0%
	15.6%
Snack Food and Cookies	15.4%
	15.0%
Wine and Brandy	13.9%
	13.8%
Engines and Turbines	13.7%
	13.4%
Book Publishers	13.4%
	12.6%
Soft Drink Bottlers	11.7%
	10.5%
Hotel Accommodations	10.4%
	5.9%
Catalog and Mail Order	5.9%

Source: Standard and Poor's, Hoovers, and Porters, 2008 (see references)

Exhibit 3:

The Top For-Profit Higher Education Companies:

Company Name	2007 Revenues	Market Cap	1 Year Sales Growth	Brands
Apollo Group, Inc.	$2,723.8 M	$8,202.0 M	9.9 %	University of Phoenix
DeVry, Inc.	$933.5 M	$3,371.8 M	10.7 %	DeVry, Ross University
Corinthian Colleges, Inc.	$933.2 M	$760.4 M	(3.5 %)	Everest Univ., WyoTech
ITT Education Services, Inc.	$869.5 M	$2,301.4 M	14.7 %	ITT Technical Institute
Strayer Education, Inc.	$318.0 M	$2,580.0 M	20.6 %	Strayer University

Source: Hoover's, Inc.

References:

Acito, F., McDougall, P.M., et al. (2008). "One Hundred Years of Excellence in Business Education: What Have We Learned?" Business Horizons **51**(1): 5.

Altucher, J. (2007). "Why Investing in Education Should Pay Off." Financial Times**:** 8.

Breneman, D., Pusser, D., Turner, S.E. (2006). Earnings From Learning: The Rise of the For-Profit Universities. Albany, State University of New York Press.

Editors (2004). "For-Profit, Post-Secondary Education: Industry Trends." Shareowner **17**(6): 7.

Editors (2005). Survey: Higher Ed Inc. The Economist. **376:** 19.

Gallagher, S. (2004). "Futurespeak: Solutions for Evolving Consumer Needs." American Demographics 26(1): 44.

Gilde, C. (2007). Higher Education, Open for Business. New York, Lexington Press.

Hoovers (2008). "Company and Industry Analysis." Retrieved March, 2008, Web Site: www.hoovers.com.

Levine, A. (2005). "All That Glitters." EDUCAUSE Review. **40:** 8.

Porter, M. E. (1996). "What is Strategy?" Harvard Business Review **74**(6): 61.

Porter, M. E. (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York, Free Press.

Porter, M. E. (1996). "What is Strategy?" Harvard Business Review **74**(6): 61.

Porter, M. E. (2008). "The Five Competitive Forces That Shape Strategy." Harvard Business Review **86**(1): 78.

Pusser, B. and D. J. Doane (2001). "Public Purpose and Private Enterprise." Change **33**(5): 18.

Ruch, R.S. (2001). Higher Ed, Inc. Baltimore, The John Hopkins University Press.

Stamati, T., P. Kanellis, et al. (2005). "Challenges of Complex Information Technology Projects: The MAC Initiative." Journal of Cases on Information Technology **7**(4): 46.

Symonds, W. C. (2003). "Cash-Cow Universities: For-profits are Growing Fast and Making Money. Do students get what they pay for?" Business Week (3858): 70.

Value Line (2008). "Educational Services." Value Line Publishing February, 2008: 1577.

Van der Werf, M. (1999). "The Precarious Balancing Act of Small Liberal Arts Colleges." The Chronicle of Higher Education 1999: July 32-33.

Walker, G. (2004). Modern Competitive Strategy. Boston, McGraw Hill Irwin.

PRACTICAL EXAMPLES OF SUPPLY CHAIN APPLICATIONS USING A DISTRIBUTION SIMULATION LABORATORY

Samir Khoury
Dept of Technology Systems
East Carolina University
Greenville, NC 27858
252.328.9644
khourys@ecu.edu

Leslie Pagliari
Dept of Technology Systems
East Carolina University
Greenville, NC 27858
252.328.9663
pagliaril@ecu.edu

Mark Angolia
Dept of Technology Systems
East Carolina University
Greenville, NC 27858
252.737.1036
angoliam@ecu.edu

ABSTRACT

Teaching supply chain applications can be very challenging for students to understand if real world examples are not used. At East Carolina University, a Distribution Simulation Laboratory has been designed in order to teach students the concepts in supply chain with real world experiences. This paper will provide detailed examples of some of the practices and software packages used within this program.

INTRODUCTION

There are several benefits to ensuring students receive real world experience in business processes, current technology, and supervision, while pursuing a degree in their chosen field of study. One benefit of gaining real world experience is they are more prepared to handle business problems and opportunities [1]. Another benefit realized from real world experience is that students become more marketable. Employers are looking for students that can adapt quickly to their work environment. As Fedorowicz, Gelinas, Usoff, and Hachey [3, p.235] point out, "it is especially difficult for a newly minted graduate to grasp even more complex inter-organizational supply chains and information flows," if the graduate was not exposed to actual business processes.

To ensure students are gaining real world experience in business processes, current technology, and supervision techniques, the undergraduate degree in Distribution and Logistics at East Carolina University created a distribution simulation laboratory. This laboratory environment replicates an actual distribution warehouse with approximately 200 different stock keeping units on hand. Students utilize a variety of material handling equipment to manipulate stock, while performing structured and detailed labs. This laboratory is used currently in 2 classes, and will be expanded in the near future.

LABORATORY EXAMPLES

In the Warehousing and Materials Handling course, students are required to complete a total of thirteen (13) labs. In each of these labs students perform real world tasks. Each lab assignment includes a discussion of the concepts, required deliverables, objectives, safety procedures, and step-by-step procedures to complete. In order to ensure success of each lab, students are divided into groups and assigned different roles for each of the thirteen (13) labs. These labs were

created by the course owner, Mr. Mark Angolia, a faculty member at East Carolina University in the Distribution and Logistics program.

Students are rotated through the following roles throughout the labs to expose them to all facets of their role and the tasks involved in each role.

- warehouse manager
- warehouse supervisor
- order picker
- auditor

A fundamental purpose of the labs is to expose the students to various order picking scenarios and Key Performance Indicators (KPIs) to provide a basis for operational improvement outside of academia. Students do hands on work in labs titled "Single Order Picking", "Batch Order Picking" and "Zone Order Picking". In each lab, a warehouse manager is utilized to control operations, while other students prepare shipments of each item picked. Students pick the same sequence of simulated orders, collecting statistics on time, order fill rate and order accuracy.

The labs were developed so students begin to examine differences between high and low volume distribution centers, customer order profiles, order picking statistics, labor management, warehouse layout, and to develop ways to improve the process. Data analysis using excel is required for each lab.

The Enterprise Resource Planning (ERP) software chosen to upgrade the labs in the coming year is SAP. This was chosen since it is one of the most widely used ERP software packages in the world [4]. The introduction of SAP into the simulation lab is intended to integrate the SAP "Sales and Distribution" and "Materials Management" modules with lab. A development plan has been designed and introduction of SAP will be piloted in the spring of 2009. The goals are to allow integration with the 3 previously mentioned order picking labs, and to upgrade the existing labs on "Physical Inventory" and "Cycle Counting". Full testing of SAP will not occur until fall 2009.

SAP is currently being implemented within the Distribution and Logistics degree program through a phased-in approach. Currently there are two courses implementing the SAP system. They are the Warehousing and Material Handling and Special Topics in Distribution and Logistics courses. The SAP graphical user interface was acquired after the degree program joined the SAP University Alliance (UA) program in the summer of 2008.

COURSES USING SAP

Currently, the Special Topics in Distribution and Logistics course is serving as a pilot for the ERP for Distributors course that will run in the spring of 2009. This course is being utilized to help develop a plan for implementation into the ERP course as well as other courses within the degree program that will utilize SAP.

The ERP for Distributors course will expose students to a variety of ERP processes while enabling students to manage a well-known ERP software package. The course is currently being

modified to allow students to manage a variety of ERP and business processes using a fictitious organization developed by the SAP UA program, called Global Bike.

Every lab developed for Global Bike allows students to complete practical exercises through a step-by-step approach. As Hayen and Cappel [4] point out, the SAP UA program has been successful in similar degree program integrations. Furthermore, in a survey conducted by Rosemann and Maurizio [8] of 714 university students from eight (8) different countries resulted in positive feedback, where the majority of students indicated they were pleased with their program of study. The majority of these students felt the SAP training made them more appealing to hiring managers.

Plans are currently underway to incorporate the SAP UA program into several more courses within the Distribution and Logistics degree program. In order to further strengthen the SAP UA program within the Distribution and Logistics program and to expose more students to real world applications that are currently in use in today's industry, students and faculty from other degree programs have been invited to participate in the program. This integration will begin in the spring of 2010 once the Distribution and Logistics program faculty are well-trained and student migration can begin.

Since ERP systems span all facets of the organization such as sales, accounting, human resources, and logistics, integration of an ERP system in a variety of courses will expose students to an ERP system they may have to use after graduation [8]. Integrating SAP, the Global Bike exercises, as well as the warehouse simulation lab will provide students many of the benefits Léger [7] identified in a similar implementation and subsequent study.

ADDITIONAL IMPLEMENTATIONS IN THE SIMULATION LAB

Other labs expose students to hardware and technology used in the distribution industry. Examples of these are bar coding and Radio Frequency Identification (RFID).

Students generate bar codes in different symbologies and test multiple "X" dimensions and mil size to get an understanding of readability and read range. The software "BarTender 9.0" is used to create common industry bar codes such as Code 39, Code 128 and Interleaved 2 of 5. Students design their own label and then use the lab SKUs to create actual bar codes using the Zebra bar code printer. PowerScan bar code scanners are used for testing and comparison which helps students understand the practicalities and limitation of long range scanning from material handling equipment such as fork lifts.

Another important technology students are exposed to in the warehousing simulation lab is Radio Frequency Identification (RFID). As Bottani [2] points out, RFID is still in its infancy stage, but is expected to become a popular method of product identification. RFID has been embraced by retail chains, such as Wal-Mart, and government agencies, such as the Department of Defense [10].

Passive RFID tags and hardware from Alien Technologies are also demonstrated. Labs are used to explain and demonstrate the basic technology of RFID. In addition, students conduct practical

experiments to test read range, interference, reliability and repeatability of this emerging technology. A portion of the lab SKUs are tagged with RFID and experiments run using various packaging materials, tag orientation, tag density, and conveyor speed to study the effectiveness of the RFID reader and antennas location/configuration.

It is imperative that students are exposed to RFID technology, since RFID adds additional benefits to product identification beyond those available in standard barcode technology. RFID tags are able to store much more detailed information such as product descriptions, units of issue, manufacture dates, and even diagrams [5].

Another significant benefit of RFID is that RFID readers do not require line-of-sight to read tags [6]. Since line-of-sight is not required, tags can be read as products enter or leave a warehouse. Tags can also be read as they pass RFID readers along major highways. RFID technology allows the tracking of product movement, well beyond what is possible with standard barcode. In fact, an RFID tagged product "can be easily tracked from beginning to end of a supply chain" [9, p.61].

To further students' exposure to real world experiences, the warehouse simulation lab was equipped with material handling equipment such as hand trucks, a flexible skate wheel conveyor, and a Yale narrow aisle reach truck. Since safety requirements prevent students from operating the forklift within the lab, students observe several forklift demonstrations provided by trained and certified instructors.

Since many of the labs students perform mimic actual warehousing and distribution functions, students learn first-hand how to complete warehouse tasks within various roles. In addition, they learn how to use some of the most popular software packages used in industry. This learning goes beyond physical movement of products, since labs incorporate supervisory skill development, decision making, and data analysis. These learning components are not only encouraged. They are required in nearly every lab exercise. This approach student learning is critical, since studies have shown that active learning, where students perform actual tasks they can apply in a business environment, results in effective learning and future application of knowledge [1].

CONCLUSION

The Distribution Simulation Laboratory at East Carolina University is an integral part of the learning process in the Distribution and Logistics degree program. By using software packages such as SAP and BarTender, and by utilizing technologies such as RFID, PowerScan Barcode readers, and incorporating hands-on application lab exercises, students graduating from this degree program gain real world knowledge and are prepared to begin work upon graduation. This approach benefits future employers, as well as students, since graduates require less initial training.

Furthermore, graduates from this program are expected to have a better understanding of the integration of technology within logistics and distribution field. As more SAP modules are developed and implemented into more courses within the program, such as Purchasing Logistics,

Global Logistics, Strategic Pricing, Supply Chain Logistics, and Introduction to Logistics, students will begin to see the entire process of ERP development and the need within a company for a similar type of integrated system.

The integration of emerging technology, current software applications, management and supervisory training, and standard logistics and distribution practices into a degree program is an ongoing endeavor. Although significant changes were made to several courses within the degree program, many more changes are planned. To ensure effectiveness throughout these changes, student learning will be tracked and evaluated with a capstone course currently under revision that will allow students to demonstrate their mastery of logistics and distribution functions, leadership skills, and most of all, their readiness for a rewarding career in their chosen field.

Although this hands-on and comprehensive approach to logistics and distribution training is expected to produce effective graduates, more research is needed to determine the long-term effects of this approach. Future research is needed to determine if graduates of this approach remain successful beyond initial employment or if they are even successful during initial employment. Future research is also needed to determine what logistics and distribution organizations value the most from graduates, beyond what can be gathered from advisory boards and graduate surveys. More comprehensive studies that reach a wider range of organizations are needed, since virtually every organization employs logistics and distribution specialists.

REFERENCES

[1] Auster, E. R. & Wylie, K. K. (2006). Creating active learning in the classroom: A systematic approach. *Journal of Management Education, 30(2),* 333-353.

[2] Bottani, E. (2008). Reengineering, simulation and data analysis of an RFID system. *Journal of Theoretical and Applied Electronic Commerce Research 3(1),* 13-29.

[3] Fedorowicz, J., Gelinas, U. J., Usoff, C., & Hachey, G. (2004). Twelve tips for successfully integrating enterprise systems across the curriculum. *Journal of Information Systems Education, 5(3),* 235-244.

[4] Hayen, R. L. & Cappel, J. J. (2003). Enterprise software certification academy: A longitudinal study. *The Journal of Computer Information Systems, 43(3),* 75-80.

[5] Jones, P., Clarke-Hill, C., Shears, P., Comfort, D., & Hillier, D. (2004). Radio frequency identification in the UK: Opportunities and challenges. *International Journal of Retail and Distribution Management, 32(3),* 164-171.

[6] Karkkainen, M. (2003). Increasing efficiency in the supply chain for short shelf life goods using RFID tagging. *International Journal of Retail and Distribution Management, 31(3),* 529-536.

[7] Léger, P. (2006). Using a simulation game approach to teach enterprise resource planning concepts. *Journal of Information Systems Education, 17(4),* 441-447.

[8] Rosemann, M. & Maurizio, A. A. (2005). SAP-related education: Status quo and experiences. *Journal of Information Systems Education 16(4),* 437-453.

[9] Tu, Y. & Piramuthu, S. (2008) Reducing false reads in RFID-embedded supply chains. *Journal of Theoretical and Applied Electronic Commerce Research, 3(2),* 60-70.

[10] Whitaker, J., Mithas, J., & Krishnan M. S. (2007). A field study of RFID deployment and return expectations. *Production and Operations Management, 16(5),* 599-612.

AN UPDATE ON UTILIZING THE TOP 25 SUPPLY CHAINS IN THE CLASSROOM

Leslie R. Pagliari, Department of Technology Systems, East Carolina University,
Greenville, NC 27858, (252) 328-9663, pagliaril@ecu.edu
Richard W. Monroe, Wall College of Business, Coastal Carolina University,
Conway, SC 29528, (843) 349-2527, rmonroe@coastal.edu

ABSTRACT

This is an update on using the Top 25 Supply Chains in the classroom. Two additional years have been issued listing the Top 25 by AMR Research and further experience has been gained in the classroom with various assignments. The paper will discuss how the Top 25 can be used in various ways to teach supply chain management. We will discuss new lessons learned while using the Top 25 in the classroom. There are also many lessons to be learned from these successful supply chain companies and we will discuss why those are important to faculty, students and practitioners.

Introduction

Supply Chain management continues to be a topic of great interest to teachers, students and practitioners. University curricula include Supply Chain courses in a variety of areas including engineering programs, business programs and technology programs. Because of the continued strong interest in supply chain management, looking at companies that are very successful with their supply chain initiatives may hold many worthwhile lessons.   AMR Research has assisted us in this endeavor by publishing the Top 25 Supply Chains. This list recognizes those companies that have achieved a high level of success in their supply chain performance. AMR also provides some fundamental performance metrics and descriptions of company performance along with the Top 25 list.

Supply Chain Management

First we discuss the fundamentals of supply chain management. Many exchanges occur in the overall process of planning, sourcing, making and delivering products, services and information. As these exchanges occur and the material moves through a series of providers and ultimately reaches consumers, the efforts of several parties need to be aligned – this is referred to as the supply chain [13].

The following definition for "supply chain management" offers further clarification:

> "Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders" [9].

The important fact to take away from this description is the need to coordinate across the entire network of companies in the supply chain. Superior supply chain performance cannot be achieved without superior performance along each link of the supply chain.

AMR Research

The Top 25 evaluation by AMR Research focuses very specifically on individual firm performance as they identify the best performing supply chains. While this approach is certainly counter to the definition of supply chain management, there is a strong argument that individual firm success very much depends on successful "integration of key business processes" [9] and successful execution of those business processes with all of the key organizations in the supply chain. We also suggest that if the featured individual firm has outstanding performance then we would expect to find partner firms from that firm's supply network who enjoy similar success. A main part of the classroom assignments is to identify some of those partner firms who have contributed as a direct supplier or as an indirect support vendor (such as a software company) leading to the status of being included among the Top 25 supply chains.

Given this discussion and given the nature of SCM, we now discuss the Top 25 and the potential uses in the classroom. This paper will explore some of the lessons that can be learned from the Top 25 Supply Chains. The paper will also be segmented to address particular issues that may appeal to the different constituencies of teachers, researchers and practitioners. In the following section we first address the criteria used by AMR in developing the Top 25 list.

AMR's TOP 25 CRITERIA

According to AMR: "The report identifies the top 25 manufacturers and retailers …[with] superior supply chain capabilities and performance. Supply chain leaders are able to shape demand, instantly respond to market changes, and crush their competitors. According to AMR … leaders carry 15% less inventory, are 60% faster-to-market, and complete 17% more perfect orders. These advantages separate predators from prey."

The criteria for selection to the Top 25 consists of publicly accessible financial performance data and structured voting by AMR analysts. From the financial measures "… return on assets and inventory turns each accounting for 25%, and trailing 12 months growth accounting for 10%. The second component of the ranking is AMR Research's opinion, which is weighted at 40% of the total score" [1]. For 2008, the voting has now incorporated "peer opinion" as 20% of the score while the voting by AMR panelists has been reduced to 20% from 40% [2]. The Top 10 Companies in the Top 25 for the four available years are listed in Table 1.

Table 1. AMR Research Top 25 Supply Chains (Top 10 only)

Rank	2004	2005	2007	2008
1	Dell	Dell	Nokia	Apple
2	Nokia	Procter & Gamble	Apple	Nokia
3	Procter & Gamble	IBM	Procter & Gamble	Dell
4	IBM	Nokia	IBM	Procter & Gamble
5	Wal-Mart Stores	Toyota Motor	Toyota Motor	IBM
6	Toyota Motor	Johnson & Johnson	Wal-Mart Stores	Wal-Mart Stores
7	Johnson & Johnson	Samsung Electronics	Anheuser-Busch	Toyota Motor
8	Johnson Controls	Wal-Mart Stores	Tesco	Cisco Systems
9	Tesco	Tesco	Best Buy	Samsung Electronics
10	PepsiCo	Johnson Controls	Samsung Electronics	Anheuser-Busch

Sources: [1][2][11]

For Class Assignments
There are many ways to utilize the AMR Top 25 Supply Chains and we have classroom tested just a few of these. In this section we describe several examples of class assignments that have been utilized with the undergraduate supply chain class.

Assignment Example #1:
The AMR Top 25 Supply Chains was introduced to the class and the weblink was provided within Blackboard so that they could access the list. The following is one homework assignment given which required the students to do further research into a few of the companies on the Top 25 list:

"Pick 3 companies from the list and research each of the 3 companies – find at least one article on each company. From the articles come up with a list of "Top 5 Characteristics of a Successful Supply Chain" and be sure to list the NAME of the COMPANY for each Characteristic that you list. Be sure the description explains the Characteristic well – so it doesn't have to be extremely long but it does need to be easy to understand. DO NOT USE ONE COMPANY FOR ALL 5 CHARACTERISTICS!!"

Assignment Example #2:
This project required writing a 10 page research paper and making a 20 minute oral presentation with Powerpoint slides to the entire class. The class was divided into eight teams and five of the eight teams selected the Top 25 as their project topic. The description for this assignment along with the optional topics are listed below:

List of possible topics:
- Supply chain integration and the Global Challenges
- More in-depth analysis of successful supply chain companies (the Top 25)
- Quality and the Supply Chain
- The application of different metrics throughout the Supply Chain
- Global Sourcing issues, practices, opportunities, etc.

Two parts to the Project:
- Written research paper
- Team presentation based on the research paper

Paper Guidelines:
- 10 pages, double-spaced, 12 point font, Times New Roman
- APA paper format, Reference list
- Tables, Charts, Photos as appropriate for the topic – these should be in an Appendix and can extend beyond the 10 pages but no more than 25% of Total Pages

Presentation Guidelines:
- Each team member must present a significant portion of the presentation
- Use Powerpoint
- Professional dress code for the presentation
- Total time is 15 minutes minimum to 20 minutes maximum

Assignment Example #3:
Students can be assigned the task of finding supplier companies that are associated with one of the Top 25 supply chains and investigate their success. The idea is to conduct more detailed research into the partner firms who enjoy similar success as a result of being associated with one of the Top 25 Supply Chains.

Assignment Example #4:
Students can be assigned the task of researching other competing companies that do not appear in the Top 25 list. Then a comparison can be made between their financial performance (return on assets) or inventory performance (inventory turns). This could be conducted for a larger group such as the entire Top 25 compared with 25 other firms. This would allow a statistical analysis to determine if the Top 25 Supply Chains are better than the others with a statistical significance.

Assignment Example #5:
This assignment was used for Term Papers during Spring 2008 and Fall 2008. The following list was provided as suggestions for students to consider:
- What can we learn from AMR's Top 25 Supply Chains?
- What makes the Top 25 Supply Chain companies so special?
- How do suppliers contribute to the Top 25 Supply Chains? (give specific examples)
- Supply Chain Integration and the Top 25 Supply Chains
- Information Technology and the Top 25 Supply Chains
- In depth analysis of 2 or 3 companies listed in the Top 25 Supply Chains
- Supply Chain Improvement
- Supply Chain Relationships
- Supply Chain Partnerships
- Detailed description of the Demand Driven Supply Network (DDSN)

You can find some of the basic information by doing a Google search for "AMR Top 25 Supply Chains."
[Note: if using the Top 25 try to focus on the lists for 2007 and 2008 and recent performance for the companies]

These five possible assignments are suggested uses for the Top 25 Supply Chains. We would not recommend utilizing all five approaches in the same class. Examples #1, #2 and #5 have been used in classes with excellent results.

Some Classroom Results
Overall, the use of the Top 25 has been a great addition to the Supply Chain and POM classes. The students are able to research widely known companies such as Dell, Toyota, Nokia, Apple and Coca-Cola. In some cases the students are even employed by one of the companies in the list such as Home Depot or Best Buy. Because they identify with these companies or have a direct personal connection with one company their natural curiosity seems to be heightened. They want to find out what this company is doing that makes them stand out in comparison to other companies.

These assignments have been used for a Supply Chain Logistics course in a Distribution and Logistics undergraduate program and the assignments have also been adapted for the POM course in the College of Business. Some of the statistics for the most recent semesters are shown in Table 2 as follows:

Table 2. Student Frequency for Top 25 Assignments

Semester	Number of Students Electing Top 25 Topic	Total Students in Class or Section
Spring 2007	30	36
Spring 2008	25	35
Fall 2008	36	40

The most popular topics for the few students who did not select a Top 25 topic included: Green Supply Chain, Reverse Logistics, and Supply Chain Relationships. These topics were among the options available in specific classes or they were approved by the instructor.

Other highlights of these assignments are as follows:
- Questions from students about the best way to find more information about the Top 25 Supply Chain companies
- More discussion/questions from students about specific companies
- In depth research is required
- Higher interest level for this assignment compared to the typical textbook assignment

In general, these can be summarized as the students are more engaged in the topics related to this assignment.

One caveat should be mentioned. Dell and Wal-Mart have received more publicity in general and have a huge amount of published information available. If an instructor chooses to adopt one of these assignments, he/she may want to exclude Dell and/or Wal-Mart. This will force students to conduct research on the companies that have not received a tremendous amount of attention already.

What We All Can Learn

Students, teachers and practitioners can learn many lessons from the Top 25 Supply Chain companies. Examples of 'best practices' and 'lessons learned' are the topics of interest for practitioners and they are also the topics that students will likely report as a result of their research. Dell and Wal-Mart are the most prominent examples that are widely recognized and widely used in textbooks, case studies and other publications to demonstrate specific leading supply chain concepts. There are many reasons for this as they are usually the ones to coordinate new and innovative ideas concerning the supply chain. The following examples will demonstrate the potential lessons to be learned from companies in the Top 25 supply chains.

Nokia – Nokia was #1 for 2007 and #2 for 2008. The company excels at speed-to-market for new product introductions. To deliver their new products they utilize rapid-response manufacturing and quick ship logistics. Nokia has instituted many "agile" capabilities in their supply chain [10]. In each instance, information technology plays a key role. "As a pioneer in value chain strategy, Nokia has led in supplier development, S&OP, and collaborative product development" [14]. It is also interesting that this Finnish company is outperforming competitors from the U.S. and Japan.

Dell – From Dell we can learn how they have employed demand management software to successfully manage that aspect of their supply chain [5][6]. We can also learn more about inventory management, financial performance and the cash-to-cash performance metric where Dell is considered to be an outstanding example [2][5].

Samsung Electronics – Samsung has been rated as #10 in 2007 and #9 in 2008 in the AMR Top 25 Supply Chains. "Samsung's processes leverage technology brilliantly" [14]. "The company's [Samsung's] outstanding use of sales and operations planning (S&OP) and forecasting allowed its supply chain to set aggressive pre-stocking inventory targets in advance of the holiday season, helping to lift volumes" [16].

Cisco Systems – Cisco's efforts are viewed as an outstanding example of "business transformation … using Internet technology to integrate its core processes and culture." These are some of the results that indicate Cisco's leadership in supply chain management and their ability to leverage the Internet:
- "90 percent of orders [are] taken online.
- Monthly online sales exceed $1 billion.
- 82 percent of support calls [are] now resolved over the Internet.
- Customer satisfaction has increased significantly" [12].

As further evidence, Cisco also won the 2008 Supply Chain Innovation Award given by the Council of Supply Chain Management Professionals (CSCMP) in cooperation with *Global Logistics & Supply Chain Strategies* magazine [2]. Information sharing and the associated information systems appear to be a key element for this achievement and recognition. From this we can learn how a company has been able to utilize the Internet in a very successful manner and we can point to Cisco as a benchmark for other companies to emulate.

I2 Technologies – From the AMR Top 25 we can also learn more about a company like i2 Technologies, not because they are in the Top 25 but because they are a software solution provider that works with many of the Top 25 companies [2][7][8]. We can learn more about the precise types of solutions that i2 Technologies provides and we can learn more about who their customers are [2][7][15]. We can also learn about many of i2 Technologies competitors such as IBM, Logility and Oracle [15].

IBM – We can learn that IBM is not only among the Top 25 Supply Chains [1][2] but that they are also a provider of supply chain software solutions in competition with i2 Technologies and other companies [3][15]. We can learn that "Supply chain leaders establish formal S&OP processes within their supply planning organizations to create an integrated planning process while extending the effectiveness of overall performance" [3]. And we can also learn that a majority of medium and large companies "have a formal S&OP process in place" [3].

From these company examples we have demonstrated many of the lessons that can be learned. Samsung and Nokia give us excellent examples that should teach us that global competition is very real and that Samsung, a Korean company, and Nokia, a Finnish company, are beating their competitors in many areas. There are many lessons to be learned directly from the Top 25

Supply Chain companies and there are many lessons to be gained by exploring those companies that assist the Top 25 such as a company like i2 Technologies.

Conclusion

We have discussed how the Top 25 Supply Chains may appeal to the different constituencies of teachers, students and practitioners. The main focus has been on various ways to use the Top 25 for classroom and semester assignments. AMR's Top 25 list has now been published for a total of four years, 2004, 2005, 2007 and 2008. As more teachers, students and practitioners become aware of the Top 25 list we anticipate that many more uses will be found. This paper is intended to encourage that effort.

Specifically in the research arena we feel there is certainly an opportunity to compare the Top 25 companies with other companies to determine if the superior performance is truly superior. This can be done in several ways. One possibility would be to develop case studies that deal with the specifics of the Demand Driven Supply Network within some of the top performing companies. To some extent these companies should become benchmark companies and there should be more opportunities for information sharing with other companies seeking to improve their own supply chain performance.

REFERENCES

[1] AMR Research. Online (2006):
    http://www.amrresearch.com/Content/View.asp?pmillid=18895&nid=2558&rid=1104301503.

[2] AMR Research. Online, 2008:
    http://www.amrresearch.com/supplychaintop25/

[3] Butner, Karen, Hüttner, Heino with contributors Spade, David and LaRoche, Michael. 2006. IBM Global Business Services. IBM Institute for Business Value, IBM Corporation, Somers, NY.

[4] CFO.com http://www.cfo.com/article.cfm/3553770?f=related

[5] Dell Online: http://www.dell.com

[6] Dubin, C. "Demand Management Software Key to Dell's Supply Chain Success." Managing Logistics; June 2001, Issue 06-01, p. 1.

[7] i2 Technologies. 2008a. <http://www.i2.com/solutions/

[8] i2 Technologies. Online:
    http://www.i2.com/assets/pdf/resources/analyst_papers/The_AMR_Research_Supply_Chain_Top_25.pdf

[9] Lambert, Douglas M., Cooper, Martha C., and Pugh, Janus D. Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, 9:2, p. 1, 1998.

[10] Lee, Hau L. 2004. "The Triple-A Supply Chain," *Harvard Business Review*, October, 2004.

[11] Purchasing Magazine online, Supply Chain's Top 25, January 13, 2005.
     http://www.purchasing.com/article/CA497322.html

[12] Schroeder, Roger G. 2008. *Operations Management: Contemporary Concepts and Cases*, Fourth
     Edition, McGraw-Hill/Irwin: New York.

[13] Stock, James R. and Lambert, Douglas M. *Strategic Logistics Management*, Fourth Edition,
     McGraw-Hill/Irwin: New York, 2001.

[14] Supply Chain Standard, 2007:
     <http://www.supplychainstandard.com/assets/getAsset.aspx?liAsset=324>

[15] Tohamy, Noha and McNeill, William. 2008. S&OP Technology Landscape: Evolution to
     Integrated Business Planning is a Work in Progress. Supply Chain Planning and Execution, 2008
     Landscape Series. AMR Research: Boston.

[16] Wehlage, C. 2008. Quoting in posting by Kevin O'Marah on <http://chainreactionblog.com>,
     November 11, 2008, AMR Research.

THE ROLE OF LEADERSHIP AND FEEDBACK IN
SUCCESSFUL COLLABORATIVE TEAM PERFORMANCE

*John Bradley
MIS Department, East Carolina University
Greenville, NC 27858
252-328-6801
bradleyj@ecu.edu

Richard Hauser
MIS Department, East Carolina University
Greenville, NC 27858
252-328-6893
hauserr@ecu.edu

ABSTRACT

The use of cooperative teams in the learning process has been a strategy for many years in an attempt to deepen the learning experience. Requiring students to take on responsibility in the team has been shown to increase productivity. The most important role is the team leader. This paper discusses the dynamics of empowering a team leader and implementing peer feedback.

INTRODUCTION

The use of cooperative teams in the learning process has been a strategy for many years in an attempt to deepen the learning experience [7]. When working in groups, students must cooperate with each other to share skills and knowledge required to accomplish the task [5][11]. Many factors have been investigated that contribute to this learning experience most of which require the participation of the team member in team activities. Several interventions have proven successful in encouraging this participation: including assigning organizational roles and evaluative feedback [1][2][8] [9][10]. This paper discusses the dynamics of empowering a team leader and implementing peer feedback.

Business Information Systems are developed in work teams. Because teams enhance the learning experience, provide opportunities to develop communication skills, and resemble professional practice [3], teams are used to accomplish several learning assignments. Work teams are groups of individuals organized to create a deliverable where the failure of one individual has a negative impact on the entire team because the team is evaluated based on the quality of the product. In a class that introduces students to the basic concepts of Management Information Systems, students complete several assignments in work teams. Several challenges are usually evident in these teams. Usually the most destructive is the lack of participation of one or more team members. In a class with eight four-student teams, several are faced with this challenge. It is common for a team to accumulate the assigned work from each team member in the eleventh hour before the assignment is due only to find out that one team member is not present and will not respond to email or phone inquiries. The resulting assignment then receives

a lower grade because one part of the requirements is either missing or hastily thrown together. To assist the team in avoiding this problem several organizational changes were implemented. These include adding structure to the organization of the teams, modifying the submission requirements to include a schedule that produces a timely notification to the team when a team member is not going to submit a part of the assignment deliverables, and implementing an automated evaluation system for individual team members.

ROLES AND LEADERSHIP

In an attempt to verify that strong leadership provides a means to neutralize some of the negative aspects of working in teams [6], a study was performed using students in four sections of an introductory course in Management Information Systems. A significantly complex project was assigned to 3-4 person teams. In two randomly selected sections, team roles (Figure 1) were explained and assigned. This was not done in the other two sections. The projects were graded using a common rubric.

FIGURE 1 – TEAM ROLES

Roles:	Description of Responsibilities
Leader	This person is responsible for keeping the group's progress on the project on schedule. The Leader should make sure a plan is developed and should monitor the group's progress during each interaction to identify where deviations from the plan occur and make sure they are corrected. The Leader is responsible for acting as the primary intermediary between the group and the course instructor, making sure the assignments are submitted on time, and for ensuring that each member of the group is participating in the assignments and able to do well on the Access part of the second exam.
Meeting Scheduler	This person is responsible for knowing the schedules for everyone on the team (a schedule should be turned in to this member immediately), deciding (based on these schedules) about the dates and times of team meetings, and notifying members of the scheduled meetings. This person has the authority to call a meeting as long as no conflicts exist with any member's *official* schedule.
Database Administrator	This person is responsible for making sure that the assignment/project files are secure, that backup copies are frequently made, and that all members have current copies of all assignments. Where necessary, this person is to coordinate the integration of different components of the database project. This person is to maintain frequent contact with other group members to make sure that they have current copies of all files.
Recorder	This person is to maintain a LOG in Excel of each interaction in the group. The log should include information about each group meeting such as the agenda for the meeting, the date and time of the meeting, the people present, and the activities performed by the group. This log will serve as required documentation if a group member decides to stop participating and the group decides to remove that person from the group. A student may not be voted off of the team without a complete log.

The results are given in Table 1. This data shows the teams in the treatment group scored significantly higher than the teams in the control group (F=8.585, p=.0004). In an attempt to determine the presence and perceived quality of leadership, two questions were asked: "Someone

in your group took on a leadership role" and "The person who usually was a leader in your group did a good job." These results show that leadership was rated higher in the treatment groups (F=6.141, p=.015).

TABLE 1 – PERFORMANCE AND LEADERSHIP

Dependent measures	Treatment Conditions		
	Control		Treatment
Standardized Project Scores	n=47		n=59
Mean		85.1	90.4
Std Dev.		9.7	8.7
Rating of Leadership	n=35		n=49
(larger = higher rating of leadership)			
Mean		8.3	9.1
Std Dev.		1.7	1.1

With the importance of team structure and strong leadership clearly established, implementing changes in the course to reflect these findings becomes the challenge. The remainder of this paper is a discussion of one approach that has proven successful.

Team Structure

An organizational structure was implemented that gives added responsibility to the team leader and specific duties to the remaining team members. In this strategy, teams are given an identity by providing a team portal in the class management system (Blackboard) that includes the ability to store and transfer files (documents, spreadsheets, databases, etc.), hold chat sessions, white board sessions, easily email one another, and communicate with one another in a discussion board. Teams are required to elect a Leader who becomes the primary intermediary between the team and the instructor (Fig. 1) . A separate portal is created just for the Leaders. This allows the Leaders to discuss problems and share solutions in addition to making the Leaders feel important which usually results in an increased commitment to the welfare of the team members and to the quality of the product. The instructor is part of this elite group and, in addition to posting occasional discussion questions, monitors and enhances the conversations. When a student reports a problem or complaint to the instructor, the Team Leader is brought in to resolve the issue. The Leaders end up with the experience of shouldering managerial responsibility. Occasionally, the instructor will contact a team member in support of the authority of the Leader.

Each of the team members are given a role to play. These roles can vary but the remaining roles used in this class are Meeting Scheduler, Database Administrator, and Recorder (Fig. 1). These students are encouraged to take their responsibilities seriously resulting in a deeper sense of "belonging" and therefore a greater commitment to the productivity of the team. All team members are exposed to teaching on topics of team development such as quality leadership, building effective teams, stages of group development, managing conflict, making group decisions, and building quality into a product in addition to frequent "Words of Wisdom" from the instructor. At the end of the class, team members evaluate their Leader on several criteria (Fig. 2) and the Leader is rewarded by having a few points added to the last assignment grade. The Team Member Evaluation and the Leader Evaluation forms have been automated

FIGURE 2 – LEADER EVALUATION

Use this form to evaluate your Team Leader on the listed criteria.
You can change an evaluation by re-submitting the new evaluation.

Explanation of criteria:
Went out of his/her way to include all team members
Kept things well organized
Motivated all team members to do their best
Listened to problems and attempted to resolve conflicts

A rating of 1 indicates the Leader did none of the items listed above. A rating of 5 indicates
the Leader did an excellent job. The overall rating is listed so that a Leader who does
poorly in one area yet excels in another more important area can be rated highly.

Balsam, Woody, you are evaluating Team #5 for Leader Performance

Team Leader: Peregoy, Collin   Evaluation: Select a score ▾

Submit   Reset

Submission Schedule

One of the most prevalent problems in managing a team is not knowing there is a problem until it is too late to fix it. Students frequently wait until the last hour before completing their part of the assignment and submitting it to the team. If a student fails to complete their part or submits substandard work, the project suffers. One way to help the Leader identify such problems is to require the team to submit their first draft or partially completed assignment early. This gives the Leader an opportunity to preview the quality and timeliness of each team member's submission while there is time to encourage an errant team member to become more engaged in the team's striving for excellence.

Team Member Evaluation

One of the most challenging characteristics of work team is that individuals receive credit for the quality of the product even if their contribution to the product was minimal. There must be a mechanism to give each student a grade that reflects their level of participation in the assignment [4]. Requiring peer feedback has the benefit of being a learning experience for the evaluator as well as the evaluatee. Evaluative feedback also benefits the student because it resembles professional practice [12]. One technique for doing this is to require each team member to evaluate the other team members. Evaluation criteria and the resulting effect on the individual's grade are clearly delineated from the beginning. After each assignment, students evaluate their team mates on a 1 to 5 scale based on the criteria in Figure 3.

FIGURE 3 - TEAM MEMBER EVALUATION CRITERIA

Attended all meetings - was there on time and ready to work for every meeting
Completed all tasks - tasks were finished when promised and were done well
Contributed to team effort - volunteered for work, assisted teammates when needed, did fair share
Overall evaluation - on balance, the overall contribution of this member to this assignment

A rating of 1 indicates the member did nothing -- attended no meeting, completed no tasks, etc. A rating of 5 indicates the member attended all meetings, completed all tasks etc. The overall rating is listed so that a team member who does poorly in one area yet excels in another more important area can be rated highly.

These criteria work for both online and face-to-face teams. The teams are provided with software that allows the team to have electronic meetings using synchronous tools like chat and whiteboard, asynchronous tools like email and discussion board supplemented with the ability to easily exchange files. The evaluation scores are averaged together and applied using two threshold values.

It is required for every student to participate in a consistent and relevant way in the activities of the team. With each assignment, in addition to a self-evaluation, each group member evaluates the participation of the other group members on a scale of 1-5. For groups with three reported evaluation scores, the highest score (not the self-evaluation score) is duplicated to produce four scores. These four scores are averaged to create a single participation score for each student for that assignment. Normally each team member will receive the same grade, the grade given for that assignment. If a student receives an average participation score between 2.5 and 3.5 inclusive then that student's grade will be reduced by 20 points for that assignment. If a student receives an average participation score below 2.5 then that student's grade will be zero for that assignment. If a student does not submit an evaluation score by the assignment due date, that student will receive a self-evaluation score of zero which will be averaged with the remaining team members' evaluation scores. If a team member ceases to participate, the remaining group members will be responsible for completing the entire assignment on time. These threshold values have been carefully selected to avoid harm to one student by another student's retaliation for receiving a low evaluation score on the previous assignment. For example, if a participating student receives a low evaluation from another student based on personal conflict, the average score would be higher than 3.5 (5 + 5 + 5 + 1 = 16/4 = 4.0) so the participating student would receive the assignment grade without reduction. If a poor student entered a self-evaluation score of 5 while the other team members entered a score of 3, the student would receive a 20 point reduction in the grade for that assignment (5 + 3 + 3 + 3 = 14/4 = 3.5). If the poor student entered a self-evaluation score of 5 while the other team members entered a score of 1, the student would receive a zero grade for that assignment (5 + 1 + 1 + 1 = 8/4 = 2.0). These thresholds allow the students to honestly evaluate one another without fear of retaliation.

The group <u>Leader</u> is a key player in these evaluations. It is this person's responsibility to make sure that everyone is being treated fairly and that the non-participating student is directly encouraged to resume participation. If a student feels they have been unfairly evaluated, the

Leader can refer to the meeting log for justification. Following the last assignment, the Leader is evaluated based on the criteria in Figure 5.

FIGURE 5 – TEAM LEADER EVALUATION CRITERIA

Went out of his/her way to include all team members
Kept things well organized
Motivated all team members to do their best
Listened to problems and attempted to resolve conflicts

The Leader receives up to 5 points added to the last assignment grade based on the average evaluation score.

SOFTWARE SUPPORT

Several web-based programs have been developed in support of these interventions. First is a program that allows the students to sign up for a team (Fig. 6).   These programs are stored on a secure server so the student must complete an authentication process prior to being allow entry to the form. Once the teams have been selected, they are instructed to choose roles. The Team Leader selects a team number and submits the names of the team members.   Once the team has been recorded, the Leader records the four roles: Leader, Database Administrator, Meeting Scheduler, and Recorder (Fig. 7).

FIGURE 6 – TEAM SIGN-UP   FIGURE 7 – RECORD ROLES

Following the submission of each team assignment, each student enters the evaluation web page where the system uses the student's unique identifier to determine team membership and lists the names of the team members next to drop-down lists of the rating scores (Fig. 8). To ensure cooperation, a small penalty is assessed if a student does not submit an evaluation. A report is generated that lists the average scores for each student as described above. Following the last team assignment, a separate evaluation is collected of the Team Leader who is given a small number of bonus points added to the last assignment grade based on this evaluation (Fig. 9). Again, the system uses the student's unique identifier to determine team membership and lists the name of the team Leader next to a drop-down list of the rating scores.

FIGURE 8 – TEAM MEMBER EVALUATION

FIGURE 9 – LEADER EVALUATION

CONCLUSION

The ability to work well in teams is important because it leads to a deeper learning experience. Structural changes were discussed that can be made in a course to enhance the impact of the use of team assignments. If taken seriously and supported by the instructor, taking the Leader role can easily result in the development of leadership skills in the student, a real benefit especially for Business students. On a Discussion Board that was created for Leaders only, one leader said, "I learned a lot about being a manager." One disadvantage is that only one of four students benefit directly from the leadership experience. If multiple projects are assigned, the students could be given the option of selecting a different person to lead each project. This decreases the impact on the one student in order to spread the benefit to more students. In conclusion, something should be done to deepen the learning experience. Changing the structure of the teams as described in this paper is one of many ways to accomplish this goal.

REFERENCES

[1] Bradley, J., White, B., & Mennecke, B. Teams and tasks: a temporal framework for the effects of interpersonal interventions on team performance, *Small Group Research*, 2003, 34(3), 353-387.

[2] Burns, M., Peters, R., & Noell, G. Using performance feedback to enhance implementation fidelity of the problem-solving team process. *Journal of School Psychology*, 2008, 46(5), 537-550.

[3] Burton, K. Using student peer evaluations to evaluate team taught lessons. *Journal of Instructional Psychology*, 2005, 32(2), 136-138.

[4] Cook, R. An investigation of student peer evaluation on group project performance. *Journal of Marketing Education*, 1981, 3(1), 50-52.

[5] Cooper, J. L., Prescott, S., Cook, L., Smith, L., Mueck, R., & Cuseo, J. *Cooperative learning and college instruction: Effective use of student learning teams.* Long Beach, CA: Institute of Teaching and Learning, 1990.

[6] Cordery, J. & Soo, C. Overcoming impediments to virtual team effectiveness. *Human Factors and Ergonomics in Manufacturing (formerly International Journal of Human Factors in Manufacturing)*, 2008, 18(5), 487-500.

[7] Entwistle, N. Promoting Deep Learning Through Teaching and Assessment. *Assessment to Promote Deep Learning. Insight from AAHE's 2000 and 1999 Assessment Conferences*, Suskie, L., ed., Washington, DC: American Association for Higher Education, 2001, 9-20.

[8] Liu, X., Magjuka, R., & Lee, S. The effects of cognitive thinking styles, trust, conflict management on online students' learning and virtual team performance. *British Journal of Educational Technology*, 2008, 39(5), 829-846.

[9] Mennecke, B., Bradley, J., & McLeod, M. The Impact of Group Process Training and Role Assignments on the Performance and Perceptions of Student IS Project Teams, *Journal of Informatics Education and Research*. 2000, 1(1), 23-36.

[10] Mennecke, B. & Bradley, J. Making project groups work: the impact of structuring group roles on the performance and perception of information systems project teams, *Journal of Computer Information Systems.* 1998, 39(1), 30-36.

[11] Persons, O. Factors influencing students' peer evaluation in cooperative. *Journal of Education for Business*, 1998, *73*(4), 225.

[12] Sitthiworachart, J., & Joy, M. Computer support of effective peer assessment in an undergraduate programming class. *Journal of Computer Assisted Learning*, 2008, 24(3), 217-231.

8

ACT, DON'T REACT: A TEACHING CASE ON OPERATIONAL RISK MANAGEMENT IN BANKING

Bryan L. Aasheim
PO Box 8150
Statesboro, GA 30460-8150
blaasheim@gmail.com

Cheryl L. Aasheim
Georgia Southern University
PO Box 8150
Statesboro, GA 30460-8150
caasheim@georgiasouthern.edu

Susan Williams
Georgia Southern University
PO Box 8153, Statesboro, GA 30460-8153
rebstock@georgiasouthern.edu

ABSTRACT

This paper is a case study on managing operational risk in a small community bank. The case has would be appropriate for junior-to-senior level students in finance or banking. The case is designed to be taught in one class hour and is expected to require 2-4 hours of outside preparation by students. It might also be appropriate and helpful to invite representatives from local banks to join in the discussion of this case.

INTRODUCTION

There are many reasons for the rapidly changing environment bankers find themselves in; the attacks of September 11, 2001, the subsequent increase in regulatory, compliance, and documentary burden, and the rapidly changing influence of technology, including its ability to increase productivity as well as significantly increase security and reputation risk are just a few. By allowing banks to compete for and serve local, national and international customers, the Internet has changed both the number and types of risks banks are facing today. The ability of individuals and businesses to operate on a global scale has led to an increase in risk, and by extension, the importance of risk management strategies. Due to increasing regulatory scrutiny, many institutions find themselves embroiled in a confusion of risk assessments, policies and procedures while trying to maintain a competitive edge in a competitive industry.

"Banks clearly bear the burden of organizing, implementing, and maintaining an effective compliance management program, and demonstrating the effectiveness of the program to examiners." [6] It is important for community banks to employ a proactive strategy to address their operational risk management needs. In order to proactively address operational risk management an institution needs both a clear set of goals and strategies and trained and

experienced people to manage and monitor the program. The purpose of this paper is to examine the current structure of one bank's risk management program, identify its strengths and weaknesses, and recommend a strategy to more effectively address risk management issues. By empowering an officer to centralize the risk management process the bank will be able to reduce duplication of effort, manage the compliance, security, and risk management effort, and produce a unified strategy for risk mitigation. This paper will show that a Risk Management Officer who is freed from significant operational duties will be able to coordinate the risk management program and most effectively address the bank's enterprise wide risk management needs. In addition, this paper will demonstrate how an individual bank, and by extension, a bank holding company, may benefit from employing enterprise wide strategies for risk management.

BACKGROUND

In order to discuss different ways community banks can mitigate operational risk and increase productivity it is necessary to understand how we define operational risk, and what strategies we might use for dealing with the necessary changes to the business culture required to adopt a proactive operational risk management stance. The Second Basel Accord defines organizational risk as, "…the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events." [7] This definition clearly divides organizational risk from credit risk or market risk, but includes risk to reputation, operations, infrastructure, and procedural integrity. This is a broad definition and encompasses many fields and departments which have traditionally been "held apart" by the banking industry. For example, an institution's reputation can face risk from all areas of operations, lending, and management activities. Although many banks have implemented policies and procedures which help to protect the institution, in many small institutions there is no specific group or person assigned to assessing the success or failure of these policies, evaluate them against the institution's mitigation strategies, and address the new risks which inevitably appear.

Managing risk is not a new concept for bankers. The challenges the banking industry faced in the late 1980's and early 1990's made an impression on the banking industry that we still feel today. "The managers…had deeply impressed upon them anew the need to mange risks, to control costs, to build capital and reserves, and generally to focus on the lessons of banking history. The passage of time no doubt has caused the experience to fade for those banks that looked into an abyss, but survived; nevertheless the systems and procedures that were put into place by many institutions remains one of the hallmarks of today's banking industry." [3] Although the systems and procedures that were implemented, such as governing body oversight, liquidity guidelines, credit and loan policies, asset/liability guidelines, and examination guidance, to help defend banks against credit, market, and asset risk, they did not fully address the needs of the modern bank to look at risk as a global or enterprise wide issue.

Currently, "the distribution of roles between the risk and finance functions, as well as between those functions and business line management, remains to be optimally delineated. For many firms undertaking enterprise optimization, a new governance model will need to be implemented, grounded on new policies and a new culture." [5] The structures, policies and organization put in place yesterday can not fully address the modern day requirements of organizational risk management. The system of checks and balances, reporting, and risk management established to

address the practices and risks evident in banking twenty years ago did not foresee the continuing globalization of world economies. They did not address a bank's need to identify its customers, verify and track their relationship activity, monitor their transactions, and secure the information the bank obtained. The rapid growth of Internet banking activity, wire transfers, automated clearing house (ACH) transactions, and the Internet itself has forced the banking industry to re-evaluate what its risks are and what the best practices in addressing those risks will be.

Many community banks have approached the increasing burden of risk assessment, Bank Secrecy Act, Information Technology and Security, Patriot Act compliance and even an increase in internal and external fraud by placing more pressure on "key" employees to address these needs. In the past, as issues arose, personnel were assigned to evaluate and perform whatever tasks were necessary to satisfy the board of directors and examiners. Because community banks, with small asset portfolios and the commensurate employee base, have a smaller pool of human resources to draw on they inevitably find themselves with fewer people involved in the risk management process. If we suppose that risk management is an organization wide enterprise, it follows that a more effective strategy is to involve the entire staff in risk management and planning, rather than limit it to a very few. In order to illustrate this point it is helpful to look at the structure of one bank, how it is currently structured to address its risk management needs and what might be done to more proactively approach operational risk management.

COMMUNITY BANK X

Overview of Current Structure

Community Bank X is located in a small town in Georgia, and has total assets of $65 million. The bank has three brick and mortar locations; a main branch, one satellite branch which offers deposit and transaction capability, and one drive-in branch, which offers ATM transactions as well as traditional deposit transaction capability. The bank has twenty-three full time employees and is organized as described in Figure 1. The bank's primary source of assets is customer deposit accounts and as such the bank has a large transactional and customer service requirement. Because the asset size has limited the number of employees the bank does not have true departmentalization.

The commercial and retail aspects of the loan department are run directly by the CEO while another senior officer is responsible for the operations aspects of the department. The deposit functions of the bank are more closely aligned with traditional hierarchies. There is an Operations Officer who oversees the deposit, customer service, and bookkeeping functions. Best practices for bank management and oversight typically recommend a separation of duties, both at the operational and management levels. The organizational structure of the bank, due to the constraints of its limited resources, puts a great deal of pressure on management to maintain true separation of operational duties. In addition, there is a direct connection in this case between normal operational activities and management. Managers and auditors are involved directly with the day to day activities and procedures they are required to monitor. Because staffing levels are not sufficient to maximize separation of duties the community bank struggles to optimize risk management.
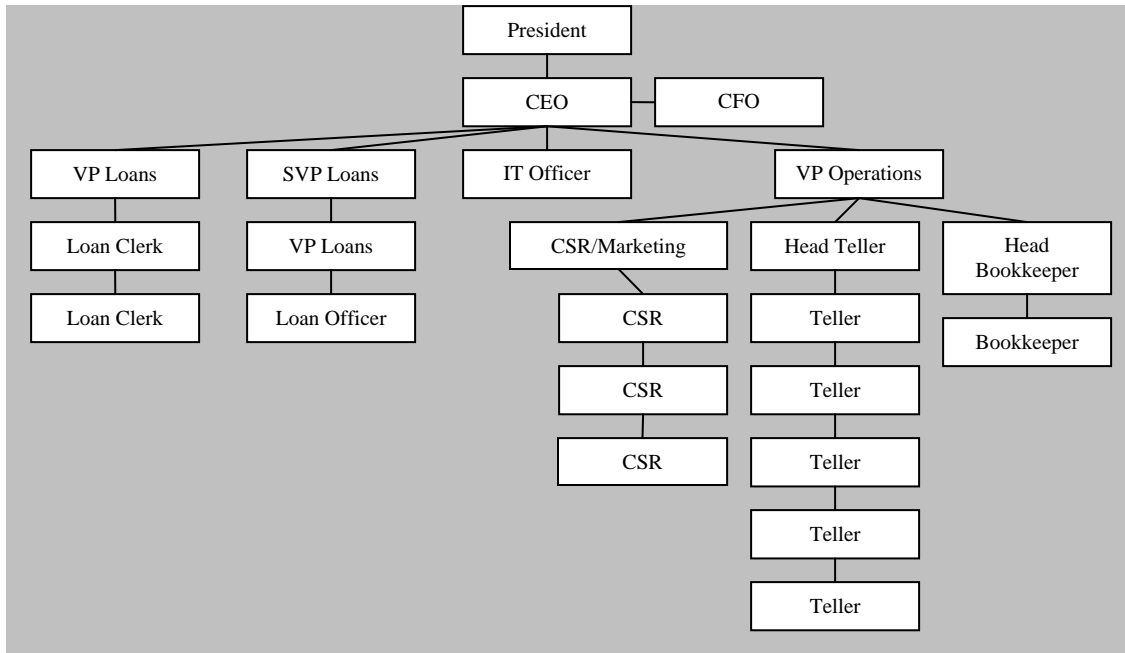
Figure 1: Community Bank X Organizational Structure

The picture becomes even muddier when we consider the assignment of compliance, reporting, audit, and oversight duties. As discussed earlier, and evidenced in Figure 1, Community Bank X struggles to find enough experienced and capable resources to allocate these responsibilities to. Duties which can be considered operational risk management in nature are distributed as shown in Figure 2. The diagram illustrates how each area, though related to the others, is treated as a separate entity. Each area has personnel assigned to it, individual policies and procedures, separate auditing programs and schedules, and separate risk mitigation strategies. Coordination of efforts is difficult to achieve because there is no central, guiding program or principle in place.

Each employee in Figure 2 is responsible for their respective areas. As each aspect of risk has come to the attention of management or regulatory bodies a "key" person has been assigned to manage that aspect of risk. A policy, which generally addresses only the specific area of concern, is authored and procedures are devised to enforce the policy's provisions. Although in many cases there is a dialogue between the different areas, and one employee might seek advice or an opinion from another, there is no direct program which addresses each aspect of operational risk and how it relates to the others. Information Technology does not work with Loan Compliance to reduce compliance risk through the implementation of newer technology. The physical security policy does not incorporate aspects of information security, despite the fact that the information security program requires physical assets be protected by physical barriers. Further, there is no enterprise-wide strategy for assessing and quantifying risk, planning for the mitigation of risk, or describing the institutions stance on the acceptance of risk.
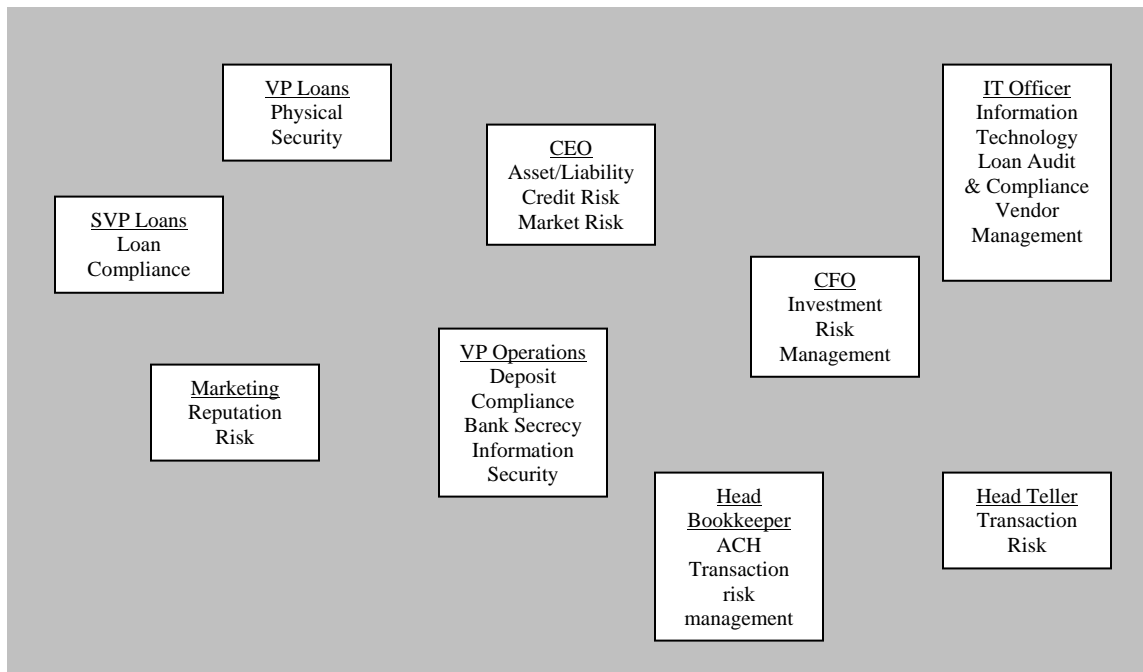
Figure 2: Current Operational Risk Management Duties

There are several problems with the "pile-on" strategy of responsibility assignment. From a risk standpoint, this type of management does not take into account the regular business processes each person is already assigned to. It does not consider current reporting, auditing, and monitoring responsibilities and how these may or may not be interrelated with new assigned responsibilities. In fact, this type of strategy can actually increase operational risk for two reasons. First, employees responsible for regular business activities and risk management activities are more likely to cross the separation of duties guidelines. That is, they are more likely to have responsibilities which require them to perform changes and auditing, or action and monitoring. In effect they would be responsible for monitoring themselves, which increases risk by removing effective checks and balances. "Smaller organizations often face a challenge of ensuring independent review of processes and decisions since officers and staff members often have multiple responsibilities that can present conflicts of interest." [1] The second way in which the "pile-on" strategy increases risk is by creating an environment in which significant regular business processes and risk management processes are funneled to one individual. This increases risk by limiting the bank's ability to plan for succession.

The supervisory perspective on risk management continues to expand. Although supervisors understand that small institutions will not have the same scope of risk and need the same scale risk management program, Susan Bies, a member of the Federal Reserve Board, stated in a speech to American Bankers Association, "small and mid-size entities, for example, may choose to apply the framework in a less formal and less structured way and scale it to their own needs – as long as quality is maintained. This underscores the message from bank supervisors that good risk management is expected of every institution regardless of size or sophistication." [1] In addition Bies states, "running a smaller or less complex bank presents different types of challenges and requires a risk management framework appropriately tailored to the institution."

[1] Bies' comments underscore the reality that auditors will require banks to have a systematic strategy for addressing operational risk no matter what size or personnel base they have. In order for an institution to have an effective risk management program it must have established goals, defined strategies to meet those goals, and processes and procedures in place for the evaluation of how the strategies meet or do not meet the expectations of the program.

Community Bank X has no formal risk management program. There are no defined goals and there is no accepted risk "stance" with regard to reputation, operations, information technology, or regulatory compliance. Service level employees are not involved in the planning or evaluation process, and there is no system to measure whether activities are in line with the bank's strategies. As seen in Figure 2, the bulk of risk management responsibilities are divided between a few officers and upper management positions that have additional operational responsibilities. The lack of a formal risk management program is a result of both a lack of resources, which hurts the bank's ability to plan, implement and assess a program, and the lack of a defined set of goals which a program might be designed to achieve.

In the first part, banks have traditionally loaded responsibility on "key" employees who have a history of strong performance. As time goes by, and operational and regulatory burden increases, these employees are overburdened with responsibilities until they are unable to effectively monitor each aspect of their job. As more responsibilities are added to each employee's job description earlier responsibilities drop off to make room. An issue's importance to management may wane and become forgotten until that particular item is discovered during an audit, or in the worst case, leads to a significant loss. Managing the assignment of responsibility is a key component of an effective operational risk management program.

The second problem goes hand in hand with the first. In a small banking environment employees are valuable assets and personnel cost is traditionally kept to the bare minimum. All employees need to maintain some kind of operational duty in order to maintain the cost effectiveness of the organizational structure. Because of this, loan officers, who are the primary marketing and sales force of the bank, often find themselves responsible for physical security, deposit compliance, BSA compliance, asset and liability management, human resources management, and information security, among others. Management of these responsibilities often takes a back seat to accomplishing the operational goals of the institution. "Compliance-risk management can be more difficult for management to integrate into an organization's regular business processes because it often reflects mandates set out by legislation or regulation that the organization itself does not view as key to its success." [1] In most community banks items such as superior customer service, community service, marketing, and sales generally take precedence. This is especially true when the primary operational duty generates income for the bank through sales, business development activities or customer service.   What activities are employees routinely rewarded for: those which generate income and profit or growth for the bank or those which are primarily designed to assuage examiners and comply with regulations? Although bank employees are sometimes rewarded for compliance or risk management activities, these rewards usually come because regulatory findings or pressure have forced an institution to aggressively address an issue or policy. Employees are not routinely rewarded, or encouraged, to place an emphasis on risk management because these activities are often seen as a

drain on resources instead of a generator of profit and growth. Without a strategy, and sufficient resource allocation to promote a program to achieve its goals, no institution can effectively address operational risk.

Proposed Structure

> *"For many firms undertaking enterprise optimization, a new governance model will need to be implemented, grounded on new policies and a new culture."[5]*

The first step in addressing an institution's risk management program is to evaluate its operational and market position and decide what "stance" it will take regarding all types of operational risk. In order to assure that adequate time and resources are devoted to risk management it is imperative that an institution answer some basic questions about its risk stance. First, the institution must decide if it will be aggressive, averse, or neutral with respect to each risk factor. For each institution this decision will be based on their current situation, business and income strategy, and personnel. An institution may be averse to reputation risk but aggressive with regard to processing risk. In the most likely scenario, each factor will be relatively in-line with the others and there will not be factors which are diametrically opposed to one another. A risk-averse institution is likely to be averse in regard to all factors and may stray into the neutral category, but is unlikely to be aggressive in any. A primarily neutral institution may choose to be aggressive at one factor and averse in another, but will maintain its primarily neutral stance throughout the strategy. Without an understanding of the institution's underlying stance and goals, there is no way to develop an effective risk management strategy.

The second step in this process is for management and the institution's board of directors to clearly describe the institution's risk management goals for a determined period. In order for global operational risk management strategies to be successful these goals must be communicated not only to management, but to front line personnel. Understanding the institution's priorities and strategies is an integral part of the decision making process. Department heads can not successfully make decisions about personnel, asset allocation, and resources without understanding their institution's plan for risk management and how their actions will help or hinder the institution's attainment of its goals. Third, middle management and employees must come up with a plan to attain the goals set by the board of directors. This plan is the operational risk management program. It should describe the bank's policies, procedures, and decision making processes which are designed to achieve the institution's risk management goals. Once the program has been defined, it must be tested. A process of auditing and reporting must be implemented to ensure the program's effectiveness.

Although operational risk management is an enterprise wide issue, and requires the combined effort of all employees of an institution, it is helpful to reduce the scope of the problem when discussing an effective management structure to implement an institution wide management program. Every good project requires an effective project manager. The project manager is not required to be an expert in every field, but rather to have a solid understanding of the personnel, program, and goals of the project. The project manager is responsible for coordinating the members of the team and keeping the project on time and within the proposed guidelines. An

effective operational risk management program requires someone who can coordinate the disparate efforts of each department or group into one homogenous program. The Risk Management Officer (RMO) should occupy a space outside of traditional bank hierarchy; with enough authority to get the job done, but without the operational responsibility of upper management.

In the proposed structure, the Risk Management Officer works as a hub or centralized base location for the dissemination of the program to department heads, middle management and employees.   This structure is defined in Figure 3. As opposed to the disconnected structure described in Figure 2, this structure shows the direct connections between each area and the centralized "hub". Additionally, there is a communication line between the RMO and the CEO and Board of Directors. The RMO would be responsible both for oversight of each area of focus, but also for making sure that each area works together with the others to maximize the effectiveness of the overall program.

The IT Policy Compliance Group states, "firms performing as industry leaders are engaged in very specific activities – more frequently – while also allocating more resources to the task…than others." [4] The benchmark paper goes on to state that industry leaders conduct more frequent and extensive system and program audits than others. Although this paper deals directly with success and failure within the IT environment we can apply its principles to risk management. In order to be successful, a program must have sufficient resource allocation. Having a competent RMO in place can help assure that resource needs are communicated to management and addressed. In order to assure there is adequate monitoring of the system it is necessary to assign specific job roles to the implementation and assessment of the program. A RMO who is engaged in operational activities is less likely to be able to facilitate inter-department communication and consistent, effective audits of the program than one who is not responsible for operational duties. The freedom from daily operational duties will allow the RMO to coordinate meetings, audits, reporting, and planning, and achieve maximum results by allowing the RMO to be available at all times and not tied to a specific operational job function. For this reason, the proposed structure would encourage the appointment of a RMO who does not occupy a current operational position.

In the proposed structure, the RMO would report to the Board of Directors on a monthly basis on the status of the risk management program, monthly auditing efforts and results, and current issues in the program. The RMO would be responsible for keeping a running dialogue with the CEO and CFO to ensure that the operational risk management program remains in line with the credit and market risk activities in these areas while maintaining its ability to achieve the institution's goals. The RMO would also be responsible for meeting with area managers to discuss current issues and mitigation efforts, as well as compliance and reporting activities. Perhaps most important of all, it is the responsibility of the Risk Management Officer to explain the risk management strategy to the employees and encourage employee "buy-in" to the program. As discussed earlier, the RMO occupies the position of being a liaison between the goals of the Board of Directors and the employees and area managers.
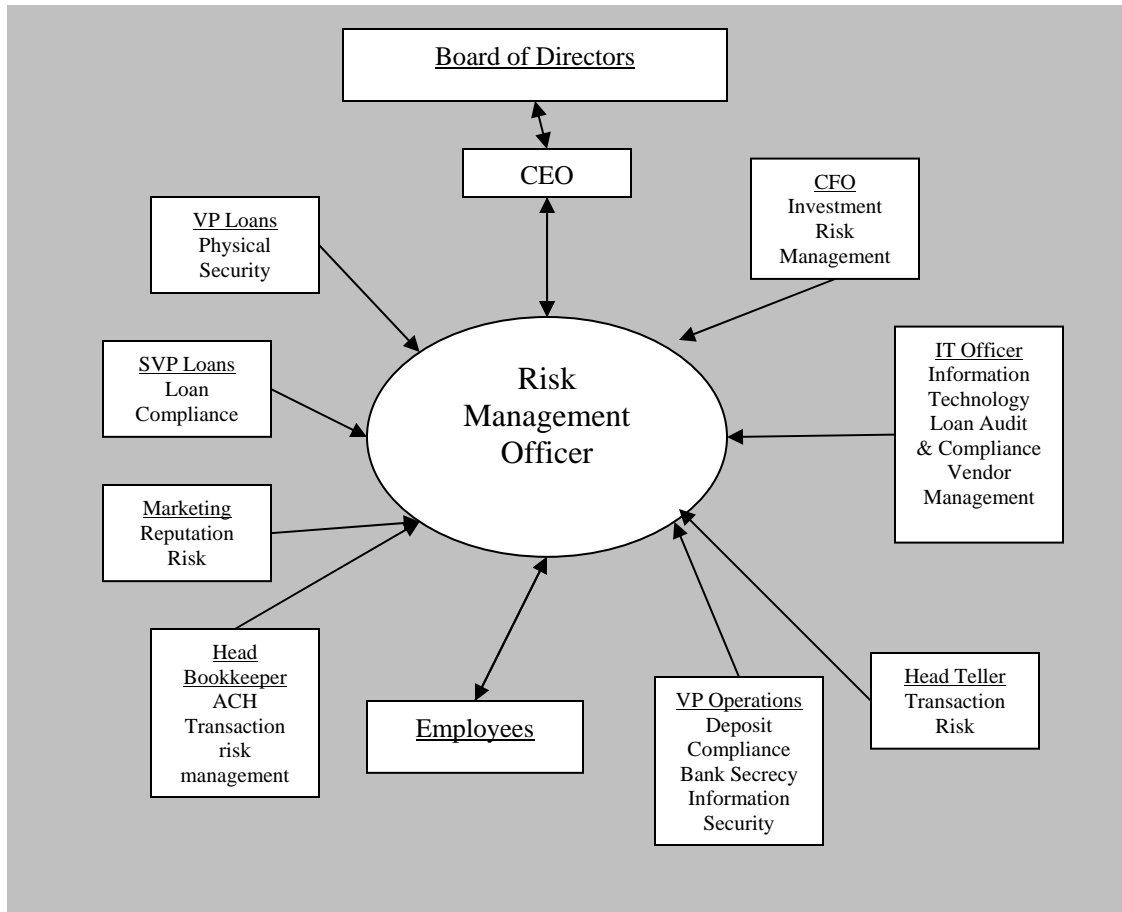
Figure 3: Proposed Operational Risk Management Structure

CURRENT STATUS OF THE RISK MANAGEMENT PROGRAM

Although there are both tangible and intangible benefits to be gained from implementation of an organizational risk management strategy there is significant reticence at Community Bank X and its parent holding company about moving in this direction. This resistance stems both from an effort to enhance income by minimizing payroll expense and from each institution's desire to manage its affairs individually and not be covered by a homogenous holding company program. Although this individuality allows each bank to tailor its program to meet its needs, it increases the risk that a bank may not effectively assess or mitigate its risk. In recent years regulatory bodies have increasingly encouraged a more consistent environment within the group of banks by consolidating and homogenizing programs and policies.

In 2006 the holding company created the IT Steering Committee and required all banks to appoint an Information Technology Officer and an Information Security Officer. In addition to forming this committee the holding company appointed an Information Security Officer who is responsible for oversight of the program and coordinating the IT compliance effort. Although there continue to be some difficulties in maintaining a united program this effort has generally strengthened the program at each bank and within the holding company. The holding company IT Officer does not currently have any operational duties and may focus her attention on risk

assessment, program implementation and co-ordination of the banks' and holding companies' risk mitigation effort. We have seen a significant increase in IT cost during this period as problems are discovered and the program is adapted or vendors are hired to help mitigate risks that are discovered. However all banks have seen a significant increase in the strength of their IT management program.

Beginning in 2007 Community Bank X has proposed that the Compliance Officer from each bank be responsible for coordinating their bank's enterprise wide compliance effort. This group will further be coordinated at this time by the holding company IT Officer. Although this effort is still in the implementation stages it is anticipated that the compliance effort will benefit, as the Information Security Program has, from a more structured plan. The addition of a centralized authority will allow each bank to more readily access other's information, insights, and solutions. In addition, a centralized resource for policy generation, knowledge and coordination of effort will enable the holding company to utilize all of its resources.

Although the bank and holding company may be years from a total consolidation of the risk management effort these steps indicate a changing attitude and culture. They point to a desire to more efficiently address risk management and compliance needs. In addition, these steps are creating a framework around which an organizational risk management strategy and program can function. However, there will be continued resistance to this effort until the cost of non-compliance or the danger of having no centralized and effective organizational risk management strategy can be demonstrated to outweigh the cost allocating adequate resources to the risk management effort. Due to the resources available at both the bank and holding company level it will be some time until a fully functional organizational risk management strategy can be implemented.

CONCLUSION

The recent growth in risk due to changes in the banking environment stemming from terrorism, government regulations, identity theft, global and international banking, multinational corporations, changing markets and economies, among other factors has necessitated a re-evaluation of the programs and procedures implemented in the past to address risk management. Historically, many banking institutions have implemented departmentalized, or "siloed", programs to address specific risk issues, but have not connected these programs into an enterprise-wide operational risk management program. Because of the rapidly changing environment and risk associated with doing business in the modern world these programs are no longer sufficient to provide an institution with the risk mitigation strategies and programs it needs. To effectively address the current environment an institution needs a coordinated program which can address changing conditions and draw from all areas of risk management to create a comprehensive plan to address risk. Because the implementation of an organizational risk management program will likely necessitate a new "culture" within the institution it is imperative for the program's success that the bank commits sufficient resources to its implementation, including the appointment of a Risk Management Officer.

CASE STUDY QUESTIONS

- What are the risks involved in the current, silo based structure?
- What are the benefits of the proposed structure? What are the drawbacks?
- What is the likely cause of resistance from management and the member banks? What strategies could be employed to mitigate resistance?
- What other solutions or strategies might be used to address risk management in Community Bank X? Defend the solutions as well as list the potential drawbacks.

REFERENCES

[1] Bies, Susan Schmidt (2006, October 20). A Supervisory Perspective on Enterprise Risk Management (excerpts from a speech delivered to the American Bankers Association). *Continuity Central.* Retrieved December 29, 2006, from http://www.contiuitycentral.com/feature0404.html

[2] Craford, Niccola, & Hoppe, Norman (2005, May 27). Dragging Operational Risk Management into the 21st Century. *Continuity Central.* Retrieved December 29, 2006, from http://www.continuitycentral.com/feature0210.html

[3] Greenspan, Alan (2004, October 5). Remarks by Chairman Alan Greenspan at the American Bankers Association Annual Convention, New York, New York. Retrieved January 17, 2007, from http://www.federalreserve.gov/boarddocs/speeches/2004/20041005/default.html

[4] Hurley, Jim (2006, February). Improving IT Compliance: Benchmark Research Report. *ITpolicycompliance.com.* Retrieved December 29, 2006, from http://www.itpolicycompliance.com

[5] Koll, Andrea & Lacan, Francis (2006, August 31). Enterprise risk management: Aligning design principles to corporate goals. As featured in Building an Edge – the Financial Services newsletter, Volume 7, Number 3. Retrieved December 14, 2006 from http://www03.ibm.com/industries/financialservices/doc/content/resource/thought/1623448103.html

[6] Moore, Steve. "Practical Compliance Management". Georgia Bankers Association 2006 Southern Operations & Technology School Handbook, 2006.

[7] Robinson, John, JRCPL Ltd. What is Operational Risk Management (ORM). *Continuity Central.* Retrieved December 29, 2006, from http://www.continuitycentral.com/whatisoprisk.html

MENTORING UNIVERSITY STUDENTS:

THE DEVELOPMENT, EVOLUTION, AND ACHIEVEMENTS OF

THE CITADEL MENTORS ASSOCIATION

W. Earl Walker, A. Bruce Strauch, and Wesley M. Jones

Earl Walker is Professor of Management and Leadership, Bruce Strauch is Professor of Law, and Wes Jones is Associate Professor of Finance at The Citadel School of Business Administration. Dr. Walker was Dean of Business Administration and is now the Chief Operating Officer of the Mentors Association, Dr. Strauch served as Director of the Mentors Association and Dr. Jones as Deputy Director.

1

ABSTRACT

As Universities find themselves in an ever-more dynamic and competitive economy, one challenge they face is finding opportunities for their graduates. There appears to be a near universal failure by colleges and universities to do anything more to prepare students for the job market than offer a job-placement office and for Business School students, standard courses in management, accounting, economics, finance, management and marketing. As most faculties have learned, undergraduates also suffer from the "center-of-the-universe syndrome" and thus expect adults to come to them.

The problem at military colleges is even more intense. In these institutions, students live in a Spartan environment with literally a 24-hour schedule, tactical officers who serve as both disciplinarians and advisors, and a cadet chain-of-command. Embedded in this culture are high expectations for integrity and self-discipline as codified in honor codes and cadet regulations governing conduct.

The Citadel School of Business Administration brought to these circumstances a new initiative called The Citadel Mentors Association and now consists of 149 mentors and 203 students. This article seeks to provide a snapshot of an unfolding Program over the period from 2001 to 2008, the challenges it faced, and the results to date. It describes a dynamic process of adaptation, changing conditions in the pool of mentors and students, and changing needs very much like what all organizations experience as they confront the challenges and opportunities before them.

A disjuncture or gap exists between the classroom and the job. Failure to formulate career goals and career paths can result in extending the college time well beyond four years and then after graduation selecting jobs by default rather than design. We have found that students must be motivated at least by sophomore year or soon after their entry into the MBA Program to navigate their own futures. The Citadel Mentors Program is our response to this problem. It is a promising strategy for bridging this gap and a potential national model.

We know from our success stories that we are having a big impact on both students and mentors. The evidence is anecdotal so far. What the Mentors Association needs is to find an economical way to measure outcomes in a field – mentoring – that is subtle and highly personal. The challenge is much like trying to decide how successful college professors are in educating students. To date most of our measures of teaching and learning are not well developed. We expect more research to grow out of our preliminary efforts here.

2

INTRODUCTION[1]

As Universities find themselves in an ever-more dynamic and competitive economy, one challenge they face is finding opportunities for their graduates. College students face so many competing priorities from courses, extracurricular activities, and social activities as well as voices competing for their attention from faculty, University staff, friends, and parents. Therefore, getting them to attend to life-after-college is problematic.

Indeed there appears to be a near universal failure by colleges and universities to do anything more to prepare students for the job market than offer a job-placement office and for Business School students, standard courses in management, accounting, economics, finance, management and marketing. As most faculties have learned, undergraduates also suffer from the "center-of-the-universe syndrome" and thus expect adults to come to them.

The problem at military colleges is even more intense. In these institutions, students live in a Spartan environment with literally a 24-hour schedule, tactical officers who serve as both disciplinarians and advisors, and a cadet chain-of-command. Embedded in this culture are high expectations for integrity and self-discipline as codified in honor codes and cadet regulations governing conduct.

The Citadel School of Business Administration brought to these circumstances a new initiative that was designed to help both graduate and undergraduate students plan for a career. This new Program is called The Citadel Mentors Association and now consists of 149 mentors and 203 students. This article seeks to provide a snapshot of an unfolding Program over the period from 2001 to 2008, the challenges it faced, and the results to date. It describes a dynamic process of adaptation, changing conditions in the pool of mentors and students, and changing needs very much like what all organizations experience as they confront the challenges and opportunities before them.

The Literature. We have been able to find almost no literature on mentoring undergraduate and graduate students. To be sure there are many articles on mentoring, but virtually all of them discuss mentoring in the workplace.

Workplace mentoring is substantially different from mentoring students. That is, workplace mentoring seeks to develop leaders for a particular organization or career field. Whereas mentoring students for a career that is well suited to their skills and interests as well as meeting marketplace challenges is quite a different kind of activity.

We have heard of other mentoring programs at graduate schools, but all of them involved groups of students. Thus, a team of students working on a business or engineering project might be assigned an executive with experience on their topic.

We think what has happened at The Citadel School of Business Administration is unique, an unusual example of a Program designed around highly experienced executives and students in the School's undergraduate (BSBA) and graduate (MBA) Programs.

4

Developing a Mentors Association at The Citadel. The Citadel (officially called, The Citadel: The Military College of South Carolina) is a South Carolina-sponsored University located in Charleston, a region that offers too few opportunities for the talented graduates of an AACSB-accredited Business School. The Citadel has a tight-knit alumni association that has fostered a myth that those graduating with a Bachelors degree from the South Carolina Corps of Cadets would never be unemployed. If you survived the four years in the Corps, cadets believed that jobs which were perfectly fit to their skills and preferences would somehow magically be offered by alumni. The reality was that when jobs were offered, they were not well suited to the skill sets of the graduates. Indeed, many fell into a trap of three jobs while in their twenties and found themselves stuck in the third one in their late 20s, unhappy and not working at the level of their skill sets.

And the undergraduates at The Citadel who were (and still are) mostly young men tend to meet young women at the mostly-female College of Charleston, marry, and then want to remain in what many consider an ideal location. All this adds up to still further reasons why too many remain in the City. As all on the Business School faculty understood, too many cadet graduates were in jobs around Charleston that seemed far below their skill sets. We found them waiting tables, coaching Little League baseball, and a host of other endeavors that did not take advantage of their special education that includes experiences in leadership, time management, and their strong code of integrity. Indeed, The Citadel has found that life in South Carolina Corps of Cadets is truly living in a leadership laboratory with all cadets involved in leadership

The MBA students were more focused, but they too often were unaware of opportunities existing beyond Charleston. Many viewed the degree only in terms of the next promotion at their existing firms and not career changes and new opportunities.

Both undergraduates and graduate students were also victims of Charleston's charms. The beaches, wonderful weather, restaurants, bars, cultural life, and historic ambiance are siren songs that disguise a job market with no large corporate headquarters and very little chance for a stellar career. Young people are moving here from all over the country, but they either have a profession such as accounting or law or they too often end up working in the service sector, a notoriously low-paying, low-skilled sector with few opportunities for upward mobility.

Also facing Universities in South Carolina was a state legislature that made it quite clear that money for higher education would diminish rather than rise for the foreseeable future. The legislature decreed that colleges in the state system were now to focus more on community impact and raising funds from private sources, a pattern that is consistent across the United States.

Opportunities. Charleston, South Carolina offers some very rich assets to address these challenges. The barrier islands of Seabrook, Kiawah, Sullivan's, and the Isle of Palms as well as the Charleston peninsula have up-scale communities where purchase prices were well in the millions of dollars. The region is seen by outsiders as a genuine community with the charm and attractions of a "kingdom by the sea."

5

Thus the region attracted highly experienced executives who had spent careers with multiple job transfers and had lived life at full-tilt. They yearned for more serene lives of beaches, tennis, golf, the Arts, theater, and the symphony. They also found in Charleston a fine medical center in the Medical University of South Carolina, a Center that assured them of continuing good health. What they quickly learned was that they could not fully let go of their careers and had moved to consulting or formed new companies. And they found they were very rapidly bored by golf.

As demographics drive the baby boomers into retirement and often to the South, there are many in Charleston who both want a more leisurely life and yet some meaningful involvement with younger people. Most of them find their children out of the house and living where job opportunities are richer. So working with young people who are disciplined and courteous is most attractive. What they have found in the Mentors Association are just such young people. The cadets are all taught – and indeed conditioned -- to be gentle people and our part-time MBA students are hungry for more opportunities.

So, these executives had time on their hands and a perspective of looking back on a life full of experience. Many wanted to give back to a community as well as offer their experiences to young people. As Citadel Professor of Law Bruce Strauch discerned, these retired executives had a wealth of knowledge and were prepared to share it. He was convinced that these executives could truly ramp up the career paths of our graduates. As he told other faculty, our cadets are mannered and respectful and highly ambitious. They dress appropriately and say "yes, sir" and "yes, ma'am." Our MBA students all hold jobs and have grown beyond the success fantasies of the undergraduate years. Given these facts, Strauch felt the students would interact well with experienced executives, and a mentoring program would be successful. With the formation of a Business School (to succeed the then-existing Department) and the arrival of new Business School Dean Earl Walker in August, 2001, the business faculty and staff pressed for development of a mentoring program.

ASSOCIATION HISTORY

Implementation. The Citadel Mentors Association was conceptualized in the Fall of 2001, supporting documents were prepared and proposed to a Mentors Association Board in February, 2002, mentors were recruited in the Fall and Spring of 2002, and the Pilot for the Program began in 2002. With Strauch's insights as a framework, the creation of The Citadel School of Business Administration and the arrival of Dean Walker were the catalysts needed to start the Program. Beyond Strauch and Walker, the Business School faculty were also convinced that their new School needed to reach out to the larger community to find friends, engage guest speakers, and ultimately to raise money for the School.

As the Department of Business Administration (the School was not formally created until the Fall of 2002 by The Citadel Board of Visitors) continued to develop its mission and values in the Fall of 2001, Strauch and Walker began their efforts to develop the Association. Equally prominent in the creation of the Mentors Association was Mr. Ray Johnson, retired Vice President of DuPont Fibers and a Citadel graduate. Johnson had started the Department of Business Administration Speaker's Bureau at The Citadel in the 1990s and wanted to involve retired executives in the Charleston area in Citadel affairs. This initiative had floundered. As Johnson, Strauch, and Walker continued to discuss their conviction that The Citadel Business School needed to involve executives, they decided that The Speaker's Bureau would not really have a dramatic impact on the students, because faculty can only

6

use so many executives in their classrooms. Furthermore executives as guest lecturers have only a limited involvement with students in class, thereby robbing them of extended opportunities to ask questions and learn from these talented people.

Johnson, Strauch, and Walker then settled on the idea of having selected students spend more time with a selected executive through a mentor relationship. They initially called their Program the "Citadel Mentors and Speaker's Bureau" later changed to just "The Citadel Mentors Association." As the Mentors Association developed Johnson went on to become the Mentors Association Founding Board Chair and was instrumental to its success.

They described the initiative as "a team of active and retired executives dedicated to developing a new team of leaders." And all agreed from the beginning that a rigidly structured program would fail. Our targeted executives were accustomed to running big companies and would not respond well to guidance that was too specific. Furthermore, since student needs differed so widely, Johnson, Strauch, and Walker were not sure that very specific guidance could even be constructed and thus would not be helpful. *Laissez-faire* for the Mentors Association was essential.

The three also decided that an orientation for prospective mentors was very important, because there were a number of educational and military issues that executives needed to understand. Since The Citadel is a military college, we used the term "Boot Camp" for this orientation.

The team did decide that suggestions to the new mentors were appropriate. Clearly Citadel students needed to learn more about such things as resume-writing, career selection, career path planning, dealing with office warfare, changing jobs, and finding a mentor in the work place. Etiquette at social events is also a central issue for many young people, and mentors are urged to take the student to a restaurant, country club or home.

Another issue was what to call the students who were being mentored. Two alternatives were "mentee" and "protégé." We decided against "protégé," because it suggested that the mentors were to recreate the students in their image. In fact the three hoped that the mentors would help the students find their strengths and preferences for a career and then act on these conclusions to envision a career. What they also were clear on was that the Mentors Association was not a "job-finding program." That is, mentors were not to find the students a job, but rather guide them to a career field and then assist them in discovering firms that would suit them. If suitable jobs for mentees came out of the Program all to the better, but job searches were not the central concern of the Association.

Creating an Advisory Board. With these considerations in mind, Strauch began preparing the documents for such a Program, and Walker continued his outreach to try to enhance the soon-to-be-created Business School. Strauch drafted the first document for what was then called the "Leaders and Mentors Association" and with editing from Walker the document was finalized on December 17, 2001.

Johnson, Strauch, and Walker then decided that an Advisory Board was needed to assess the prospects for this initiative. Johnson and Walker recruited four executives to meet with Strauch and Walker on February 12, 2002. At this meeting, the Advisory Board decided that this Program held great promise for Citadel students. Specifically the minutes from the meeting noted the following:

7

It was agreed that academic year 2002-03 would be a pilot program. Mentors will meet with students once a quarter and more frequently if interested. Each mentor will handle three cadets and three MBA students. There will be flexibility in any desired rotation or group changes. Mentors will have total flexibility in their activities. Objectives will be (a) career steering/pathing; (b) reinforcing what they already know, especially with cadets; (c) translating Citadel experience into corporate success; (d) helping them socially; and (d) showing that competence is more than technical skills -- it is attitude and character…. An orientation on the Citadel, especially the Corps of Cadets, will be conducted for the mentors, probably in May [2002].

Also agreed to at this Board meeting was that Strauch and Walker would draft a memorandum on how mentors and mentees might interact, would poll students on their interest in such a Program, would seek to find executives who were interested, and if there was interest among students and executives, the School would do the pilot in Academic Year 2002-2003. The "Rules of Engagement for the Pilot Program, Academic Year 2002-2003" was finalized on April 10, 2002.

Strauch discussed the Program with students in his classes and found considerable interest. In fact Strauch and Associate Dean Mark Bebensee were instrumental in recruiting students for the Program in the Spring of 2002. Generally these students were among our best and were all rising seniors. Many of the undergraduates were majoring in accounting. The MBA students were recruited in Strauch's graduate business law course. Thus, the Pilot Program was open only to invited students.

Johnson and Walker also found considerable interest among active and retired executives in the greater Charleston region. During the Fall and Spring of 2001-2002, Walker continued his outreach efforts and found a large trove of executives who expressed interest in working with students. Johnson was also successful among his friends on the Charleston barrier islands.

Although some of these executives were Citadel graduates, most in fact were not. The network of interested executives grew with surprising speed. Although some executives indicated that they were too busy for the Association, Johnson and Walker encountered no one who was skeptical or failed to see its value.

Based on these efforts, Walker decided that the School should move forward with the Pilot Program. Thereafter the Mentors Association Boot Camp was designed and then given to prospective mentors in three sessions during May and June, 2002.

Bebensee, Johnson, Strauch, and Walker knew from the beginning that the School would need support personnel. They found that the Citadel Honors Program had one full time faculty member and one part-time staff person with far fewer people to manage.

There were clearly many immediate issues that required staff support. Matching mentor and mentees was a difficult problem. And mentors were accustomed to getting immediate response to questions and concerns. They were also incredibly eager to please us and wanted reassurance they were on the right track. Thus two new members were added to the Mentors Association: Finance Professor Wes Jones became Deputy Director and Mrs. Lonnie Rewis became a part-time Mentors Association Coordinator.

8

Also implemented were certain procedures for students and mentors. Students were asked to contact their mentor soon after an assignment. And the Program stressed that the mentors should feel free to drop out if they find they were not having fun. Both mentors and mentees were given the right to "fire" each other. Thus mentors who found a student who was not responding could fire the student and be assigned a new one. Students who felt they did not have a good match could go back into the pool for the next available mentor.

Pilot Year. When the Pilot Program was launched on September 1, 2002, the Association consisted of 17 mentors and 36 students, 17 of whom were MBA students. Each of the mentors had at least one cadet and one MBA student. Table 1 displays the number of mentors and mentees as the Program has grown since the Pilot in 2002-2003.

TABLE 1: NUMBER OF MENTEES, MENTORS AND ORIENTATIONS
FOR THE CITADEL MENTORS ASSOCIATION[1]

Category		Year					
	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Mentees (Students)	36	58	109	172	204	203
Undergraduate	19	38	59	104	143	144
Graduate	17	20	50	68	60	59
Mentors[2]	17	44	76	117	146	149
Mentor Orientations Each Year	4	5	2	5	3	2

Notes: All data is from Mentors Association electronic and paper files maintained in The Citadel School of Business Administration.
1. 2002-2003 mentor and mentee data is for the beginning of the year; Mentor Orientations for 2002-2003 are actual end of year data. For all the other years, the data is for end of year.
2. Some mentors drop out each year, so numbers reflect actual mentors. Clearly recruiting of mentors has been ongoing and kept the numbers growing.

To implement the pilot, mentors were asked to provide a brief, one paragraph biography, and students were required to fill out an interest sheet. By way of example, Ray Johnson provided the following biography:

Raymond G. "Ray" Johnson retired as Vice President of manufacturing for DuPont's fibers business. Fibers were DuPont's largest chemicals and specialties business with revenues in excess of $6 billion. Prior to retirement he was responsible for all fiber plants in Europe and

9

the United States. After graduation from the Citadel he served as an officer in the US Army. Ray has been active in Citadel activities, serving previously on The Citadel Speakers Bureau. He now chairs The Citadel Mentors Association that is dedicated to mentoring cadet and MBA business students. Ray and his wife Anne live in Charleston and have three children and six grandchildren.

The student interest sheet asked for all contact information. We found that having personal emails cell phone numbers – especially for undergraduates – was crucial. It also asked for a list of career fields they were interested in pursuing, a list of hobbies, and a short paragraph indicating why they wanted a mentor and what they hoped to gain. Graduate students were asked for a resume so that mentors could learn about their work history.

The pilot was judged a success by the Business School faculty and staff. Thus in the Spring of 2003, Dean Walker decided that the Program should move to a full-fledged Association open to any Business School student. He also concluded that it needed to grow for clearly more mentors would be needed. Furthermore, the Program was embedded as a goal in the School vision for 2007. Faculty and staff have continued to actively encourage undergraduate and graduate students to enroll and as Table 1 makes clear the Program has seen considerable growth.

The Pilot did reveal a number of lessons. First, undergraduates needed to get a mentor earlier than their senior year. If mentors began the second half of their sophomore year, mentors could influence their course choices and their summer activities based on their interests. Thus if students were interested in marketing, they could take more marketing electives during their senior year. In addition students could seek an internship either during the academic year or in the summer and could find summer employment that exposed them to marketing firms. It became clear that even more staff support would ultimately be needed to sustain the ever-growing number of mentors and mentees.

We found that mentors like to get together not only with all the mentees, but also by themselves to get to know each other. Thus, as numbers continued to grow and social events were planned, staff support was needed to match mentors and mentees, help mentors and mentees who were not able to connect effectively, and coordinate breakfasts, lunches, and parties that brought members of the Association together.

The Pilot also demonstrated that mentors were referring mentees to other mentors whose specialties fit student career preferences. Thus a student may be interested in finance, be assigned a mentor based on that preference, and then decide later that a career in management was preferred. Thereby the mentor could seek another mentor with considerable management experience to counsel the student.

The School learned that an Advisory Board of executives was needed to oversee the Program. Initially the Board consisted of Johnson as Chair and later Mr. James Whetstone (a retired textile sales executive) as Vice Chair. Johnson and Whetstone soon learned they needed to draw in others to assist them.

Although the number of undergraduate students signing up for a mentor continued to grow, some were hesitant to contact their mentor. To the surprise of Association leaders, undergraduate mentees were rather intimidated by the backgrounds of the mentors and thus put off contacting them. Indeed,

10

mentors to undergraduates had to work harder to meet with them. To be successful, undergraduate mentors needed to contact their students first, plan an event, and strongly encourage the mentee to come. Once the relationship was established, communication and meetings were much easier.

Finally, it became very clear that faculty and staff advisors were crucial if the Program was to reach more of our students. Faculty needed to discuss the Mentors Association in their classes and emphasize the great help a mentor could provide in developing a career and getting a good start on a new job. As students visited the office seeking course counseling, faculty and staff had another great opportunity to encourage students to get a mentor. And mentees were instrumental in encouraging other students to sign up. In fact, the Association leaders and faculty concluded that the most effective sales tool we had was word-of-mouth promotion by mentees.

SUBSEQUENT MENTORS ASSOCIATION DEVELOPMENTS.

As the Mentors Association has continued to evolve over the period 2003-2008, staff have changed, The Dean retired and returned to faculty, social events were altered, processes were codified, and a sponsor for staff support stepped forward. After Mrs. Lonnie Rewis moved on to a new position in the Business School, Mrs. Connie Anthony, Mrs. Sandra Brown, and then Mrs. Jan Warner became the new Association coordinators. Anthony and Brown found new opportunities after one to two years, thereby requiring ongoing staff development and training. Their enthusiasm and efforts to sustain the Association were central to its growth and success. In fact when Anthony was offered a new position in the Business School, she was reluctant to give up her role as Mentors Association Coordinator; as she made clear to Dean Walker, she loved the students and the mentors so much that she was hesitant to accept a promotion!

The staff requirements have continued to grow substantially. Just the sheer number of students and mentors as well as working with the Advisory Board and planning social events required one-half the time of an hourly staff person by 2008.

Also the School hired two professional staff, an MBA Director and an undergraduate curriculum advisor. Both advise students and actively encourage them to sign up for the Association. After six years as Dean, Walker retired and became a full-time faculty member. The new Dean Ron Green was equally enthusiastic about the Program and in fact added more staff time to its ongoing management.

Leadership of the Association became a serious challenge. Mentors sought more communication, orientations required more coordination, and more involvement with the Advisory Board became more important. The Business School decided that using faculty as Directors, who could give only part-time attention to Association operations was not sufficient. So, the School decided that a paid Chief Operating Officer model was appropriate. This new COO was to dedicate four to six hours a week to Association affairs.

This model was instituted in January, 2008 with the Dean as the Chief Executive Officer, a paid faculty member as COO, and a Coordinator who assigned mentees to appropriate mentors and provided staff support to the COO and the Board. The COO's specific job responsibilities are to serve as the Association planner, the initiator for selecting new mentors, ongoing communication with existing mentors, and Advisory Board liaison. More specifically, the COO is to determine, formulate,

11

coordinate, and execute policies, procedures, and budget for the overall successful operation of the Mentor's Association as recommended by Mentors Association Board of Directors and approved by the Dean. Dean Green also asked Walker to serve as COO.

The budget for the Association also became an issue. Funds were needed to hire the COO and hold the social events that keep the mentors and mentees involved with each other. Fortunately a Citadel School of Business Administration Advisory Board Member Mr. Chip Coffee and Tidelands Bank stepped forward to provide funds to sustain ongoing activities.

The Board also changed as Johnson moved out of the area. Colonel Bill Crowe (a retired Air Force officer and corporate executive) was selected as Chair. Mrs. Elizabeth Prout (a financial executive for a Pharmaceutical firm) became Vice Chair for graduate students. Whetstone remained as Vice Chair for undergraduate students.

A number of social activities have been used for the mentors and mentees. Each Christmas, The Citadel Chorale does a concert; the Mentors Association has a reception before the event and then preferred seating is arranged for the mentors. Also each Fall, the Association has a lunch for all cadets and their mentors and a mentor breakfast to bring the mentors together. In the spring, there has been a barbecue for mentors followed by a baseball game with Charleston's Division AA professional team.

The COO and the Board have held meetings as often as once every two months and new processes have been developed. These include criteria for selecting mentors, objectives for mentors in working with students; suggested activities for mentors to do with their mentees, and a fact sheet on what life is like in the South Carolina Corps of Cadets.

After the second year Johnson and Whetstone developed a Mentors Association brochure for students and mentors. The brochure covered the mission and goals of the Program, the various firms that were represented by the mentors, and an application form that each student must fill out to obtain a mentor.

With the arrival of the new Dean, Whetstone and the new Board developed a second brochure. This one added new material to the first one and contains messages from the Dean and Mentors Association Advisory Board Chair as well as comments from students who have had mentors. They also developed a new logo of the new Cooper River Bridge in Charleston and a motto that reads: "Crossing the Bridge to Success in Business, the Military, and Public Service." Whetstone designed a pin and a bumper sticker that is being sent to all mentors along with a letter personally signed by The Citadel President Lieutenant General John Rosa (USAF, Retired)..

The Association has also begun to accept the top-ranked cadet officers in The Citadel South Carolina Corps of Cadets as mentees. The senior leadership of The Citadel Tactical Department saw the Association as a wonderful way to help senior cadet officers prepare for their jobs in leading the Cadet Corps and with subsequent career opportunities. The Association has also been willing to accept cadets outside the Business School, but has not advertised this opportunity widely – keeping peace among fellow Deans was important to Deans Walker and Green!

Recruiting Mentors. Recruiting and orienting mentors is a crucial Association issue. Given that the Association saw itself as a community of trusted individuals working with young people on their careers, selection needed to be done carefully. Johnson and Walker relied on their personal contacts or

12

on referrals. The first criteria for selecting mentors were substantial executive experience. By "executive" the Association meant that someone had been in charge of a number of others or possessed a major portfolio if a staff leader (such as a comptroller or manager of sales) and had at least four years of experience working as a manager or higher. The Association did not limit itself to just business leaders; clearly, governmental, professional, and not-for-profit service also qualified someone to be a mentor.

The other criteria were educational, ethical and interest in young people. That is, a mentor candidate needed at least an undergraduate and ideally a master's degree. He or she should be someone of high ethical standards and integrity as manifested by such indicators as corporate or professional ethics training (as in ongoing law or accounting courses), membership in a service organization such as Rotary, attendance at a military college, armed forces service as an officer, or living in college under an honor code. We also wanted people who were empathetic to and interested in young people (often manifested by expressed interest or passion in helping or having had children of his/her own).

Once a candidate had been identified, Johnson or Walker played golf or had a lunch with them. They found that asking questions and listening to others as they talked about their careers, their families, and their interests were highly effective devices to decide whether a candidate was appropriate for the Association. Not all interviewed were selected. Indeed there were a number of cases where it was clear that someone just did not fit the Association.

As the Board grew, all Board members as well as the Association CEO and COO became recruiters for the Association. Based on their recommendations, a candidate was required to attend the mentor orientation or "Boot Camp."

The mentors the Association has been able to recruit are remarkable. Not only are they enthusiastic about the Association and committed to developing young people, they have had successful careers with a number of organizations. The business organizations include the following: AT&T, Bankers Trust's, Bayer, Booz|Allen|Hamilton, Citigroup, Colgate-Palmolive, Corning, Deloitte & Touche, Eastman Kodak, Ernst & Young, ExxonMobil, General Foods, General Motors, Giant Cement, IBM, Kimberly-Clark Corporation, KPMG, JC Penney, Merrill Lynch, Oracle Corporation, Owens Corning, Parke-Davis, PricewaterhouseCoopers, Proctor and Gamble, RJR-Nabisco, Saatchi and Saatchi, Sears Roebuck, SmithKline French, United Technologies, Vought Aircraft Industries, and Xerox.

Others have been with governmental, health care, and not-for-profit organizations such as: the Botanical Gardens and Museum of Art in Nashville, Tennessee, the California Public Utilities Commission, Hogere Textile School at Tilburg (the Netherlands), INSEAD, the Institute of Certified Management Accountants, the Inter-American Development Bank, Roper St. Francis Healthcare, Palmetto Health Richland, the United States Army, the United States Customs Service, the United States Marine Corps, and the United States Postal Service.

13

A good number have been entrepreneurs as well as family and small businesses owners. Others are attorneys and one was a Watergate Prosecutor. Another mentor is the current CEO of the huge South Carolina power generator Santee Cooper. Still another had just retired as CEO of Bayer Crop Science.

They have attended a remarkable range of Universities to include: Berkeley, Barcelona Polytechnic (Spain), The Citadel, Clemson, Columbia, Cornell, Dartmouth, Duke, Emory, Fordham, Georgetown, Georgia Tech, Hamilton, Harvard, Indiana, Johns Hopkins, Michigan, MIT, Montana, New York University, North Carolina, Ohio State, Pepperdine, Pittsburgh, Princeton, Rutgers, Sorbonne, Stanford, Swarthmore, Syracuse, Tilburg (the Netherlands) the United States Military Academy, the United States Naval Academy, Utah, Villanova, Virginia, VPI, Wake Forest, Washington and Lee University, Wesleyan, Wharton, and Yale.

Clearly such diversity in experience and education has been of huge benefit to the Mentors Association and to Citadel students. What has not been detailed here is the equally extraordinary range of volunteer activities in which Citadel mentors have been engaged. Although most are not Rotarians, they have lived the Rotary motto of "Service Above Self" in their contributions to their communities.

Mentors Association Boot Camps.

Boot Camps are required for all mentors – no mentor was assigned a mentee until after Boot Camp attendance. Three hours were allocated for the event. In attendance were members of the Board, Association Directors, The Dean as CEO, the Associate Dean, the COO, representatives from The Citadel Tactical Department, and one or two mentees.

In three hours, mentor candidates find themselves bombarded with details. Clearly the special culture of The Citadel needed to be explained as well as details about the Business School's undergraduate and graduate programs. Furthermore, detailed documents were distributed about the School's mission, values, and vision; philosophy of the Program; and how mentors and mentees were assigned. To promote the Association goal of a community of Citadel mentors, all candidates were also given a complete list of all mentors to include their contact information and their biographies.

In keeping with our conviction that the Association would not survive if heavily structured, the Boot Camps do not get specific about how mentors and mentees should interact. Thus, Boot Camps outline some basic objectives but stress that mentors have extensive experience in developing people and do not need the Association managing their interaction with the students. We do hand out a potential activities guide that could be used or ignored at will. Thus, suggestions are made to the mentors about what meetings with mentees might cover, how frequently mentors might meet with mentees, where and when meetings might take place, and the kinds of relationships that had occurred between some mentors and mentees. For example one mentor who was a consultant to the CEO of a Fortune 50 company flew his mentee to a consulting meeting and let him listen in as the CEO and the consultant discussed ongoing challenges facing the firm.

To sign up, mentor candidates were asked to either fill out a form or email a message with all contact information and a brief biography. Our experience was that almost everyone who attended one of the Boot Camps joined the Association.

14

Recruiting and Assigning Mentees. To the Association leadership's surprise, mentees did not initially flock to the Program. Clearly the issues were time and intimidation. That is, undergraduate cadets already had very full schedules. The 24-hour cadet schedule kept the undergraduates mostly overwhelmed with their day-to-day requirements. The MBA students were also fully engaged with their courses, work, and family life.

Intimidation also played a role. Reading of the backgrounds of the mentors both undergraduates and graduate students were hesitant to sign up.

Clearly the Business School faculty, staff, and the Association had to play a more prominent role in getting them all to realize the opportunity that having a mentor would do to enhance their careers. So after the pilot year when mentees were mostly hand-picked by Bebensee and Strauch, the faculty began to play a more prominent role in encouraging students to sign up. They did this by talking more about the Association in class and inviting Mentors Association Board members to their classes.

The addition of Business School professional staff who advised undergraduate and graduate students also played a key role. As these advisors were the initial contacts that students had with the Business School; their involvement was crucial in the development of the program,

Once a student signed up, the Association Coordinator assigned him or her to a mentor. The matches were made primarily on career interests on the part of the students and career experiences on the part of the mentors. The Association was able to use on a computer program written by a graduate student to help with the matching process. However, the Coordinator still needed to spend considerable time working on the matches.

However, given that many mentors wanted only one student and sometimes preferred an undergraduate or graduate student, mentors with the appropriate career experiences were not always available. Therefore mentees could also be assigned based on their hobbies. Thus a golfer could be matched with a mentor who loved golf. Interestingly these matches seemed to work out as well as those assigned on career interests, particularly for the undergraduates. The undergraduates so often had little idea of their strengths or career interests. They needed help in discerning their strengths and interests and then uncovering opportunities that existed in the marketplace.

What was not accomplished by 2008 was a Mentee Boot Camp, in which prospective mentees were told of the Program. This was discussed frequently by the Board, but usually set aside as the students were seen as too busy and unlikely to attend.

In a small number of cases, students disengaged from the Program. That is, some never contacted their mentors, while others had one or two meetings and showed no further interest in continuing the relationship. This was most frustrating to the mentors who expected students to be responsive and involved. Therefore, the Association leaders and staff found themselves firing such students from the Program and working to smooth relationships with the mentor.

RESULTS

So what have been the results for the Mentors Association? That is, has the Association in fact improved career planning and prospects for Citadel students? We are confident but not fully convinced that the Association has had a profound impact on students. So far our data is anecdotal. As mentees graduate, they tend to move on with their lives and generally do not stay in touch with us.

Our confidence in the value added as a result of the program comes from a variety of sources. First, some of the mentors as well as some mentees have shared their stories with us. Furthermore, faculty report that students in class talk openly about the impact that mentors have had on their thinking, their planning, and their futures.

We will, in this section, share some of the more dramatic stories of students finding their way to careers that suit them as well as exciting new jobs they have found. To better understand how much the Program has helped, one must first realize that The Citadel itself has very little data on the impact its undergraduate cadet experience or its graduate program has on its graduates. And The Citadel has always had a bit of an inferiority complex sometimes being labeled as just "a small Southern School."

Furthermore, although The Citadel has fine Directors of Career Services and Alumni Affairs, their offices are woefully understaffed by the standards of many other Universities. Part of this shortfall has sprung from the fact that South Carolina does not have a sparkling economy and tends to fund its educational institutions in rather limited ways. Thus, graduates have not had access to exciting opportunities in highly demanding jobs where they can showcase their skills.

Consequently, it has been rather rare for them to find their way to the big accounting firms, exciting financial organizations, or Fortune 100 firms in the last several decades. Before then, while the draft still existed, most of the undergraduate cadets served in the armed forces. And they chose to do so as officers, commissioned upon graduation as military second lieutenants or ensigns. Such a beginning for their careers exposed them to a wider world and some of the challenging and rewarding jobs that were available beyond South Carolina. And a good number found such jobs.

The MBA students have also suffered from this sense of inferiority and lack of career counseling. Most of them appear to have remained in the Charleston region or in South Carolina and have not sought a wider world of opportunity. Thus the world-views of our mentors have had a huge impact on all our students' sense of opportunities beyond their own community as well as upon their confidence that they too could compete in a wider world.

Success Stories. As Beatty (all names used here are fictitious) pointed out in a recent telephone conversation with Walker, "the Mentors Association has been a wonderful experience for me. I have had five mentees. Three of them were terrific, one was OK, and one disappeared after several meetings. I am still in touch with the three who I think I helped a lot."

16

He went on to talk of one undergraduate mentee who managed to land a high paying job with J.P. Morgan in Houston. The student went through a Citadel graduate to find the firm. As an indicator of this student's thoroughness, Smith pointed out that he had been with a large financial firm, connected the mentee with that firm and found out that soon thereafter the student was interviewing the conglomerate's Senior Vice President in New York City!

He concluded that of the three large Universities he worked with –one of these is a large state University where he is the Alumni Association Chair, none were doing this as well as The Citadel. In fact, he had concluded that programs such as these keep alumni connected to the school and build camaraderie between the school and the alumni.

In describing his overall experience with The Citadel Mentors Association, he noted, "I am finding that the Program is as good for me as for the mentee. I bring them right into my home and make them part of my family." And as he did this, he found that he was helping the mentees "more with life lessons," and those were more important than the business lessons." For example with the student he helped place at J.P. Morgan, he found that he had a rough upbringing. "My family and I helped him with the needed social graces." Clearly this same lesson is true at many Universities, where many are first generation college students. Such students clearly need help with life lessons and social graces.

In another case Mentor Charles came to The Citadel School of Business Administration as a clinical professor of accounting. He was a great teacher and soon grew interested in the Mentors Association. After Bootcamp, he began work with undergraduate student Dennis. He was so impressed with Dennis that he introduced him to his son who worked in investment banking in New York.

At that firm, Dennis successfully interviewed for a summer internship and found himself among an intern group that was entirely Ivy League. He performed so well he was given a job offer right at the end of the summer. We learned via back-channels that the senior partners were actually fighting over who got him as a trainee. Clearly Dennis was very capable and exemplified some of the best qualities of our graduates. Clearly the mentors program gave him the contacts to get out into a larger world and truly excel.

Undergraduate student Eustis was one of the first women to attend The Citadel and found herself a bit daunted by the future. She took the general legal environment course and was inspired to pursue law school. Her mentor Fabian had a highly successful career at DuPont, rising to be one of its most senior executives. Eustis and Fabian hit it off because she was from Delaware as is the DuPont headquarters.

Fabian sent Eustis to DuPont headquarters and had her introduced to the corporate counsel, but also insisted that she visit the senior executives in other divisions. In the course of the visit, she talked with a senior production executive and toured the manufacturing operation. Utterly enthused, she successfully interviewed for a job at DuPont in production. After a several year job in production, she subsequently decided to go to law school.

17

Graduate student Lane was a technician at the Medical University of South Carolina. She and her mentor discussed a wide variety of topics in addition to her employment choices. They talked about management accounting and finance in the airline industry, even into details about how to handle lost revenue opportunities when a plane takes off with empty seats. They discussed "just in time" inventory to see if its impact on profitability had been maximized.

They then moved on to discuss her career. Lane and her mentor discussed how best to leverage her medical and scientific experience. After agreeing the growth potential in the pharmaceutical business is extraordinary, the mentor suggested she investigate areas of marketing as that was her MBA specialty. She dug into product management, sales and medical advertising agencies. He was able to direct her to another mentor with more relevant experience in the industry. It appears she has found her niche.

Undergraduate student Mike was in the Navy ROTC Program at the Citadel. His mentor had been a naval officer. The two hit it off. Mike was interested in the nuclear power program and the mentor lined him up to meet a senior admiral in that field. Mike was also referred to books to read by his mentor. As Mike said to Walker, the mentor provided him with the "best professional development books that I have ever read." The student is now in the Navy and well launched.

Graduate student Nance was stumbling about in his career. As he noted,

> I spent most of my undergraduate career worrying about what I would do with my life, while my post graduate career was spent searching for where I would fit within my chosen profession. With the help of my mentor and the [Mentors Association], I discovered my entrepreneurial spirit and a refreshing professional environment with [a bank in South Carolina]. I am excited at the opportunities ahead for me at [my bank] and the chance to work for one of the fastest growing small businesses in South Carolina.

Mentor Ohio was assigned an undergraduate student who had a life goal of being an airline pilot. The student and Ohio met and talked often. His mentor suggested that there were other alternatives and convinced him to consider other opportunities. The student found an opportunity in Washington through The Citadel School of Business Administration and Mentors Association network. He is now an executive assistant to a senior vice president of a huge aerospace firm in Washington. As he noted, "How many college graduates can say they spend 3 to 4 days out of a week on Capitol Hill in a limousine or Mercedes Benz S500?"

Graduate student Price was a successful pharmaceutical representative but engaged to a medical student who would most likely be moving for his residency. Her mentor discussed how to maximize her opportunities within her current company to secure a spot in a new city. They discussed her desire to get involved in local charity boards and the ethics of taking such a position if she knew she was moving very soon. When the fiancé received his residency slot, her mentor wrote a letter of recommendation to a new university's MBA program and was invited to her wedding. Clearly Price found her mentor to be a huge help.

18

Mentor <u>Roberts</u> was brought into the Association through Mentor <u>Smith</u>. Smith had extensive management experience in both large corporations and smaller independent companies focusing on electronics, consumer products, healthcare and biomedical services. Mentor Smith found himself with a student who was interested in accounting, and realizing that he could not help with the student interested in accounting, he called on his neighbor Roberts. Roberts, who had been a Vice Chair of a Big Four Accounting Firm helped counsel the student, enjoyed it, and soon found himself at Mentors Association Bootcamp.

After Bootcamp, Mentor Roberts has worked with several students, two of whom have found their way to his old firm. But Roberts also found himself with a Citadel football player whose family was involved with a pest control firm. The football player needed considerable coaching on social and life skills. And Roberts reports considerable improvement in the mentee's skills to interact with others.

Roberts counsels all his students to develop an "Elevator Speech." That is, he coaches them to imagine they have 30 seconds in an elevator to tell a senior executive who they are and what skills they possess. He even takes them to The Citadel Library to rehearse this over and over so, in his words, "They can say it in their sleep." This exercise has clearly helped his mentees.

CONCLUSIONS

Current business school professional concerns are focused on measuring and achieving better out-puts in the classroom. Yet a disjuncture or gap exists between the classroom and the job market that has far more serious consequences than weak coverage in a narrow subject area. Failure to formulate career goals and career paths can result in extending the college time well beyond four years and then after graduation selecting jobs by default rather than design.

On a national basis, the business community has institutionalized the junior summer internship as a sound method of evaluating job-readiness of potential employees. Yet students must be motivated at least by sophomore year or soon after their entry into the MBA Program to navigate their own futures. The Citadel Mentors Program is our response to this problem. It is a promising strategy for bridging this gap and a potential national model.

The Mentors Association began with the advantage of an affluent retirement community and a highly organized Corps of Cadets with total accountability for their time. This filled our mentor rolls rapidly and made student organization fairly easy. We know from our success stories that we are having a big impact on both students and mentors.

But, as is also clear, the evidence is anecdotal so far. What the Mentors Association needs is to find an economical way to measure outcomes in a field – mentoring – that is subtle and highly personal. The challenge is much like trying to decide how successful college professors are in educating students. To date most of our measures of teaching and learning are not well developed.

19

This experiment in student mentoring is still relatively young. As of 2008, the Program has been in existence for only six years. It has called for many resources from the School, but it has also dramatically enhanced the reputation of the Business School as an innovative force in education. And it has involved many executives in the School. They have served the School on its Advisory Board, as full-time clinical faculty, and guest lecturers. Furthermore, the Program has opened doors in the South Carolina Lowcountry for the School to be involved much more deeply in organizational development, consulting, and finding guest lecturers in our courses.

Its success is due to the leadership of the Business School faculty and staff who have been enthusiastic and supportive. Furthermore, The Citadel's top leadership has also promoted the Association and provided needed resources to sustain it. We expect more research to grow out of our preliminary efforts here and would welcome your ideas.

20

Endnotes:

[1]This article is constructed from documents prepared by The Citadel School of Business Administration, over 200 contemporaneous emails saved in The Citadel server and available to Walker, and the memories of the authors who were direct participants in the development of The Citadel Mentors Association. The data was developed by the staff of the Association.

FACULTY ASSESSMENT OF INTERNSHIPS:
CREATING A BETTER SYSTEM

Suzanne J. Smith, Department of Business Administration,
Presbyterian College, 503 S Broad St, Clinton, SC 29325
(864) 833-8454, ssmith@presby.edu

Linda Jameison, Director of Career Services and Internships,
Presbyterian College, 503 S Broad St, Clinton, SC 29325
(864) 833-8379, ljameison@presby.edu

ABSTRACT

Internships are growing in popularity and importance. Students, employers, and educators have seen the importance of well-designed internship programs in strengthening a student's understanding of classroom knowledge and readiness for full time work. Employers have identified "faculty-evaluated internships" as the most significant determinant of recent college graduates' success in a job. [18] This paper examines the existing degree of faculty supervision involved in internships at fourteen institutions of higher education in the US. It also reviews the processes, roles, and time commitments faculty members have with the employer, the student, and career services. It reports what employers say they want with respect to faculty involvement in the oversight and evaluation process. Findings indicate that most schools implement one of three models of supervision, and these systems have evolved over time at each institution based on resources and staffing expertise and interest. Colleges and universities must review their own missions to determine whether current models need further clarification, faculty compensation, and support from career services.

INTRODUCTION

Internships have received more attention in recent years as college students, their parents, and employers have realized the value of these experiences in strengthening an applicant's worth as a new employee. The Peter D. Hart Research Associates, Inc. released a survey of 301employers on behalf of The Association of American Colleges and Universities on January 9, 2008 to determine how these employers perceive different elements in a student's college experience. [18] Many media outlets picked up on this study and reported these findings as important to improving job-readiness after college. [15] [24]

This study made clear that employers consider traditional college assessment mechanisms such as multiple choice or essay tests as less effective at evaluating and preparing students for careers. These employers were less than impressed at the effectiveness of such modern improvements such as electronic portfolios, perhaps because they do not understand them or do not want to take the time to review them.

Employers gave higher credibility to a student's senior project as an effective tool in demonstrating depth of knowledge. However, the element which employers rated as "very

effective" most frequently was participating in a faculty-evaluated internship or a community-based project in which students apply college learning in a real-world setting. Figures 1 and 2 show the proportion of employers who rated these assessments as "fairly useful" and "very useful."

Figure 1. Employer Assessment of College Graduates' Skills/Knowledge [18]
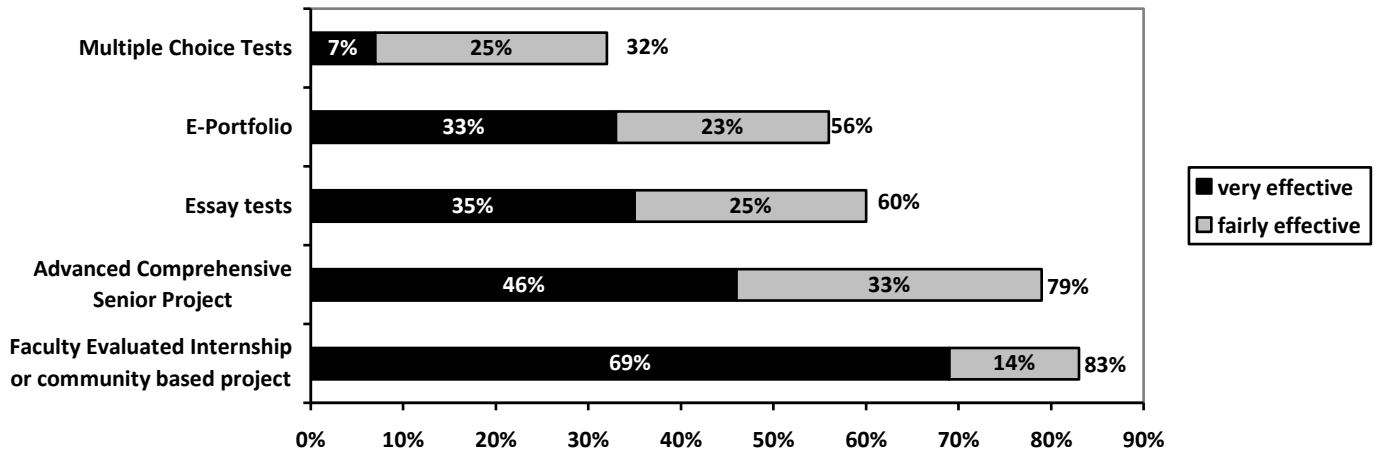
Figure 2. Employers' Opinion of Assessments' Usefulness in Evaluating College Graduates' Potential for Success [18]
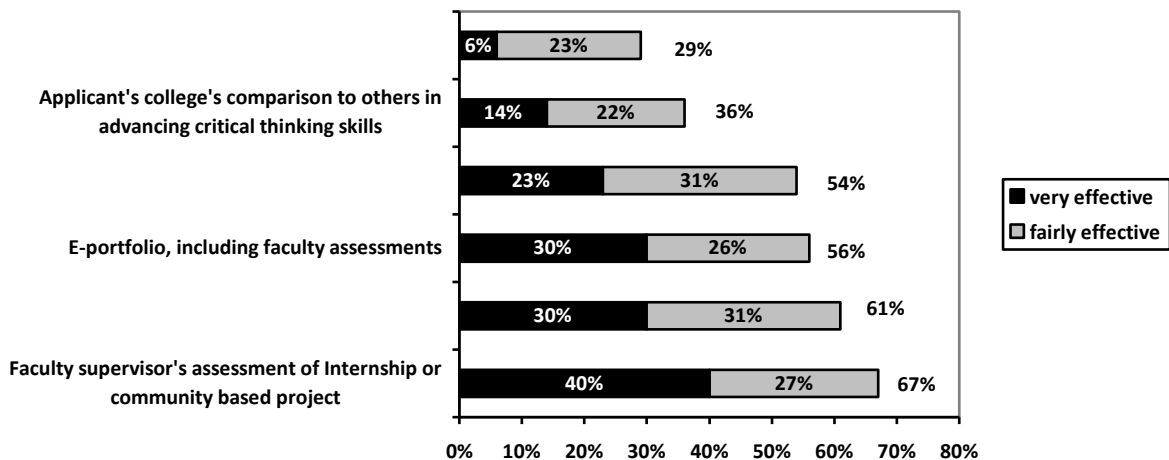
According to a representative of the Peter D. Hart Research Associates, "faculty-evaluated" simply meant that the student received college credit for doing the internship. It is different from a part time job in that faculty members were involved at some level in overseeing this student's experience. There were no other specifics involved in the definition of this term.

This study will examine the different interpretations of "faculty-evaluated" internships by reporting on the range of common practice of faculty supervision of internships at a variety of

types of colleges and universities in several US states. It will also report on what employers expect or want with respect to that level of supervision.   For the purposes of this paper, the scope will be limited to business administration or business-related majors rather than a wider variety of disciplines. Other fields such as psychology, health care, and education internships or practicum experiences are often supervised more closely by faculty members because of the specificity of the knowledge and skills they practice.

DEFINING CHARACTERISTICS OF AN INTERNSHIP

An intern is "one who works in a temporary position with an emphasis on on-the-job training rather than merely employment." [25] Almost all colleges and universities offer credit bearing internships as a way to supplement the curriculum for upper level students. Employers consistently identify internships as one of the best indicators of future success. [16] [18] [20] One expert estimates that about 78% of college students in 2008 said they plan to complete at least one internship before graduation. [3] While that figure sounds a bit high, it is clear that employers, parents, and students recognize the value of this experiential education.

Students participating in an internship program may or may not receive a paycheck from the organization. Factors which influence payment depend of competitiveness of the position, the degree of skill required, and the nature of the organization (non-profits generally do not pay interns). Some prestigious internship roles have gone up for auction at charity fundraising events, and parents have paid up to $5000 for the opportunity for their son or daughter to work as an intern for top tier companies such as Miramax, Nuveen, and JPMorgan Chase. [10] Recruitment for the most prized top ten percent of internships (Microsoft, Google, and Disney) begins ten months prior to the start of the internship. These slots are filled by New Year's Day. [3]

Some schools require internships as part of a menu of general education experiential learning options. One scholar recommends requiring internships of all business students as part of the curriculum. He points out the value of having a trial run at a job for both the student and the employer. In addition, he extends this concept to faculty members as he proposes "introducing faculty sabbaticals in the industry during which faculty members will handles management responsibility in business." [2]

An internship is not a part time job.   Internships can be paid or unpaid, and interns can work with large, prestigious corporations or small non-profits. Regardless of these factors, college students who participate in internships should develop transferrable skills. They may learn how to supervise projects, plan events, build client relationships, support team members, or improve spreadsheet management for organizations. In the process, they also learn about organizational dynamics and how to manage their own time and priorities. Effective internship programs restrict the amount of clerical responsibilities assigned to interns and recommend that students participate in a least one project of significance to the organization.

CURRENT PRACTICES AT COLLEGES AND UNIVERSITIES

This study surveyed faculty members, career services professionals, and/or website information at fourteen colleges and universities regarding business-related undergraduate internships. Most of these schools were located in the southeast and represented a wide range of types of institutions in higher education: technical colleges, private liberal arts colleges, and small and large public universities. Several themes emerged with respect to the organization and supervision of internships:

1. All schools have developed their own systems based on the skill sets and resources available at their institution.
2. These systems have evolved over time into their current state, and there is not a common administrative system in place in higher education for supervision internships.
3. Both faculty members and career services professionals have important contributions to make in the internship process.
4. Almost all the schools offered internships for academic credit; one school restricted internship credit to a "transcript designation" rather than hours toward graduation. Only one school gave students grades which factor into the GPA.

What follows is an attempt to categorize each of the fourteen separate systems into five models. Not all of the schools within each model shared exactly the same details, but there were enough similarities to group them together.

1. **Informal:** The first internship model is very informal. The student approaches an employer and asks to participate in an internship. The student then selects a faculty member as the internship advisor. The college requires the student to keep a log of working hours and a journal of internship activities. At the end of the internship the student submits a summary paper of the internship. It is unlikely that the student will see written feedback on that document, though faculty members often provide verbal affirmation of the work. The professional supervisor sometimes provides a written evaluation of the student's work. The faculty member reviews the materials and assigns a grade of either of "satisfactory" or "unsatisfactory" (pass/fail). There were very few cases of unsatisfactory work. Most faculty members do not make contact with employers unless they deem it necessary to follow up on a problem. Career services may or may not be aware of the internship, and they do not share responsibility for supporting interns with the faculty member.

2. **a. Designated Faculty Internship Coordinator:** In the second model, a designated faculty member (or members) serves as internship coordinator(s) for the major/department. The coordinator typically receives one course release per academic year. The intern is required to submit weekly or bi-weekly e-mail reports during the internship. The e-mails were quick checks designed simply to touch base with the student, but occasionally the e-mails help address problems which develop in the internship. This model also requires a log of hours, journal, and the same grading process as the first model. In addition, the faculty member sometimes requires interns to read a book or complete a personal skills assessment in order to learn more about themselves

and strengthen their work habits. A final project or presentation is also part of this model. One school had a variation on this framework by designating the Dean of the Business School as the internship coordinator.

2. **b. Designated Faculty Internship Coordinator with Graded Internship:** This model expands on the previous model by requiring the faculty coordinator to meet at least once at the job site with the professional supervisor. This model also requires more of the student, including a project, presentation, an interview of the supervisor about business ethics, and a handwritten thank you note to the supervisor (photocopied for the faculty member). The school which has developed this model requires the faculty member to assign letter grades based on a complex point system designed for the course.

3. **Career Services/Faculty Partnership:** The final model features a partnership between the Office of Career Services and faculty members. Career services professionals are active participants in the process and help coordinate activities between the student, faculty, and professional sponsor. They require regular contact with the student during the internship in the form of personal appointments, assigned readings, and/ or group class meetings. Interns also meet with faculty members to discuss discipline-specific components of the internship once or twice during the semester. Faculty members review and evaluate logs, journals, and summary papers. The Career Services representative is the school-designated contact point for the professional supervisor.

Each of these models offers strengths and weaknesses. The informal model relies on student initiative to achieve success. It expects little of faculty members, but it also fails to compensate their efforts. The second model compensates faculty members with a course reduction. Its success depends on the faculty member's ability to motivate students to make the most of their internships. Faculty coordinators can promote learning through group discussions, assigned readings, and reflective experience papers and presentations. The final model does not compensate faculty members, but it shares the responsibility for motivating student learning with the Office of Career services.

The issue of assigning letter grades versus pass/fail credit is one that every school must address. One institution said they assigned grades at one point, but they soon learned that students with low GPAs flocked to the internship experiences primarily as a way to boost GPA. The faculty member at the only university in the survey which does assign grades said that the process of achieving a high letter grade is rigorous and not perceived as an easy A.

 Table 1 summarizes pertinent dimensions of the internship experience. While this paper outlines several models, each school chooses different levels of faculty involvement in the internship process, and not all programs may fit neatly into these four models. The table is not meant to suggest that all faculty members should be involved at the highest level. Rather, it is a tool to break down the components of faculty oversight in the internship process and help each school evaluate how best to use current skill sets and resources.

Table 1. Faculty Involvement in Supervision Student Internships

Area of Faculty Oversight	Level of Faculty Involvement		
	Low	Medium	High
Reviewing Student Internship Journals	turn in at end, no feedback	receive weekly, no feedback	receive weekly and provide feedback
Meet individually with interns	once	two or three times	weekly
Transcript designation/ credit bearing/grade	transcript designation	pass/fail credits	graded credit
Class or group meeting	none	once or twice	weekly, bi-weekly, or monthly
Required readings	none	recommended, not required	required and critiqued
Project/paper/presentation	none	required, no feedback	required and critiqued
Site visit	none	phone or e-mail contact	meet once at site with additional phone/e-mail contact
Approval of location	defer to student and sign form	defer to student and Career Services, sign form	intentionally collaborate with student, Career Services, and employer; sign form

WHAT EMPLOYERS WANT AND NEED

Yearly, NACE (National Association of Colleges and Employers) conducts the Jobs Outlook survey of employers to identify hiring trends and needs. The result of Job Outlook 2008 is that employers want qualified applicants for full time positions with the top rated skills of communication, work ethic, team work, initiative, interpersonal and problem solving skills. An overwhelming number of respondents (95%) factor in candidate experience when making hiring decisions. Coplin outlined how internships help students gain skills that employers are looking for. [7] Therefore it is understandable that almost half of the employers surveyed in NACE's report prefer that the college graduate have internship or cooperative education experience that help to establish the required skill set that employers need.

Employers prefer interaction with a campus supervisor to help the intern employer define the expectations for the student. The sample of employers queried for this paper indicates that campus supervision of the student's learning is through faculty, career services, or even coaches. The administration of the internship (placement, processing evaluations and assignments) is most often through career services. The roles of campus supervision may vary, but the end goal is for the employer to understand expectations and to create consistency where applicable for the process.

Employers want to have interaction with faculty, but on a limited face to face basis. Comments included "checking in with the intern during the summer and at the end with the employer." [5] A faculty visit should be scheduled so that all parties are available to provide feedback and the site visit does not impede the work that is in process. Meeting occasionally is a "way for companies to connect with professors."[17] Learning about the organization can provide information that could "assist faculty as they design curricula." [14] These comments reflect the need to create relationships with employers that can provide context in the classroom to real world application.

Ongoing involvement of faculty with the student and employer during the internship may not be practical given proprietary interests of the employer. They may require the faculty to sign confidentiality agreements. Under these circumstances, the faculty member can be a partner in the project and provide advice to the student and the company. They witness how the student applies academic work (theory) to real world problems (practice). The campus supervisor also sees how well the student gains transferable skills and how they handle conflict and challenges in the workplace. If faculty cannot be directly involved in the workplace, follow up with the student on campus through assignments (journals) and small group sessions can reflect the learning process. Students who process work performed through the internship in small group synthesis skills learned that are required by employers [9].

From the employer's perspective, the role of the faculty member is to establish the learning objectives with the student at the beginning of the internship. The employer then will use these objectives to assess the student at the end of the internship. All employers surveyed want to provide evaluations. Having the evaluation parameters will ensure that the company and faculty provide information that will be valuable to the end learning objectives of the student [14].

MOTIVATING FACULTY TO PARTICIPATE

Faculty members who supervise internships without compensation need structure and clarity regarding their responsibilities in order to help the intern achieve success. There is a wide range of levels of involvement for uncompensated campus supervisors. Some take this role very seriously and view it as an opportunity to mentor students in their careers. They probe students more deeply with tough questions, and they touch base with employers to confirm that the internship is working out well. Others see their role in the process as a burden and minimize contact with the student and employer. Those faculty members who take it seriously tend to take on a greater number of students in this role than others in their department, thus adding to the time they already spend in the process.

For faculty members supervising informal, uncompensated internships, career services personnel should work with deans and department chairs to create clear expectations. Workable frameworks may include checklists, scheduled meetings, and suggested questions to prompt interns as they relate their work experience to course content. Deans need to evaluate whether this informal model is achieving the student learning outcomes. If there is not a critical mass of students to create a class, then perhaps there could be other ways of crediting or compensating professors who do a good job, either financially or non-financially. Professors could receive a

stipend based on the number of students supervised effectively. Internship supervision could factor into tenure and promotion decisions and in the post-tenure review process.

Schools offering course reductions for faculty members identify 15-20 as the range of students equating to one course. One professor estimates that he spends about 8-10 hours supervising each student's 3-hour internship. [22] Supervising internships effectively takes time.

When campus supervisors lead internships as part of a course reduction, they develop their own structure for evaluating interns. Included in this structure should be evaluation forms identifying the criteria and method for the intern's performance appraisal by the faculty member.   The readings and personal assessment options will vary with each faculty member, but they will connect classroom learning and personal habits to success in the workplace.

Partnerships between career services and faculty members can make the faculty member's time more efficient.

CONCLUSIONS

Internships offer a win-win-win opportunity. They are good for students, employers, and higher education.   Internships strengthen classroom education by giving students a chance to put their skills and knowledge to work. Students can build stronger resumes, and they can evaluate whether an organization or career path is a good fit. Internships are good for the employers because the interns provide expertise, fresh ideas, and inexpensive (or free) employment. Many employers view the internships as a trial run for prospective full time hires, and NACE estimates that 30% of interns receive job offers.[20] Finally, they are good for the college or university because they support educational goals and strengthen ties to outside organizations. The intern's success reflects favorably on the intern, the organization, and the school.

Employers in the AACU study respect faculty involvement in the student internship experience. The question that remains is the definition of faculty involvement. An internship has several individual and institutional stakeholders: students, faculty, employers, career services, and the college or university. The different stakeholders provide different definitions, but the end goal is similar: provide an experience that helps the student gain transferable skills. The range of responses reviewed for this paper from faculty, career services and employers indicates that each institution creates a program and policy that emerges over time.

Employers recognize that the skills students gain through an internship will be integrated into the students' overall knowledge base when follow up with campus supervision is an element of the process. Career services professionals build employer relationships to support internships and full time employment opportunities. Their involvement also support overall vocational development. Faculty can provide a framework for students to integrate classroom learning with real world application. The level of involvement varies depending on resources available and curriculum expectations. Each of these stakeholders have an interest in providing feedback that can help a college have a more effective internship policy that aligns with the college's mission.

REFERENCES

[1] Albergotti, Reed, et. al, "America's A-List Internships." *The Wall Street Journal*, February 18, 2005.

[2] Bagchi, Prabir K. "Management Education at a Crossroads: Some Insights for Reengineering." *Decision Line*, July 2007, pp. 11-16.

[3] Belkin, Lisa. "Who Will You Be This Summer?" The New York Times, January 6, 2008.

[4] Catawba College Website, http://www.catawba.edu/academic/business/internhips.asp, viewed September 12, 2008.

[5] Caudle, Amy. Enterprise Rent-a-Car, Greer, SC. Personal communication, September 18, 2008

[6] Chaker, Anne Marie. "Summer Internships Can Carry a Price." *The Wall Street Journal*, June 29, 2006, p. D1.

[7] Coplin, William D.(2003) "10 Things employers want you to learn in college: The know-how you need to succeed. Ten Speed Press; Berkeley, CA.

[8] Erskine College Website, http://www.erskine.edu/academics/business-admin/business-required.shtml/ , viewed September 12, 2008.

[9] Exley, Kate & Dennick, Reg (2004). "Small group teaching: Tutorials, seminars and beyond". Routledge Falmer: New York, NY

[10] Fried, Joseph P. "Job Requiirement." *The New York Times*, January 6, 2008.

[11] Gamerman, Ellen. "Internships for Sale." *The Wall Street Journal*, June 10, 2006, p. P1.

[12] Georgia Southwestern State University Website, http://www.gsw.edu/SOBA/Internship.shtml, viewed September 13, 2008.

[13] Gruben, Kathleen, Marketing internship coordinator, Georgia Southern University, email received September 17, 2008.

[14] Hammett, Patsy. Milliken Inc., Spartanburg, SC. Personal communication, September 16, 2008

[15] Marklein, Mary Beth. "Employers want new way to judge graduates beyond tests, grades." *USA Today*, January 22, 2008.

[16] NACE Research. "Job Outlook 2008". Copyright 2007, National Association of Colleges and Employers, Bethlehem, PA

[17] Patton, Colleen. Blackbaud, Charleston, SC. Personal communication, September 16, 2008.

[18] Peter D. Hart Research Associates. "How Should Colleges Assess and Improve Student Learning? Employers' Views on the Accountability Challenge." http://www.aacu.org/LEAP/documents/2008_Business_Leader_Poll.pdf , viewed March 15, 2008.

[19] Pierce, Marianne. Director of Undergraduate Research and Internships, Furman University, Greenville, SC. Telephone interview, September 12, 2008.

[20] Simon, Anna. "Internships gain new popularity in job market." *The Greenville News*, July 29, 2006, p. A1.

[21] Smith, Chrisjon. Winthrop University, Rock Hill, SC. Telephone interview, September 12, 2008.

[22] Tolbert, Sam. College of Business & Public Affairs, Lander University, Greenwood, SC. Telephone interview, September 10, 2008.

[23] University of Minnesota-Duluth Website, http://www.d.umn.edu/lsbe/internships/internships.php, viewed September 13, 2008.

[24] Wasley, Paula. "Tests Aren't the Best Way to Evaluate Graduates' Skills, Business Leaders Say in Survey." *The Chronicle of Higher Education*, January 23, 2008.

[25] Wikipedia, http://en.wikipedia.org/wiki/Intern , viewed October 9, 2008.

[26] Winston Salem State University website, http://www.wssu.edu/WSSU/ About/Administration/Division+of+Student+Affairs/Career+Services/Co-op+-+Internship.htm, viewed October 9, 2008.

SUMMER INTERNATIONAL INTERNSHIP IN CHINA FOR UNDERGRADUATE ACCOUNTING STUDENTS: AN EXPERIENTIAL LEARNING APPROACH

Sean Chen, Department of Business & Accounting
Furman University, Greenville, SC 29613. (864) 294-3554, sean.chen@furman.edu

INTRODUCTION: THE 2008 SUMMER CHINA INTERNSHIP

This paper introduces the 2008 Summer China Internship(2008 SCI), a program at Furman University that is funded by the Hollingsworth International Internship Scholarship and was designed expressly for undergraduate business and accounting students who wish to have a summer international internship experience. The 2008 SCI was a preliminary field study to examine the feasibility of establishing other similar study-away programs in China in the future. With the experience and insights gained from the 2008 SCI program, a 2009 May-Experience program entitled, "Business Practices in China," a summer study-away program, has been approved by the University, and the recruiting process has begun.

MAJOR COMPONENTS OF THE 2008 SUMMER CHINA INTERNSHIP

The major component of the 2008 SCI was a two-week supervised summer internship in Suzhou Industrial Park in Suzhou, China. In addition, the program includes a variety of cultural heritage visits to historical sites in Suzhou; supervised travel to financial district in nearby Shanghai; and substantial opportunity for independent travel to Beijing and other cities.

The program was also benefited from the language and cultural exchange opportunities through the collaboration of Furman's partner school Soochow University in Suzhou. Throughout the whole program, Furman students stayed in Soochow University's international students dormitory. Each Furman student was assigned a Chinese roommate who assisted the Furman student in getting around the city and the area, for visitations to various historical sites and "cultural excursions," and for exchanges in languages and other cultural aspects. The most interesting part of the 2008 SCI was a day trip to historical site Zhouzhuang, a canal city long viewed as the Venice in China, during which trip Furman students were accompanied by Soochow University tourism majors who served as tour guides and practiced their English and applied their knowledge and skills in tourism.

CONCLUSION: BENEFITS AND CHALLENGES

We believe that the 2008 SCI may help other universities and colleges who are in the process of designing similar study-away programs. Our experience may be particularly helpful for other liberal arts colleges that have similar academic goals and student profiles to Furman University. In the rest of the paper, we will discuss the development and administration of the program as well as the advantages of the program to its various constituencies, including students, faculty, home and host universities, internship sponsors, and future employers. We will also discuss potential challenges to the program such as language barriers and connecting internship sponsors in China. The higher cost associated with international travel may also present a hindrance to many colleges when they design similar programs

HANDS-ON EXPERIENCE WITH LINEAR REGRESSION

Hope M. Baker, Department of Economics, Finance and Quantitative Analysis, Coles College of Business, Kennesaw State University, MB 0403, 1000 Chastain Rd., Kennesaw, GA 30144-5591, hbaker@kennesaw.edu, (770)423-6307.

ABSTRACT

Linear regression is one of the most widely used statistical tools and has applications in all disciplines. The instruction of linear regression to the novice learner requires a balance between the presentation of theory and application which is often difficult to achieve in the few weeks allowed for the topic. In this paper, a linear regression assignment is described that takes the student from data specification and collection through regression model development, validation and interpretation. Students get hands-on experience with multicollinearity, indicator variables and the frustration often encountered when developing predictive models.

INTRODUCTION

Linear regression is covered in a required course in almost all business schools. Professors of these courses are all too familiar with the dilemma of covering enough theory to give students a solid foundation to properly use the tools while keeping them interested and focused on the practical applications and benefits of the tools. When terms such as multicollinearity, heteroscedasticity and normality of error terms are mentioned, students' eyes begin to glaze over. The topic of this paper is a linear regression assignment that was first implemented two years ago. Students complete the assignment in teams, although it could be done individually. There are several phases for which students must submit their work to get feedback before continuing. The phases include model specification, data collection, model estimation and validation, interpretation and reporting. Based on feedback from the instructor, teams of students often have to repeat the steps of a particular phase or start over with the model specification phase to make revisions before continuing. The assignment, which is completed outside of class, is conducted in parallel with the class lectures and discussions allowing students to build their knowledge of linear regression as they work through project. The following sections describe the application and phases for the assignment.

LINEAR REGRESSION ASSIGNMENT

The introductory lecture on linear regression opens with a discussion about factors which affect apartment rental rates; a topic to which all students can relate. A brainstorming session is held to develop a list of such factors. Following this discussion, simple linear regression is introduced using a sample of apartments for which the monthly rental rates and apartment sizes, in square

feet, are recorded. At the end of this class session, the first phase of the team assignment is provided.

Phase 1. Model Specification

The instructions for the various phases of the assignment are shown in Tables 1 and 2. The first step for the teams is to identify five or more characteristics they feel have an impact on monthly rental rates for apartments. The most common factors listed by students are apartment size, number of bedrooms and number of bathrooms. Other factors chosen include distance from campus, age of complex, amount of security deposit, pool, tennis courts, gym, playground, garage, fireplace, hardwood floors, washer & dryer and Internet access. Every semester, at least one new variable emerges.

Some of the common problems students have with model specification include the following:

- Apartment "amenities" are listed as an independent variable. Instructor feedback includes 'How do you define "amenities"?' Students typically respond that amenities include a pool, tennis courts, gym, laundry, security, playground, garage, etc. It is explained that each amenity listed represents one decision variable. The team then has to decide specifically which amenities to include in the model.
- "Distance from campus" is another common factor chosen. Instructor feedback in this case is "How do you measure distance from campus, in time or miles?" The team is forewarned that this information may not be easily attainable for all apartments in the sample and that measurement of distance must be consistent across the sample.
- "Washer and Dryer" is another variable with potential problems. Apartment listings do not always distinguish between the existence of the actual appliances OR the existence of hookups for appliances.
- Some of the characteristics selected by students are not included in all apartment listings. Fireplace is a good example. Students are instructed to be wary of their data sources and not assume that no mention of an amenity, such as a fireplace, indicates the absence of one. It is important to fully understand how to interpret your data sources.

Class time during phase 1 of the assignment is used to instruct students how to use the regression tool in Excel and how to determine the validity and significance of a simple estimated regression model.

Phase 2. Data Collection

In the second phase, students collect their data. They are required to locate at least 30 apartments from different apartment complexes in the area. There are many sources of information concerning apartments, online and in-print, so this is not a difficult task. It is emphasized that this is not a true random sample but more of a convenience sample. In-class discussion focuses upon methods that could be used to obtain a true random sample of apartments.

Although encouraged to locate apartments with a variety of characteristics for the factors of interest, i.e. varied numbers of bedroom, with and without pools, different sizes, etc., there are always a few teams that look for apartments that match their "dream apartment" only. In other words, the sample contains only 2-bedroom, 2-bath apartments with a pool, gym and garage. This is particularly a problem with indicator variables. For example, if the indicator variable for a pool is included, the sample may contain only apartments with a pool or only 1 or 2 without a pool. Such issues provide a great opportunity to explain that one cannot determine the impact of the chosen factors on apartment rental rates unless the sample data contains apartments with different measurements for each factor. In the case of indicator variables, students are instructed to collect more data to include at least 5 apartments with and without the amenity of interest.

Most teams have no issues with their data and are allowed to progress to the next phase. Other teams have to revise their data, based on instructor feedback, before continuing. During this phase, class time is focused upon multiple regression models, model validation, assessment of the error assumptions and multicollinearity.

Phase 3. Check for Multicollinearity

Multicollinearity is one of those topics included in the statistics course IF time allows. Building it into this assignment ensures coverage of it and allows students to experience it first-hand. Almost all teams select at least two variables that are highly correlated, namely apartment size and number of bedrooms. These student samples are used in class to illustrate the effects of multicollinearity on the estimated regression model. Attempts to correct the models by 1) omitting one of the correlated variables and 2) using an interaction variable are both demonstrated.

Samples with multicollinearity must be corrected before moving on to the next phase. If it is necessary to remove more than one variable to do so, the team must add a new variable in order to maintain at least four independent variables in the model.

Phase 4. Obtain the Estimated Regression Function

Students are required to submit the Excel files containing their estimated models along with the information requested under Phase 4 in Table 1. If a model is significant and a good fit, the team can continue to the model validation phase. If a model is not significant or not a good fit, the team must start over. The latter situation has occurred only once when a team chose not to include apartment size, number of bedrooms or number of bathrooms in their model.

Using the feedback-revision cycle for this assignment ensures that all groups have a valid model as they move into the final phase. No student team can respond to questions posed in the last

phase with "our model is not significant so we cannot answer these questions." During phases 3 and 4, students learn how to interpret the regression model results and use those results to make predictions.

Phase 5. Model Validation, Interpretation, Implementation and Critique

The last phase contains several steps required to finish the project. In a more advanced class, the model validation step would be included in Phase 4. Students would not be allowed to continue with a model that does satisfy the error assumptions. It is important not to overlook this step with students in an introductory class, so a simplified approach to model validation is adopted.

Model Validation: The residual plots for the estimated model are used to assess the validity of the error assumptions. Students are instructed to study the graphs to look for evidence of patterns in the residuals. A more complete discussion of the error assumptions is covered in class. Thus far, there have been no models for this assignment for which validity was an issue.

Significance of Independent Variables: Students must evaluate the level of significance associated with each of their independent variables. In all cases, teams have at least one, and usually two to four, variables that are not statistically significant. The dilemma of how to handle insignificant variables is discussed in class. This is a good time to interject a discussion on the ethical issues related to the omission of model variables.

Interpretation of the Model: As shown in Table 2, students must interpret the adjusted coefficient of determination and the 95% confidence interval estimates of the independent variable coefficients. Students have difficulty with the concept that the hypothesis that a regression coefficient equals 0 is the equivalent of a hypothesis that the "slope" for that variable is 0 meaning there is not a statistically significant relationship between that independent variable and the dependent variable. Likewise, students are still shaky on the interpretation of p-values. However, confidence interval estimates of the variable coefficients give the students a visual depiction. They understand the implication when the interval estimate contains 0.

Making a Prediction: Using their estimated regression model, the team calculates the average rent for their "dream apartment" indentified at the outset of the assignment. The predicted values for all teams are presented in class and discussed. During this discussion, it is emphasized that the predicted values are averages or point estimates. Students are assured that one can compute confidence interval estimates of their predictions and can even make predictions of actual apartment rental rates versus average rates, but those techniques are beyond the scope of an introductory course. That always brings a sigh of relief!

<u>Process Improvement</u>: For the final step of the assignment, the team must write at least one paragraph describing improvements they would make if they were actually hired to complete a study like this. The culmination of the team assignment and class discussion of linear regression is the presentation of each team's critique of their models. This is a lively discussion as students provide wonderfully insightful suggestions to their peers.

CONCLUSIONS

The assignment presented in this paper is relatively easy to implement. It does require quick turnaround times by the instructor to provide feedback for each phase. Allowing it to be a team assignment versus an individual assignment minimizes the instructor time required. Plus, students learn more when working together and they definitely enjoy the project more. Students self select membership on teams of $3 - 4$ students each. Classes in which the assignment has been implemented had enrollments between 50 and 60.

Three to four weeks are allocated for linear regression; the timeframe for the assignment is three weeks. As grades are not assigned until the project is completed, it is important to encourage students to stay on top of the due dates for each phase. At this point, the only written requirement is the critique done at the end of the project. The addition of a required managerial report is being considered for future classes.

There has been no explicit measurement of the benefits and effectiveness of this assignment in terms of student learning. Plans are underway to develop a survey instrument for this purpose. Anecdotal evidence of the effectiveness of the project comes from observation of students. They are very excited and animated during this portion of the course which is near the end of the semester. Class participation increases significantly in volume and depth. Peer evaluations by the students reveal more equal participation among team members versus that for a textbook case completed earlier in the semester. Although the difficulty level has increased, students perform much better on linear regression problems on the final exam in relation to student performance before the assignment was implemented. The level of difficulty for linear regression has increased because more in-depth topics are now included, such as multicollinearity, interpretation of residual plots, interpretation of confidence interval estimates for the regression coefficients, etc.

Assignment Instructions

Find Your Dream Apartment: List the attributes of the perfect apartment. You may have to compromise to arrive at a group consensus!

Factors affecting Apartment Rental Rates in Cobb County
Your task for this assignment is to build a linear regression model to estimate apartment rental rates in Cobb County. To do so, use the following steps or guidelines. As you can see, there are some interim deadlines before the final project is due; be sure to make a note of these.

Phase 1. Identify at least 5 factors (independent variables) you think significantly contribute to the monthly cost of apartment rent. In the space below, write a brief justification for including each factor or variable in your model. Feel free to use more independent variables if you like. When you have completed this step, send this document to me via email in WebCT. I would like to verify that your independent variables are valid and measurable.

Phase 2. Collect your data. Identify at least 30 apartments located in XXX County and record the monthly rent values along with the values of your independent variables for each in an Excel worksheet. Be sure to include apartments from different properties and different locations. There are numerous apartment finder publications available with this information. List all of your sources in the designated area below. When you have collected your data, send the Excel worksheet to me via email in WebCT.

Phase 3. Test your data for extreme multicollinearity. Remember, if the absolute value of the correlation coefficient between two independent variables is .70 or higher, you should only include one of the two in your regression model. You should have at least four independent variables in your final model; so, if you have to eliminate more than one of the original five variables because of multicollinearity, you need to add a new variable. Send the Excel file in which you compute and interpret the correlation coefficients to me via email in WebCT.

Phase 4. Use the regression tool to obtain your estimated regression function. If your model is not significant, contact me immediately. You will need to find other factors that do contribute to monthly rent. Complete this section and email this document to me via WebCT.

Estimated regression function:_____

Adjusted R^2 = _____

Significance Level of the Model (significance F) = _____

Comment on the validity and fit of the model:

Table 1. Assignment Instructions – Phases 1 – 4

Phase 5.

Model Validation: Use the residual plots to assess the validity of the model. Record your observations in the space below.

Significance of Independent Variables: Discuss the significance level of the relationship between each independent variable and apartment rental rates.

Model Interpretation: Once you have a statistically significant model, record the following:

- Estimated regression function: _____

- % of variability in rent prices explained by your set of independent variables: _____

- An interpretation of the 95% confidence interval estimates for the coefficients of each independent variable.

Make a Prediction: Now, use your model to calculate the average monthly rent for an apartment with the attributes of your "dream apartment."

Critique your Model: In paragraph form, describe any shortcomings you feel your model has and how you would improve the model. This can include anything from the model specification process, data collection, analysis, etc. Approach this phase as if you have been hired to conduct a study like this.

Send your final Excel file and this completed form to me as email attachments in WebCT.

Table 2. Assignment Instructions – Phases 5

ANALYSIS AFTER OUTPUT III – ALGORITHMS

Kenneth R. MacLeod, College of Business, East Carolina University,
Greenville, NC 27858 (252) 737-1046 macleodk@ecu.edu

ABSTRACT

The concept behind this set of papers is that students must be taught how to analyze data, specifically, using the tools of a typical management science course. Previous papers have dealt with basic decision making in the forms of payoff tables and decision trees. The next step is to deal with algorithms, starting with the transportation algorithm. While many books simply lump the transportation algorithm in with linear programming (under the umbrella term of constrained optimization), I find it easier to explain the concepts of an algorithm in a setting the students can readily grasp. The students learn a set of concepts for working with an algorithm to glean all the information they can about a given situation.

INTRODUCTION

In the classroom, the decision making process:

1)   Identify the problem
2)   Gather data
3)   Create and run the model
4)   Analyze the output
5)   Implement and revise

often stops with the third step – create and run the model. The assumption appears to be that students will know how to use the output to make good decisions. Unfortunately, my students seem to lack that innate ability. With that realization, my class has changed to focus on the outputs of the models and what needs to be done once the model has been run.

In the process of teaching students how to analyze output (step 4), not simply run mathematical models, I begin with basic decision making – payoff tables [1] and decision trees [2]. With each of these topics, the students are presented with a format for breaking the information down into smaller, easier-to-understand pieces, which can then be re-assembled so the analyst ends up using all the relevant data and knowing why the recommended alternative is preferred. The procedures vary slightly, since the tools are different, but the final objective is the same.

Once those basic concepts are absorbed (to whatever degree) the class moves on to using a computer to analyze a situation. The concept of making a decision is latent in this process, but is no longer the primary focus. By that I mean that in the end, a recommendation (or several) can be formed, but that recommendation is almost a by-product of analysis process. This approach is somewhat contrary to how the students expect to use the computer models.

Sadly, there is a very strong disposition among my students (if nowhere else in the business world), to blindly accept whatever output is provided as a result of running a computer model. Usage of the model is restricted to inputting data into a black box, and mindlessly implementing whatever output results. While no professor would ever advocate this to her or his students, it takes more than simply warning the students about this error to keep them from committing it. This paper outlines a process that teaches the students the problems with using a computer model as a black box.

ALGORITHMS

While most of my students have heard of algorithms, few know what one is. I have a nice little discussion of Alexander the Great, Al-Quazir, and the Renaissance that fills them in, but the essential definition is simple: an algorithm is a set of mathematical (the "algo" part) steps that are repeated (the "rithm" part). The emphasis on mathematics is no longer really necessary, but for what I am doing, it still holds true. The algorithm's steps are repeated because each time the answer that is generated improves. This leads to two concepts: that the problems they are facing have more than one solution, and we need some method to evaluate each solution.

Simple mathematical problems can be expressed as a single equation, leading to a single solution. The problems now facing the students have sets of equations describing what is (and is not) acceptable, and within what is acceptable you have a lot of possible answers. This, of course, leads to the concepts of variables, another concept they use but cannot define. Most of my students are astonished to learn that variables are simply numbers, literally numbers. That means a variable can be used to answer questions such as "How many…" or "How much…" With each new solution, the values of the variables (or some of them) change, hence their name.

The means of evaluating the solutions is called an objective, something simple to start with, like maximizing profits or minimizing costs. The profit (or cost) of each solution that is generated is determined, and a higher profit (or lower cost) solution is preferred. Of course, it would take an infinite amount of time to individually check an infinite number of possible solutions, so we need something better, which leads to the steps of a search algorithm:

1) Gather and organize your data
2) Develop an initial solution
3) Identify and evaluate search directions
4) Use the best search direction to generate a new solution
5) Repeat from Step 3 until no further improvements are possible

I am not going to quibble over the number of steps in this list – it sufficient for the students to grasp what the algorithm, and therefore the computer, is doing. As the computer picks the best search direction each time, it is easy to introduce the concept of implicit enumeration, that the computer does not need to evaluate every solution, because any solution not evaluated will be worse than the solutions that are evaluated. At this point, the students move to considering a simple algorithm in a setting they can readily grasp – Transportation.

THE TRANSPORTATION ALGORITHM

I will grant that the transportation algorithm has been made somewhat obsolete by the blazingly fast processor speeds of modern computers (the algorithm's original benefit was that it more efficient than the linear programming algorithm), yet it remains a wonderful teaching model because students can readily grasp the setting and the significance of the data. Further, the transportation table itself is a format that the students can quickly understand and interpret. This ease of understanding allows the class to move past the initial setup process and into the analysis process very quickly.

The transportation setting is simple: a supply of something is stored at several places (sources) and is needed at several other places (destinations). Any source can ship to any destination. The data needed is the supply at each source, the demand at each destination, and the cost per unit of shipping from each source to each destination. All of this can be displayed in a table with the sources as the rows (labels on the left, supply amounts on the right), the destinations as the columns (labels at the top, demand amounts on the bottom) and costs in the cells of the table, as shown in Table 1:

	Chicago	St. Louis	Cincinnati	Supply
Kansas City	6	8	10	150
Omaha	7	11	10	175
Des Moines	4	5	12	275
Demand	200	100	300	

Table 1: Transportation Table

This is from a problem about shipping grain from silos near Kansas City, Omaha, and Des Moines, to mills near Chicago, St. Louis, and Cincinnati.

Setting up this table takes care of the first step of the algorithm: gathering and organizing the data. The second step, developing an initial solution, helps the students to understand what a solution is (which routes to use and how many units to ship on each of those routes), and that the computer needs to be told where to begin (computers are not that smart). I usually advocate the simplest initial solution – the Northwest corner approach (any standard management science text can provide details, such as [3]). It is simple (students are less likely to make mistakes) and shows them that units are allocated to meet demand. The initial solution is shown in Table 2:

	Chicago	St. Louis	Cincinnati	Supply
Kansas City	6 / 150	8	10	150
Omaha	7 / 50	11 / 100	10 / 25	175
Des Moines	4	5	12 / 275	275
Demand	200	100	300	

Table 2: Initial Solution

The third step, identify and evaluate search directions, brings up the necessity of improving the cost of this solution (shipping the most units, 275, on the highest cost route, Des Moines-Cincinnati, is probably a bad idea). Sparing the details of a stepping stone evaluation of each unused route, the students learn that they can, indeed save money by using an empty route, but not the one they expected and that they have to pay more on some routes to save money on others. This concept of trading off cost increases with cost decreases is the heart of the Reduced Cost calculation of the Simplex algorithm for Linear Programming, but is much easier to understand in this setting. Generating a new solution is actually much easier than evaluating all the search directions, and although costs have decreased, the students must repeat the evaluation of the unused routes to learn that the second solution is no more optimal than the first, and thus learn about algorithms repeating.

This is merely a summary of the Transportation algorithm, and the students are expected to learn it from lecture notes posted on a website, before analyzing a transportation system.

ANALYZING A TRANSPORTATION SYSTEM

The example used here is from Anderson, Sweeney & Williams' excellent textbook [3]. The situation deals with a company that has two production plants, three distribution centers, and nine customer zones. The data for the case provides the production capacity of each plant, the demand at each customer zone, and the costs or shipping from the plants to the distribution centers and from the distribution centers to the customer zones. The current distribution plan assigns each customer zone to a single distribution center. This example (or almost any example) can be used to illustrate a series of lessons about using computer models to analyze a situation.

First Lesson

The real world usually won't match your computer's software.

Students get confused about how to set up this problem as a transportation model. They know where to ship from, the plants (or is it the distribution centers?) and they know they want to get the units to the customer zones, but they aren't sure which costs to use. They could use a Transshipment setup, but I have them find a way to use the Transportation setting (a one-stage set up) to handle a two-stage shipping problem. This can be done by listing the sources as all combinations of the plants and distribution centers, as shown in Table 3:

	Dal.	SA	Wich.	KC	DNV	SLC	PH.	LA	SD	Dum.	Supply
EP-FW	3.5	5.3	6.3	7.6	100	100	100	100	100	0	
EP-SF	100	100	100	100	4.9	6.9	5.6	100	100	0	
EP-LV	100	100	100	100	100	100	100	6.3	6.7	0	
SB-SF	100	100	100	100	6.6	8.6	7.3	100	100	0	
SB-LV	100	100	100	100	100	100	100	3.3	3.7	0	
Demand	6300	4880	2130	1210	6120	4830	2750	8580	4460		

Table 3: Initial Setup

This creates a new problem –allocating supply for each plant, as each plant is listed more than once. Theoretically, any single row might need all the capacity of the plant, so that is what you have to do. Fortunately, total supply (50,000 units) exceeds current demand (41260), so the dummy column should absorb the extra. The final table is shown in Table 4:

	Dal.	SA	Wich.	KC	DNV	SLC	PH.	LA	SD	Dum.	Supply
EP-FW	3.5	5.3	6.3	7.6	100	100	100	100	100	0	30,000
EP-SF	100	100	100	100	4.9	6.9	5.6	100	100	0	30,000
EP-LV	100	100	100	100	100	100	100	6.3	6.7	0	30,000
SB-SF	100	100	100	100	6.6	8.6	7.3	100	100	0	20,000
SB-LV	100	100	100	100	100	100	100	3.3	3.7	0	20,000
Demand	6300	4880	2130	1210	6120	4830	2750	8580	4460	88,740	

Table 4: Final Setup

The lesson here is that if you understand how the algorithm works, and you are clever enough, there is usually a way to get your situation to fit your software. The fit will not be perfect, and you will have to be careful not to create new problems. Using existing software is usually better than constantly pestering your boss to buy you more software to fit each new problem.

Second Lesson

Always check the validity of your model

Students often ask why so many of the routes are blocked (the costs of 100 in Table 4). Eventually they realize I have set up the table to reflect the way the company currently operates with each customer zone assigned to a particular distribution center. They grasp this is a good thing to calculate, as a base case, but I point out it also allows them to validate their model – if the computer output does not match what is happening in the real world, then either the real world is wrong or their model is wrong. The lesson is that if it does match, then you have more confidence in using the model.

Third Lesson

Simply having a computer printout does not mean you have all the information you need.

The students are usually relieved to find that they do not have to do all (or even any) of the calculations themselves. Using Solver, in Excel, all they have to do is set up the constraints and click Solve to get an optimal solution. They now think they are done, because they have an output such as Table 5, at the top of the next page:

	Dal.	SA	Wich.	KC	DNV	SLC	PNX.	LA	SD	Dum.	Supply
EP-FW	6300	4880	2130	1210						15480	30,000
EP-SF					6120	4830	2750			16300	30,000
EP-LV										30000	30,000
SB-SF										20000	20,000
SB-LV								8580	4460	6960	20,000
Demand	6300	4880	2130	1210	6120	4830	2750	8580	4460	88,740	

Table 5: Initial Optimal Solution

Once the students demonstrate that the know how to read the table, I ask if they are ready to report to their bosses. When they say "Yes," I ask how much El Paso has to produce next quarter. As the students start to hem and haw, and frantically try to calculate it, I point out that their bosses are unlikely to want to wait while they perform calculations that could have been done ahead of time. The lesson is that the information is available to them, they simply didn't think ahead.

Fourth Lesson

Your model may not be dealing with all the relevant data.

The first question posed by this problem is what would happen if the company lifted the shipping restrictions (let any distribution center handle any geographically close customer zone). This can be answered by removing most of the blocked routes in Table 4 (shown in Table 6), and results in a cost savings of about $16K per quarter (the actual shipping routes are not relevant, so I am not showing the solution table).

	Dal.	SA	Wich.	KC	DNV	SLC	PH.	LA	SD	Dum.	Supply
EP-FW	3.5	5.3	6.3	7.6	100	100	100	100	100	0	30,000
EP-SF	7.4	7.6	6.7	8.2	4.9	6.9	5.6	5.5	4.9	0	30,000
EP-LV	100	100	100	100	9.6	7.5	6.6	6.3	6.7	0	30,000
SB-SF	9.1	9.3	8.4	9.9	6.6	8.6	7.3	7.2	6.6	0	20,000
SB-LV	100	100	100	100	6.6	4.5	3.6	3.3	3.7	0	20,000
Demand	6300	4880	2130	1210	6120	4830	2750	8580	4460	88,740	

Table 6: Open Shipping

This initially seems pretty good to the students (I ask them if they think they will be paid as much as $16K per quarter), until I ask them how this will affect their company's operations. Eventually, they figure out that the customer zones will no longer know which distribution center to contact to place an order, so all orders will have to be placed via a centralized location. There will be expenses involved in both setting up this call center and in staffing it. In addition, the distribution center managers go from effectively running their own companies to simply carrying out the orders issued from the calling center (and everyone knows how managers *love* to give up authority). The lesson is that this might still be a good solution, but then again, it might not.

Fifth Lesson

Never trust a computer.

The second question posed by this problem is what if production plants were allowed to ship directly to customer zones. This is answered by adding new sources, EP-Direct and SB-Direct, to the existing model (Table 7, below). By now, the students have become complacent; the model has worked for the base case and one alteration, so it is working correctly. This time, the solution saves them $65K per quarter, and they are all ready to recommend this solution to their bosses.

	Dal.	SA	Wich.	KC	DNV	SLC	PH.	LA	SD	Dum.	Supply
EP-FW	3.5	5.3	6.3	7.6	100	100	100	100	100	0	30,000
EP-SF	7.4	7.6	6.7	8.2	4.9	6.9	5.6	5.5	4.9	0	30,000
EP-LV	100	100	100	100	9.6	7.5	6.6	6.3	6.7	0	30,000
EP-Dir	100	3.5	100	100	100	100	100	100	100	0	
SB-SF	9.1	9.3	8.4	9.9	6.6	8.6	7.3	7.2	6.6	0	20,000
SB-LV	100	100	100	100	6.6	4.5	3.6	3.3	3.7	0	20,000
SB-Dir	100	100	100	100	100	100	100	0.3	0.7	0	
Demand	6300	4880	2130	1210	6120	4830	2750	8580	4460	88,740	

Table 7: Direct Shipping

The trap is that adding the new sources allowed the computer to ship 20,620 units out of San Bernardino, 620 units over capacity. It is not hard to fix this problem, and costs go up by only $1.2K, but the lesson is that not realizing there was a problem can be deadly.

Fifth Lesson

Not every question requires use of the algorithm to find the answer.

The next problem posed to the students is what they should do if an upgrade were available for the company's production lines. The upgrade would both reduce costs per unit (El Paso is currently $0.50 more expensive per unit than the newer San Bernardino plant) to the same level at both plants and increase capacity per quarter at both plants (in the most recent solution, San Bernardino is running at capacity, and would like more). The downside is losing 6,000 units of capacity per plant during the quarter that the upgrade takes place. Most of the students realize that both plants can't be done in the same quarter (that would drop capacity by 12,000 units, below the demand level of 41,260), but the argument is which plant to do first. If they have been paying attention, they will suggest running both options (El Paso first versus San Bernardino first) and comparing the costs, but that is not necessary.

If San Bernardino is done first, El Paso will have to pick up 6,000 units of demand because San Bernardino is running at capacity. This will increase production costs (El Paso is $0.50 more expensive per unit) and transportation costs (using non-optimal shipping routes). If El Paso is done first, nothing changes in the production schedule (El Paso has more than 6,000 units of idle capacity) and when San Bernardino is done the next quarter, El Paso will already be producing at

the lower production cost, which will save us the increase in production costs and actually offset the increase in transportation costs a little. The lesson is that knowing your data and thinking about it can save you a lot of work.

Sixth Lesson

Once you have gone to the trouble of setting up a model, USE IT.

From here, any number of questions can be posed. For example, referring back to the third lesson, I ask the students how many units each distribution center is handling. Initially, all three handle about the same volume, but with direct shipping, that volume is cut nearly in half. The question becomes whether we still need three distribution centers. Dropping each distribution center in turn is not hard (simply give it a supply of zero units) and they learn that while dropping Ft. Worth or Santa Fe will increase transportation costs about $25K, dropping Las Vegas increases costs by only about $15K, making it the logical choice. When they ask why we would be interested in increasing transportation costs, I refer back to the fourth lesson and point out we would be saving all the costs of running a distribution center, which might offset the increase in transportation costs. While we don't know the cost of running a distribution center, our boss might, and the lesson here is that they should use the model to gather as much information they can.

This also gives me an opportunity to point out that the logical choice does not always win. Given that travel for business reasons can be written off on one's taxes, I am nearly certain that the distribution center in Las Vegas gets "inspected" quite a bit more than the other two combined. If that is true, it is unlikely that the Las Vegas distribution center would be closed unless the costs were dramatically in favor of doing so.

CONCLUSION

As noted in the beginning, decision making is only a small part of using a computer model. For one thing, we would have to vary the demand forecast to develop enough data to fully compare all the options (I sometimes consider that another lesson – *understand what your model is NOT doing for you*). The real point is to use the model to fully understand the decision situation.

By the end of the lesson, I hope the students have gotten past the idea that the computer model will make the decision for them. The model can help you understand the data, particularly with complex data, but it is too limited to allow you to turn your brain off. A model will answer any question you ask, but you have to be bright enough to think of the question and phrase it in a way the computer can understand (adjust the model's set up to answer the question). The students must also be continually aware of the limitations of the models and must be almost paranoid about looking possible mistakes in the output. If I can at least get them to distrust computer output, then they have made a good start in using computer models.

REFERENCES

[1] "Analysis After Output," K. R. MacLeod, Proceedings of the 37th Annual Meeting of the SEDSI, February, 2007.

[2] "Analysis After Output II – Decision Trees," K. R. MacLeod, Proceedings of the 38th Annual Meeting of the SEDSI, February, 2008.

[3] "An Introduction to Management Science," Anderson, D. R., D. J. Sweeney, and T. A. Williams, 10th Edition, Thomson South-Western, Mason, Ohio, 2003.

Emotional Intelligence Skills:
The Building Blocks of Defense from Emotional Labor Burnout

L. MELITA PRATI
Department of Management
College of Business
East Carolina University
Bate Building, Room 3112
Greenville, NC 27858
Ph: (252) 328-5696
E-mail: pratil@ecu.edu
Facsimile: (252)328-4094

JOY H. KARRIKER
Department of Management
College of Business
East Carolina University
Bate Building, Room 3108
Greenville, NC 27858
Ph: (252) 328-5693
E-mail: karrikerj@ecu.edu
Facsimile: (252)328-4094

Running head: EMOTIONAL LABOR PERCEPTIONS, EMOTIONAL

INTELLIGENCE, BURNOUT

Abstract

We examined the moderating role of four emotional intelligence components on the relationship between emotional labor perceptions and burnout. Specifically, we hypothesized that the four abilities (i.e., emotional perception and appraisal, emotional facilitation of thought, emotional understanding, and emotional regulation) alleviated burnout related to emotional labor perceptions of customer service employees. Results supported some of the hypothesized relationships, and we found that the abilities emotional perception and appraisal and emotional regulation were effective in moderating the relationship between emotional labor perceptions and burnout. Implications, limitations, and directions for future research are discussed.

Emotional Intelligence Abilities:
The Building Blocks of Defense from Emotional Labor Burnout

The seminal work by sociologist Arlie Hochschild (1983), *The Managed Heart: The Commercialization of Feeling*, brought the idea of emotional labor to the attention of organizational scholars. She defined emotional labor as "the management of feeling to create a publicly observable facial and bodily display" (p. 7). Her idea of emotional labor suggested that there are organizationally established rules of emotional display that one follows in order to deliver successful performance in customer service interactions. In this work Hochschild (1983) included a warning: this process of managing one's emotions for organizational purposes may lead to detrimental outcomes for the employee such as job stress reactions including burnout. A significant body of research has supported this claim (e.g., Morris and Feldman, 1997; Abraham, 2000; Totterdell and Holman, 2003; Zapf, Seifert, Schmutte, Mertini, & Holz, 2001; Zapf, 2002).

The current study builds on recent research supporting the idea that emotional intelligence may alleviate strain associated with burnout such as, depression and physical strain. Prati, Liu, Perrewé, & Ferris (*In Press)* found that emotional intelligence attenuated the positive relationship between surface acting (a form of emotional labor) and depressed mood at work and physical strain. Durán, Extremera, and Rey (2004) indicated that emotional intelligence provides one the capacity to overcome strain associated with burnout through a deepened sense of engagement in the work situation and increased personal accomplishment and well-being. Slaski and Cartwright (2002) found that those scoring higher in emotional intelligence suffered less subjective stress. Ciarrochi, Deane, and Anderson (2002) found a negative correlation of the emotion self-managing ability factor of EI with depression, and Saklofske, Austin, and Minski (2003) found a negative correlation of EI with depression-proneness.

The focal question of the current investigation asks how the individual components of emotional intelligence, as outlined by the Salovey and Mayer (1997) model, might impact the emotional labor − outcomes relationship. Specifically, how the skills encompassed by the emotional intelligence construct may serve to alleviate strain (i.e., burnout) associated with perceptions of emotional labor. The four components of emotional intelligence, as delineated by Mayer and Salovey (1997), are examined in the context of the relationship between one's perceptions of emotional labor within the organizational setting and his or her susceptibility to burnout (see Figure 1). Because of the previously mentioned findings regarding emotional intelligence and strain, it is expected that one or more of these components provide an individual the ability to elude stress related to one's perceptions of emotional labor. Therefore, emotional perception and appraisal, emotional facilitation of thought, emotional understanding, and emotional regulation are examined to determine whether or not these factors alleviate the strain of burnout resulting from one's perception of organizational emotional labor requirements.

Insert Figure 1 about here

Emotional Labor Perceptions, Efforts, and Outcomes

Diefendorff and Richard (2003) provided evidence supporting the idea that employee perceptions of organizational rules of emotional display lead to some level of emotional effort on the part of the employee. The study indicated that perceptions of organizational rules for emotional display were related to actual rules established and consistently followed within the organization. As well, this study and Brotheridge and Grandey's (2002) study found that one's

attempts to follow these organizational rules did relate to his or her perceptions of organizational rules.

Individuals' perceptions of organizational rules related to emotional labor can result in two primary types of emotional effort: surface acting and deep acting. Surface acting is the enactment of perceived organizational requirements such that the individual portrays the expected emotion physically, but may not necessarily feel the expected emotion. Deep acting is the enactment of these perceived requirements by attempting to cognitively adjust previously felt emotions to be more in line with organizationally expected emotion and portraying the emotion accordingly.

The emotional labor process has been related to many negative individual outcomes. As Hochschild (1983) warned, the practice of emotional labor, starting with the acceptance of perceived organizational requirements of emotional labor, may lead to negative outcomes such as decreased job satisfaction, depression, and burnout. For instance, Diefendorff and Richard (2003) presented evidence that perceptions of organizational rules to suppress negative emotions had a negative impact on job satisfaction. Abraham (2000) noted that the lack of control over one's emotional expressions, as a result of emotional dissonance and required emotional displays, will cause one's organizational commitment to deteriorate. Similarly, Zapf, Vogt, Seifert, Mertini, and Isic (1999) indicated that emotional dissonance and emotional effort, in the form of required actions to display unfelt emotions, could lead to a resentment of the organization.

In further support of this relationship, Karasek's (1979) model of job strain explains that perceptions of job demands, and the level of control one feels with regard to those demands, will influence the amount of stress experienced on the job. This theory is relevant to the present

model in that one's perceptions of organizational demands for emotional labor is a source of stress. According to Karasek's model, this stress may be influenced by one's ability to control the required performance based on his or her emotional intelligence attributes.

Zapf (2002) stated that previous stress research points to one's level of control over stressful situations, and one's level of social support as resources that may alleviate detrimental stressor effects. These two are available resources for those with high levels of emotional intelligence. The possession of emotional intelligence skills provide resources for control over stressful situations, regardless of restrictions on or expectations of emotional display that may be dictated by the organization. This idea is supported by Zapf, Vogt, Seifert, Mertini, & Isic (1999) in their definition, "Control means having an impact on one's conditions and on one's activities in correspondence with some goal" (p. 377).

Certain individual characteristics have been suggested to influence the relationship between perceptions of emotional labor requirements and performance of emotional labor efforts. Such variables include personality dimensions such as extraversion, neuroticism, positive and negative affect, as well as individual skills like social skill (e.g., Morris & Feldman, 1996; Abraham, 1998; Diefendorff & Richard, 2003). Certainly, it is reasonable to assume that emotional intelligence may fall within the realm of individual skills that influence this relationship.

Sosik and Magerian (1999) claimed that emotionally intelligent individuals feel more secure in their ability to control and influence life events. Therefore, those with high levels of emotional intelligence may feel a certain amount of control over employee-customer interactions, and thus the ability to achieve the goals of their role. This control comes from the

employee's innate ability to drive the emotional exchange in the interaction using available emotional intelligence skills.

Burnout. Research has indicated that one's perception of emotional labor requirements related to the employee-customer interaction may result in psychological strains such as burnout and depressed mood at work. With regard to the detrimental outcomes of emotional labor, burnout is a subject of concentrated focus in the literature. There have been several interpretations of burnout composed over the last twenty years.

A widely used measure of burnout developed by Pines and Aronson (1988) delineates the burnout construct to include emotional exhaustion, physical exhaustion, and mental exhaustion. Pines and Aronson's (1988) view of emotional exhaustion includes feelings of depression and hopelessness. Physical exhaustion is represented by feelings of being weak and tired, in addition to the inability to sleep or maintain immunity to illness. Mental exhaustion is defined as feelings of ineffectiveness and resentment.

Much of the emotional labor literature indicates that burnout is an outcome of the emotional labor process. The causes of burnout with regard to this process are primarily attributed to efforts to fulfill emotional labor requirements in service interactions. A number of studies have found unequivocal evidence linking emotional exhaustion to the emotional labor process (Zapf et al., 2001; Zapf, 2002; Totterdell & Holman, 2003).

Shirom (1989) noted that emotional exhaustion is the integral component in the conceptualization of burnout. Many adverse effects have been associated with this strain, such as depression, reduced organizational commitment and job performance, as well as an increase in turnover intentions (Cropanzano, Rupp, & Byrne, 2003). Demerouti, Bakker, Nachreiner, and Schaufeli (2001, p. 499) surmised: "Emotional exhaustion closely resembles traditional stress

reactions that are studied in occupational stress research, such as fatigue, job-related depression, psychosomatic complaints, and anxiety." Cropanzano, Rupp, & Byrne (2003) cite depression as one of the many adverse effects associated with burnout. Cropanzano et al. (2003) argued that resentment of the organization and a reduction in organizational commitment result from emotional exhaustion, an outcome of the depletion in emotional resources.

According to the literature, there have been several direct connections found with emotional intelligence having a favorable impact on measures of depression. Saklofske et al. (2003) found a negative correlation of EI with depression-proneness, and Ciarrochi et al. (2002) found a negative correlation of the emotion self-managing ability factor of EI with depression. Similar to its impact on symptomatic depression, it is reasonable to assume that emotional intelligence has a similar impact on burnout related to the emotional labor process.

Emotional intelligence abilities can be useful resources in jobs where demands for emotional regulation are excessive. Perceived requirements of emotional labor matched with the ability to facilitate emotions to maintain, improve, or modify one's emotional state provides emotionally intelligent individuals with invaluable coping mechanisms to defeat the adverse effects of psychological stressors such as burnout. The symptoms associated with burnout can be alleviated when one draws upon these resources. Emotional, physical, and mental exhaustion can be more successfully tempered or avoided because of the additional resources available to emotionally intelligent individuals (i.e., basic emotional intelligence skills, social support networks, perceived control over interactions).

The Moderating Influence of Emotional Intelligence

Mayer and Salovey (1997) describe emotional intelligence as a set of cognitive abilities that enable one to mentally process and use emotional information. In their theory, the following

four factors of emotional intelligence were proposed: perception and appraisal of emotion, facilitation of thought using emotion, understanding emotional knowledge, and regulating emotional thought and display toward goals. Because of these abilities, emotionally intelligent individuals are better equipped to understand and maintain responsibilities of emotional display, and avoid undesirable feedback or other undesirable outcomes such as physical and mental strain.

The literature indicates that emotional intelligence abilities help to alleviate strain associated with emotional labor requirements. In a review of the literature, Abraham (2000) posited that the emotionally intelligent individual is equipped with the skills necessary to alleviate strains, because they are able to understand the causes of strain and develop tactics to reduce the impact of the aggravating stressors. Therefore, one who is emotionally intelligent is more apt to address the stressor and contrive a plan to reduce the stressor as it occurs. Under such circumstances, emotional intelligence is seen as a resource used to minimize the effects of work stressors, such as burnout. Zapf, Seifert, Schmutte, Mertini, & Holz (2001) referred to the idea that one's "given cognitive capacities" are resources used to alleviate stressors. Regarding the emotional labor process, Zapf, Vogt, Seifert, Mertini, and Isic, (1999) state that the various cognitive abilities of those with high levels of emotional intelligence provide them the resources necessary to reduce strain through the adaptation of the stressor such as emotional labor perceptions.

For example, Schaubroeck and Jones (2000) reported a significant positive relationship between emotional labor requirements (in the form of emotional suppression) and physical strain. Accordingly, they found evidence that individuals without the ability to adapt emotions according to emotional labor requirements are more likely to experience physical strain. In

addition, Pugliesi (1999) indicates that emotional labor outcomes are less problematic when individuals have some level of control over the management of their emotional experiences. The hypotheses formulated in this study propose that categorical emotional intelligence skills influence the relationship between perceptions of emotional labor requirements and experienced burnout.

Perception and appraisal of emotion. Individuals who have the ability to accurately perceive the emotions of themselves and others are better able to facilitate accurate expression of emotions and understand others' expressions of emotion. With regard to emotional labor, this ability to accurately perceive and express emotions facilitates the effective performance of emotional labor requirements (Lam & Kirby, 2002). According to Zapf et al. (2001), this ability is a principal aspect of emotion work. This ability allows one the control over certain interactions, especially those that may otherwise be considered as problematic.

Individuals must be able to discern the emotions of themselves and others in order to address the cause of emotions, whether the cause is a positive or negative factor, and capitalize on that understanding to promote successful interactions (Zapf et al., 1999; Zapf, 2002). In other words, if an employee is able to discern the basis for a customer's negative feelings, he may be able to empathize with the customers' situation and employ the accurate expression of appropriate emotion. In this way, the customer's emotions may be neutralized or perhaps transformed (Zapf et al., 2001; Diefendorff & Richard, 2003).

Additionally, the benefit is not only to the customers and the organizational bottom line, but also to the employees. Empathetic involvement serves to reduce the difference between the employee's actual emotion and the emotion the employee is required to display. This allows for a more genuine concern for the customer by which the employee can act with more emotive effort

resulting in more effective customer service performance (Kruml & Geddes, 2000). Also, any physical or psychological stress felt by employee, as a result of the perception of organizational requirements to suppress or express emotion, may be reduced when the customer interaction is addressed in this way.

Hypothesis 1: The ability to perceive and appraise the emotions of one's self and others will moderate the relationship between perceived requirements of emotional display and burnout.

Emotional facilitation. This dimension of emotional intelligence allows the individual to guide or utilize emotional thought processes to alter emotional states (Mayer & Salovey, 1997). In the previous example, the employee, through accurate perceptions of his own and the customers' emotions, is able to guide emotional displays according to priority of goals. The employee recognizes that the most important goal in the customer service interaction is to ensure the customers' positive perception of the organization over and above the employee's personal needs or wishes. Abraham (1999) and George (2000) suggested that emotional intelligence facilitates this prioritization of goals.

Because of this prioritization of goals, employees must be able to modify their perceptions of the customer service interaction in order to facilitate appropriate emotional responses (Grandey, 2000; Totterdell & Holman, 2003). Jordan, Ashkanasy, and Hartel (2002) asserted that those with a high measure of emotional intelligence, in reference to this dimension, engage in "emotional assimilation," whereby they are able to choose from a range of perspectives in order to facilitate satisfactory outcomes for the organization as well as satisfying personal needs. Those without an adequate level of skill in facilitating the emotional thought

processes may be unable to disengage from deleterious emotional responses to the customer interaction in order to appropriate a modified situational perception that would be more advantageous to the situation (Ciarrochi, Chan, and Caputi, 2000).

Resulting strains from perceived requirements of emotional labor efforts may be reduced because of one's ability to use emotional facilitation of thought. The level of skill in this area may serve to buffer the negative effects of the difference between actual emotions and emotions required for display, for example. Through this skill, one can guide and thus enjoy the perception of control over the employee-customer situations. As such, it enables employees to drive the emotional exchange in the interaction (Mann, 1997).

As was previously explained, the literature indicates that the feeling of control over situational events produces a buffering effect between emotional labor stressors and resulting strains (Morris & Feldman, 1996; Zapf, 2002). Also, emotionally intelligent individuals can use the various perspectives at their disposal to reduce actual felt or experienced dissonance between felt and expected emotions. From the customer perspective, the employee desires a satisfactory interaction, and decreases emotional dissonance by taking his or her own need to display actual felt emotion out of the picture so that the focus of the interaction is on the customer's needs and expectations.

In addition, this ability can facilitate an overall focus on organizational goals as a priority in the performance of perceived emotional labor requirements. Ashforth and Humphrey (1993) suggested that an orientation of emotional labor toward organizational well-being will benefit employees through reduced stress related to the organization's requirements for emotional display. Due to the fact that employees are dedicated to the organization's well-being, their acts of emotional labor should be in line with that focus. In this case, the act of emotional labor is a

means by which they fulfill a purpose rather than acting against a personal orientation of purpose, such as the need to display felt emotions. Accordingly, emotional labor acts as a means of self-satisfaction rather than a stressor (Schaubrock & Jones, 2000). In fact, Abraham (1998) suggested emotional facilitation of thinking programmed toward an organizational orientation may be a buffer to reduce job dissatisfaction, which has been shown to be an effect of work-related emotional dissonance.

The emotional intelligence ability to use emotion in the facilitation of thought processes provides for the use of relevant information in prioritizing attention to more important issues. For those on the job, facilitation of thought would give high emotionally intelligent individuals the motivation to prioritize organizational gain over individual need to express felt emotion (Ashforth & Humphrey, 1993; Schaubroeck & Jones, 2000; Prati et al., 2003a). In this way, emotionally intelligent individuals are more able to reason that their emotions should be more in line with organizationally required emotions, thus reducing a source of strain (e. g., perception of emotional labor).

Hypothesis 2: The ability to facilitate emotions of one's self and others will moderate the relationship between perceived requirements of emotional display and burnout.

Understand emotions. The third component in the framework of emotional intelligence involves understanding the origins and successful use of emotions toward certain ends. This includes skills such as analyzing and understanding emotional antecedents, formulations, and outcomes (Mayer & Salovey, 1997). With regard to emotional labor, one must have some measure of this dimension in order to fulfill organizational requirements. After all, in order for individuals to be able to use emotion to alter an emotional state, they must understand their

present emotional state and how it evolved, and which emotion might best be employed to alter the current emotional state.

Along with perception, the understanding of emotion is useful to employees in working toward organizational goals, such as engendering customer rapport. One with a well-developed understanding of emotion will be more able to extinguish the anger of an irate customer and create good will for the organization from that exchange. Kruml and Geddes' (2000) findings indicate that empathetic concern, which evolves from emotional understanding, will have a negative impact on the stress associated with such situations. One reason why this might be the case is that empathetic concern applies more to identification with the other's feelings, and thus employees are less focused on their own feelings and more on what the customer needs. Because of this control over one's participation in emotional exchanges, the emotionally intelligent individual will feel less stress from such interactions, and thus less stress from the related expectations in the work situation overall.

The quality of emotional labor efforts such as surface and deep acting and the respective outcomes of those emotional labor methods are dependent upon individuals' level of emotional knowledge and understanding. Prati et al. (2003a; 2003b) explained prior research indicating that one's emotional display may positively or negatively influence others' emotional states. As well, effective use of emotional influence can motivate individuals to act in accord with the desire of the person providing that emotional influence. Goffman (1969) referred to acts of presentational influence, similar to emotional influence, as "control moves."

Rafaeli and Sutton (1987) gave the example of tip earners, such as wait staff, to illustrate this influence. They indicated from previous research that the use of positive emotional display earns reward. They also asserted that the organization can benefit from the effective use of

emotional display because of the efficacy of emotional display to engage and establish relationships with customers. Therefore, one's understanding of emotion is crucial to the control of the customer service interaction and successful fulfillment of perceived emotional labor requirements (Grandey, 2000).

In addition to aiding in the effective use of emotional labor practices and their expected outcomes, research indicates that understanding emotions and how to use them may help to reduce strain associated with perceived emotional labor requirements. For instance, Abraham (1998) explained that one who is motivated to comply with organizational display rules, and has the ability to understand and use emotions, may have a resulting reduction in job dissatisfaction. Perhaps this motivation and ability also might help in the reduction of other work strains, such as burnout.

Hypothesis 3: The ability to understand the emotions of one's self and others will moderate the relationship between perceived requirements of emotional display and burnout.

Emotional regulation. The final dimension of emotional intelligence is the skill by which one regulates or manages feeling of one's self and others based on openness to all emotions, reflection on experienced emotions, and goal-oriented emotional behavior (Mayer & Salovey, 1997). As stated earlier, the ability to manage one's emotions enables one control over the customer service interaction (Lam & Kirby, 2002). According to Morris and Feldman (1996), fulfilling emotional labor requirements involves the cognitive management of emotion in order to fulfill organizational expectations of emotional display. These cognitive processes, including "effort, planning, and control," primarily fall under the branch of emotional regulation (Grandey,

2000). With regard to emotional labor functions, this dimension of emotional intelligence provides the channel through which emotional labor efforts are employed.

With regard to benefits of proficiency in this skill as applied to perceived emotional labor requirements, employees who are adept and flexible in their emotional reactions have been shown to suffer less from strain associated with those requirements (Prati, Liu, Perrewé, & Ferris, *In Press*; Saklofske, Austin, & Minski, 2003; Ciarrochi, Deane, & Anderson, 2002; Slaski & Cartwright, 2002; Ciarrochi, Chan, & Caputi, 2000; Schaubroeck & Jones, 2000). The previously mentioned "control moves" of Goffman (1969) are used with more tactical precision in order to build and maintain relationships with customers, which helps to ensure successful fulfillment of perceived organizational and customer expectations of emotional display. For example, individuals who are able to effectively manage their emotions might suffer less from burnout, depression, and physical strains.

Hypothesis 4: The ability to regulate the emotions of one's self and others will moderate the relationship between perceived requirements of emotional display and burnout.

Method

Sample

A total of 244 employees and managers from 29 stores of an 87 year-old retail chain were surveyed, and provided complete and useable data. The sample was primarily female (68.4%) and white (80.3%), with 7.4% African-American, 5.8% Hispanic, and 6.6% other. The average age was 31 years with a range of ages between 16 and 78. The average tenure with the organization was 1.9 years with a range of tenure between 1 month and 30 years. The education

level of associates was fairly split with 46.3% having high school degrees and 52.9% having at least some college level course work. Managerial positions were held by 26.2% of the sample.

Measures

Emotional intelligence. The Self-Report Emotional Intelligence Test (SREIT) (Schutte, Malouff, Hall, Haggerty, Cooper, Golden, & Dornheim, 1998) was used to measure the components of emotional intelligence. The scale has 33 items. A 5-point Liker-type scale was used, with items responses ranging from "strongly disagree" to "strongly agree". Arguments for the scale being a useful tool in research cite the brevity of the scale as well as the reliability and validity evidence (Schutte & Malouff, 1999; Abraham, 1999; 2000). The *SREIT* is a 33-item self-report measure of emotional intelligence.

There have been several concerns expressed regarding this measure. One concern expressed by Petrides and Furnham (2000) and others, which is particularly relevant to the current study was that the data obtained with the *SREIT* should undergo factor analysis to confirm the four-factor structure found in their analysis, as they are unsure of the stability of their solution. It should be noted that Ciarrochi et al. (2002) and Saklofske et al. (2003) also have reported results confirming the four-factor solution, which is similar to the one presented here.

Because there is a question of the stability of the *SREIT* factor structure, a factor analysis using SPSS was conducted for this investigation. The four-factor solution was confirmed as a reasonable fit to the theoretical model of Mayer and Salovey (1997). All but four standardized factor loadings exceeded .40, and the factors were highly to moderately correlated. The internal consistency reliability estimate of the emotional intelligence measure for all items with factor loadings exceeding .40 was $\alpha=.89$.

Insert Table 1 about here

Items in each factor category revealed characteristics similar to the emotional intelligence abilities proposed by Mayer and Salovey (1997). Items categorized in factor 1 reflected one's ability to regulate emotions for promotion of emotional and intellectual growth. The items loading on factor 2 indicated the ability to facilitate emotion. Factor 3 items addressed one's ability to perceive and appraise emotion. Factor 4 was the ability to understand emotion and emotional knowledge. Subscales representing emotion regulation (α=.79), emotional facilitation (α=.78), emotion perception and appraisal (α=.85), and emotional understanding/knowledge (α=.70) all exceeded the α=.70 reliability threshold of Nunnally (1970).

Perceptions of Emotional labor. Perceptions of emotional labor were measured using Schaubroeck and Jones' (2000) 10-item scale. A 5-point Likert-type scale was used, with item responses ranging from "never" (1) to "always" (5) indicating the level of perceived emotional labor required by the organization. Examples of items include "I have to put on a happy face at work even if I don't want to do so" and "I often suppress my emotions at work".

Burnout. The career burnout scale was used to measure burnout. This 21-item scale measures the three primary symptoms determined to indicate burnout, according to Pines and Aronson (1988). These symptoms are emotional exhaustion, physical exhaustion, and mental exhaustion. Subjects were instructed to indicate how often they experienced the items. The items for this scale include "Feeling disillusioned and resentful", "Being physically exhausted", and

"Being emotionally exhausted". The burnout scale (α=.94) exceeded the α=.70 reliability threshold of Nunnally (1970).

Results

Table 1 presents the mean, standard deviations, intercorrelations, and internal consistency reliability estimates for all variables. All reliability estimates were acceptable, and variables were correlated, but not so high as to suggest construct redundancy.

Insert Table 2 about here

We used moderated hierarchical regression analysis to examine the respective, moderating effects of emotional perception and appraisal, emotional facilitation, emotional understanding, and emotional regulation on the relationship between emotional labor perception and burnout, while controlling for gender, age, and tenure. Hypothesis 1, that emotional perception and appraisal moderates the relationship between emotional labor perception and burnout, was supported. The interaction of emotional labor perception and emotional perception and appraisal had a significant effect on burnout ($R^2 = .287$, $\Delta R^2 = .019$, F = 15.812, p<.001). As Figure 2 illustrates, the relationship between emotional labor perception and burnout was slightly positive for individuals with high emotional perception and appraisal, but much more so for individuals low on emotional perception and appraisal. Because the respective interactions between emotional labor perception and emotional facilitation and emotional understanding were not significantly related to burnout, Hypotheses 2 and 3, that emotional facilitation and emotional understanding each moderate the relationship between emotional labor perception and burnout, was not supported. The interaction of emotional labor perception and emotional

regulation, however, did have a significant effect on burnout ($R^2 = .422$, $\Delta R^2 = .025$, $F = 10.334$, $p<.002$), supporting Hypothesis 4 and indicating emotional regulation moderates the relationship between emotional labor perception and burnout. The relationship between emotional labor perception and burnout was relatively flat for individuals with high emotional regulation, but quite steep for individuals with low emotional regulation (see Figure 2).

_____

Insert Figures 2 and 3About Here

_____

Discussion

The current study examined the moderating effect of emotional intelligence abilities on the relationship between emotional labor perceptions and burnout. Similar to Schaubroeck and Jones' (2000) findings with regard to the connection of emotional labor perceptions to physical symptoms of distress, this investigation revealed that perceptions of emotional labor were found to have a positive and significant relationship with mental and emotional distress associated with burnout.

In addition, observations in this investigation held true according to Karasek's (1979) model indicating that job strain due to perceptions of job demands may be alleviated when control factors are considered. In this case the control factors over perceptions of emotional labor job demands were in the form of emotional intelligence abilities. It was hypothesized that each of the four emotional intelligence abilities would moderate the relationship between emotional labor perceptions and burnout. The results were not supported for moderation of two of the four abilities. The only significant moderators were emotional perception and appraisal and emotional regulation.

The results clearly indicated that factors of emotional intelligence impact the relationship of emotional labor perceptions and burnout. Thus, the more skilled one is specifically in perception and appraisal of emotions and in regulating the emotions of one's self and others, the less demanding a job might appear to be in fulfilling requirements of emotional labor. As well, emotional regulation had a negative significant relationship with burnout. Indeed the more ability one has to regulate his or her emotions, the less psychologically taxing the requirements to do so will be.

The other components of emotional intelligence did not appear to impact the relationship at issue. Emotional facilitation, the facilitation of one's thoughts to create another emotional state, is a skill that may be applied to a singular situation. One engages in facilitation of thought on an episodic basis, whereas burnout is cumulative resulting from a series of these episodes. Therefore it is reasonable to assume that the facilitation skill will be less likely to have a cumulative effect in the relationship, but be more of a factor in the situational interaction process.

In addition, emotional understanding did not have a significant moderating effect in this investigation; however, there was a significant negative relationship between this component and burnout. It would seem that one's ability to understand his or her emotions and the emotions of others has a measurable impact on the effects of burnout. One possible explanation for the lack of significance for this ability with regard to the specific relationship of perceptions and burnout is that the understanding ability is not relevant to perceptions, but the active fulfillment of emotional labor.

The lack of significant findings was surprising. As was presented earlier in this paper each ability has characteristics that has application in the emotional labor process. Emotional

regulation or adaptability (e.g., Schaubroeck and Jones, 2000) is a significant variable related to the issue of emotional labor and strain, but that is the only component of emotional intelligence that has been given any attention. This investigation answered the question dealing with the efficacy of the other three components in the alleviation of strain due to emotional labor perceptions.

Limitations

This study has several limitations including, the cross-sectional design, self-report measure of emotional intelligence, and single source data. These limitations plague many studies in the literature today, but are nonetheless worthy of mention. Therefore, an attempt to provide some sort of resolution and suggestions for correction in future studies is necessary. That being said, the study is not without merit regardless of these limitations as it is the first to break down the emotional intelligence abilities provided by Mayer and Salovey (1997) and evaluate the impact of each on a relationship that is of great interest especially in the service industry.

The cross-sectional nature of the data limited the conclusions regarding the "how" of the moderating influence in the examined relationships. How one applies his or her ability to facilitate emotions toward emotional labor expectations, or the ability to regulate ones emotions toward that end is not a question that can be answered in this particular examination. At this point, it was only possible to establish that there is an influence of some of the abilities on the relationship in question. Future research should consider using more process-oriented, within-person research methods to capture exactly how individuals with such abilities inhibit burnout associated with emotional labor perceptions (e.g., orientation to emotional labor through broadened perspective-taking, use of social support, leader-member exchange transactions).

The measurement of emotional intelligence has been a continuing concern since the phrase was coined. As previously described, emotional intelligence is a set of skills providing individuals the capability to use emotional symbols toward objectives. Of late measurement discussions have questioned which of the following are most appropriate: maximum ability (one's ability to perform) or average ability (how one usually performs) (Chapman & Hayslip, 2005). It would be more appropriate to use a performance measure if the objective is to simply measure one's ability, however, understanding how one actually uses his or her emotional intelligence abilities may be conducive to self-report assessment.

The major concern in the case of self-report measurement is whether something other than one's actual emotional intelligence (e.g., personality) is measured. Indeed, performance-based measures are not without concerns (Ciarrochi et al., 2002). We chose the self-report measure, *SREIT*, for emotional intelligence because it has relatively well-established psychometric validity and brevity. In light of the continuing measurement limitations in this regard we suggest that the results of the study be interpreted with caution.

Regarding any concern of common method variance related to self-report data, we acknowledge that total reliance on this data type may be considered a limitation. However, there have been recent arguments showing that common method variance alone may not be enough to reject results from single-source data (Breland, Treadway, Duke, & Adams, 2007). Quite a few past and recent studies entertain acceptance of this assertion (Breland et al., 2007; Crampton & Wagner, 1994; Doty & Glick, 1998; Spector, 2006).

Practical Implications and Future Research

Although the above-mentioned limitations may cause reason for concern regarding how the results are interpreted, the support of the data toward our arguments provides reason for further

study regarding the impact of individual emotional intelligence abilities and their impact on emotional labor and its antecedents and outcomes.

The results of this study are useful to illustrate the importance of evaluating each component in the model created by Mayer and Salovey (1997). Emotional intelligence has been shown to have an impact on leadership, the alleviation of strains, and performance, but the construct has not been comprehensively tested, analyzing each of the skills in relation to many organizational issues. The majority of emotional intelligence studies have tested the overall construct without investigation into how each component may influence certain organizational outcomes.

The components delineated by Mayer and Salovey's model deserve attention. Analysis of these components in relationships where emotional regulation or composite emotional intelligence has only been applied may provide useful and practical insight into those relationships. Without the findings of this investigation on might conclude from the literature that the most relevant component to reducing job strain related to emotional labor would be emotional regulation. The present study concurs that emotional regulation is certainly a relevant and beneficial ability toward stress management for those who must perform emotional labor, but this study also indicates that emotional perception and appraisal may play a meaningful role toward that end.

In this investigation, there was no indication that emotional labor perceptions are impacted by the other two components, but that is not to say that these other components are without merit in the evaluation of the emotional labor process. There are many other ways in which these components might prove useful in this process. For example, emotional facilitation might prove to be very useful in the area of deep acting. One who has difficulty in the facilitation

of thought toward the goal of positive emotional display, might also have problems with deep acting efforts. A finding of this nature would be practical in understanding how to improve one's deep acting ability.

Indeed other duties related to the fields of service and people management may be better executed by those who have honed abilities falling under the umbrella of emotional intelligence. Through this lens, each of these abilities or a combination thereof may provide a formula toward more successful performance. For example, sales ability when analyzed may reveal that the skills of emotional facilitation and emotional understanding are important factors in sales performance. In the study of leadership the skill of emotional appraisal and expression may be found to be an important factor in follower commitment or follower performance. Just as the evaluation of the composite construct has shown, the individual components of emotional intelligence may only serve to enrich the field of emotions and outcomes.

The results of this study and other future studies as suggested above could impact how organizations hire and train employees, how support systems are modeled for those who perform emotional labor and other strain inducing duties, and how such individuals are managed. The present case has several implications regarding the impact of emotional perception and appraisal and emotional regulation on how one perceives emotional labor duties and thereby manages resulting strain. Firstly, it might behoove managers to introduce duties related to emotional labor in a way that represents these duties in a positive light, thereby managing perceptions toward the benefits of such duties. Secondly, a support system where emotional labor experiences are shared and potential solutions are posed for problematic situations that may occur in the future. A third implication of these results is the importance of training toward the management of perceptions and preparation of employees for successfully carrying out the duties expected. Finally,

management support may play a role in the promotion of the healthy and successful execution of emotional labor through the facilitation of the activities mentioned above.

Conclusion

Emotional intelligence abilities can be useful resources in jobs where demands for the regulation of emotional display are excessive. The accurate perception of one's emotional state and the emotional states of others as well as the ability to regulate those emotions provides emotionally intelligent individuals with invaluable coping mechanisms to defeat the adverse effects of perceived psychological stressors. This study presents evidence that the symptoms associated with burnout can be alleviated when one draws upon these resources.

The results further explain the general consensus of this body of literature that the effects of work stressors are impacted by the resources individuals have at their disposal. In this case certain emotional intelligence abilities are shown to be valuable resources. Further analysis would be useful to reveal how one or more emotional intelligence abilities could contribute to the promotion of job performance, the alleviation of other work stressors and deleterious outcomes, as well as other issues within the realm of organizational behavior.

REFERENCES

Abraham, R. (1998). Emotional dissonance in organizations: Antecedents, consequences, and moderators. *Genetic, Social, and General Psychology Monographs*, *124 (2)*, 229-246.

Abraham, R. (1999). Emotional intelligence in organizations: A conceptualization. *Genetic, Social, and General Psychology Monographs*, *125 (2)*, 209-219.

Abraham, R. (2000). The role of job control as a moderator of emotional dissonance and emotional intelligence-outcome relationships. *The Journal of Psychology*, *134 (2)*, 169-184.

Ashforth, B. E. & Humphrey, R. H. (1993). Emotional labor in service roles: The influence of identity. *Academy of Management Review*, *18 (1)*, 88-115.

Breland, J. W., Treadway, D. C., Duke, A. B., & Adams, G. L. (2007). The interactive effect of leader-member exchange and political skill on subjective career success. *Journal of Leadership and Organizational Studies*, *13 (3)*, 1-14.

Brotheridge, C. M. & Grandey, A. A. (2002). Emotional labor and burnout: Comparing two perspectives of 'people work'. *Journal of Vocational Behavior*, *60*, 17-39.

Chapman, B. P., & Hayslip, B. (2005). Incremental validity of a measure of emotional intelligence. *Journal of Personality Assessment, 85*, 154-169.

Ciarrochi, J. V., Chan, A. Y. C. & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality and Individual Differences*, *28*, 539-561.

Ciarrochi, J., Deane, F.P. & Anderson S. (2002). Emotional intelligence moderates the relationship between stress and mental health. *Personality and Individual Differences*, *32(2)*, 197-209.

Crampton, S. M. & Wagner, J. A. III. (1994). Percept-percept inflation in microorganizational research: An investigation of prevalence and effect. *Journal of Applied Psychology, 79 (1),* 67-77.

Cropanzano, R., Rupp, D. E. & Byrne, Z. S. (2003). The relationship of emotional exhaustion to work attitudes, job performance, and organizational citizenship behaviors. *Journal of Applied Psychology*, *88 (1)*, 160-169.

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*, 499-512.

Diefendorff, J. M. & Richard, E. M. (2003). Antecedents and consequences of emotional display rule perceptions. *Journal of Applied Psychology*, *88 (2)*, 284-294.

Doty, H. D. & Glick, W. H. (1998). Common methods bias: does common methods variance really bias results? *Organizational Research Methods, 1 (4),* 374-406.

Durán, A., Extremera, N., & Rey, L. (2004). Self-reported emotional intelligence, burnout, and engagement among staff in services for people with intellectual disabilities. *Psychological Reports*, *95*(*2*), 386-390.

George, J. M. (2000). Emotions and leadership: The role of emotional intelligence. *Human Relations*, *53 (8)*, 1027-1044.

Goffman, E. (1969). *Strategic interaction*. Philadelphia: University of Pennsylvania Press.

Grandey, A. A. (2000). Emotion regulation in the workplace: A new way to conceptualize emotional labor. *Journal of Organizational Health Psychology*, *5 (1)*, 95-110.

Hochschild, A. R. (1983). *The managed heart: Commercialization of human feeling*. Berkeley, CA: University of California Press.

Jordan, P.J., Ashkanasy, N.M. & Hartel, C.E.J. (2002). Emotional intelligence as a moderator of emotional and behavioral reactions to job insecurity. A*cademy of Management Review*, *27 (3)*, 361-372.

Karasek, R.A. (1979). Job demands, job decision latitude, and mental strain: Implications for job-redesign. *Administrative Science Quarterly, 24*, 285–308.

Kruml, S. M. & Geddes, D. (2000). Exploring the dimensions of emotional labor: The heart of Hochschild's work. *Management Communication Quarterly*, *14 (1)*, 8-49.

Kruml, S. M. & Geddes, D. (2000). Catching fire without burning out: Is there an ideal way to perform emotion labor? In N. M. Ashkanasy & C. E. Haertel (Eds.), *Emotions in the workplace: Research, theory, and practice* (pp. 177-188). Westport, CT: Quorum Books/Greenwood Publishing Group.

Lam, L. T. & Kirby, S. L. (2002). Is emotional intelligence an advantage? An exploration of the impact of emotional and general intelligence on individual performance. *The Journal of Social Psychology*, *142 (1)*, 133-143.

Mann, S. (1997). Emotional labor in organizations. *Leadership and Organization Development Journal*, *18 (1)*, 4-12.

Mayer, J. D. & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence: Educational implications* (pp. 3-27). New York: Basic Books.

Morris, J. A. & Feldman, D. C. (1996). The dimensions, antecedents, and consequences of emotional labor. *Academy of Management Review*, *21 (4)*, 986-1010.

Morris, J. A. & Feldman, D. C. (1997). Managing emotions in the workplace. *Journal of Managerial Issues*, *9 (3)*, 257-274.

Petrides, K. V. & Furnham, A. (2000). On the dimensional structure of emotional

intelligence. *Personality and Individual Differences*, *29*, 313-320.

Pines, A. & Aronson, E. (1988). *Career burnout: Causes and cures*. New York:

The Free Press.

Prati, L. M., Douglas, C., Ferris, G. R., Ammeter, A. P. & Buckley, M. R. (2003a).

Emotional intelligence, leadership effectiveness, and team outcomes. *International Journal of Organizational Analysis*, *11 (1)*, 21-40.

Prati, L. M., Douglas, C., Ferris, G. R., Ammeter, A. P. & Buckley, M. R. (2003b). The role

of emotional intelligence in team leadership: Reply to the critique by Antonakis. *International Journal of Organizational Analysis*, *11 (4)*, 361-367.

Prati, L. M., Liu, Y., Perrewé, P. L. & Ferris, G. R. (*In Press*). Emotional

Intelligence as Moderator of the Surface Acting – Strain Relationships. *Journal of Leadership and Organizational Studies*.

Pugliesi, K. (1999). The consequences of emotional labor: Effects on work stress, job

satisfaction, and well-being. *Motivation and Emotion*, *23 (2)*, 125-154.

Rafaeli, A. & Sutton, R. I. (1987). Expression of emotion as part of the work role. *Academy*

of Management Review, *12 (1)*, 23-37.

Saklofske, D. H., Austin, E. J., & Minski, P. S. (2003). Factor structure and validity of a

trait emotional intelligence measure. *Personality and Individual Differences*, *34* (*4*), 707-721.

Schaubroeck, J. & Jones, J. R. (2000). Antecedents of workplace emotional labor

dimensions and moderators of their effects on physical symptoms. *Journal of Organizational Behavior*, *21*, 163-183.

Schutte, N. S. & Malouff, J. M. (1999). *Measuring emotional intelligence and related constructs*. Lewiston, NY: Edwin Mellen Press.

Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J. & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, *25*, 167-177.

Shirom, A. (1989). Burnout in work organizations. In C. L. Cooper & I. Robertson (Eds.), *International review of industrial-organizational psychology* (pp. 25-48). New York: Wiley.

Slaski, M. & Cartwright, S. (2002). Health, performance, and emotional intelligence: An exploratory study of retail managers. *Stress and Health*, *18 (2)*, 63-68.

Sosik, J. J., & Megerian, L. E. (1999). Understanding leader emotional intelligence and performance: The role of self-other agreement on transformational leadership perceptions. *Group and Organization Management*, *24 (3)*, 340-366.

Spector, P. E. (2006). Method variance in organizational research: truth or urban legend? *Organizational Research Methods, 9 (2),* 221.

Totterdell, P. & Holman, D. (2003). Emotion regulation in customer service roles: Testing a model of emotional labor. *Journal of Occupational Health Psychology*, *8 (1)*, 55-73.

Watson, D., Clark, L. A. & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The *PANAS* scales. *Journal of Personality and Social Psychology*, *54 (6)*, 1063-1070.

Zapf, D., Vogt, C., Seifert, C., Mertini, H. & Isic, A. (1999). Emotion work as a source of stress: The concept and development of an instrument. *European Journal of Work and Organizational Psychology*, *8 (3)*, 371-400.

Zapf, D., Seifert, C., Schmutte, B., Mertini, H. & Holz, M. (2001). Emotion work and job

    stressors and their effects on burnout. *Psychology and Health*, *16 (5)*, 527-545.

Zapf, D. (2002). Emotion work and psychological well-being: A review of the literature and

    some conceptual considerations. *Human Resource Management Review*, *12 (2),* 237-268.

Table 1: Factor Analysis Results for *SREIT* Emotional Intelligence Scale

Items	Factor 1 Emotion Regulation	Factor 2 Facilitate Emotion	Factor 3 Perceive and Appraise Emotion	Factor 4 Understand Emotions	Item-Total r
I easily recognize my emotions as I experience them.	.65				.51
I have control over my emotions.	.64				.39
I know why my emotions change.	.63				.34
I expect that I will do well on most things I try.	.61				.38
When I am faced with a challenge, I give up because I think I will fail.	.56				.34
When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.	.52				.32
I am aware of my emotions as I experience them.	.50				.51
When I experience a positive emotion, I know how to make it last.	.48				.59
I present myself in a way that makes a good impression on others.	.47				.54
I motivate myself by imagining a good outcome to the tasks I take on.	.46				.55
When I am in a positive mood, solving problems is easy for me.	.43				.48
I use good moods to help myself keep trying in the face of obstacles.		.67			.55
When I feel a change in emotions, I tend to come up with new ideas.		.62			.57
When my mood changes, I see new possibilities.		.60			.39
I expect good things to happen.		.59			.54
When I am in a positive mood, I am able to come up with new ideas.		.59			.58
Emotions are one of the things that make my life worth living.		.58			.44
I like to share my emotions with others.		.54			.23
When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.		.49			.45
By looking at their facial expressions, I recognize the emotions people are experiencing.			.75		.45
I can tell how people are feeling by listening to the tone of their voice.			.74		.48
I know what other people are feeling just by looking at them.			.70		.39
I am aware of non-verbal message other people send.			.70		.57
I find it hard to understand the non-verbal messages of other people.			.59		.40
I am aware of the non-verbal messages I send to others.			.57		.56
Other people find it easy to confide in me.				.62	.33
It is difficult for me to understand why people feel the way they do.				.54	.38
I compliment others when they have done something well.				.50	.45
I help other people feel better when they are down.				.49	.49

Table 2: Correlations

	Emotional Labor Perceptions	Emotional Regulation	Emotional Facilitation	Emotional Perception and Appraisal	Emotional Understanding	BurnOut
Emotional Labor Perceptions	1					
Emotional Regulation	-.244(**)	1				
Emotional Facilitation	.006	.504(**)	1			
Emotional Perception and Appraisal	-.092	.472(**)	.397(**)	1		
Emotional Understanding	-.094	.558(**)	.609(**)	.469(**)	1	
BurnOut	.485(**)	-.391(**)	-.080	-.105	-.231(**)	1

** Correlation is significant at the 0.01 level (2-tailed).

Figure 1.

The Moderating Role of Emotional Intelligence Components in the Emotional Labor Perceptions – Burnout Relationship.

Components of <u>Emotional Intelligence</u>

- Emotional Perception and Appraisal
- Emotional Facilitation
- Emotional Understanding
- Emotional Regulation

Perceptions of
Emotional Labor
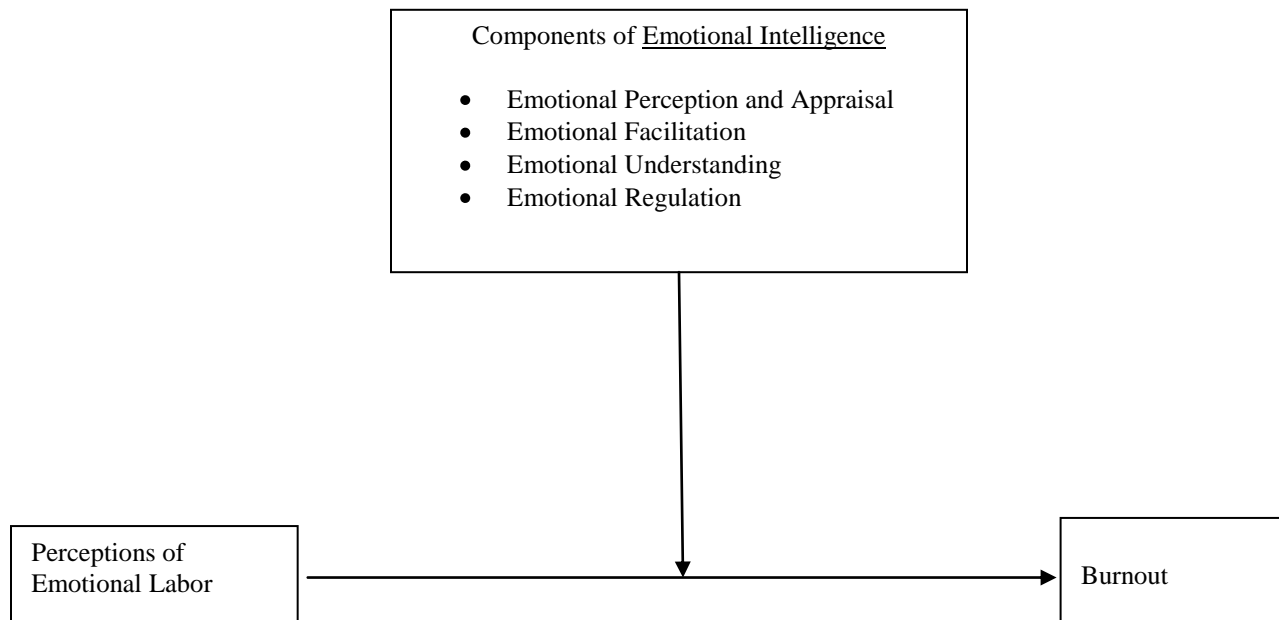
Burnout

Figure 2
Interactive Effects of Emotional Perception, Appraisal, and Expression on the Relationship between Emotional Labor Perception and Burnout
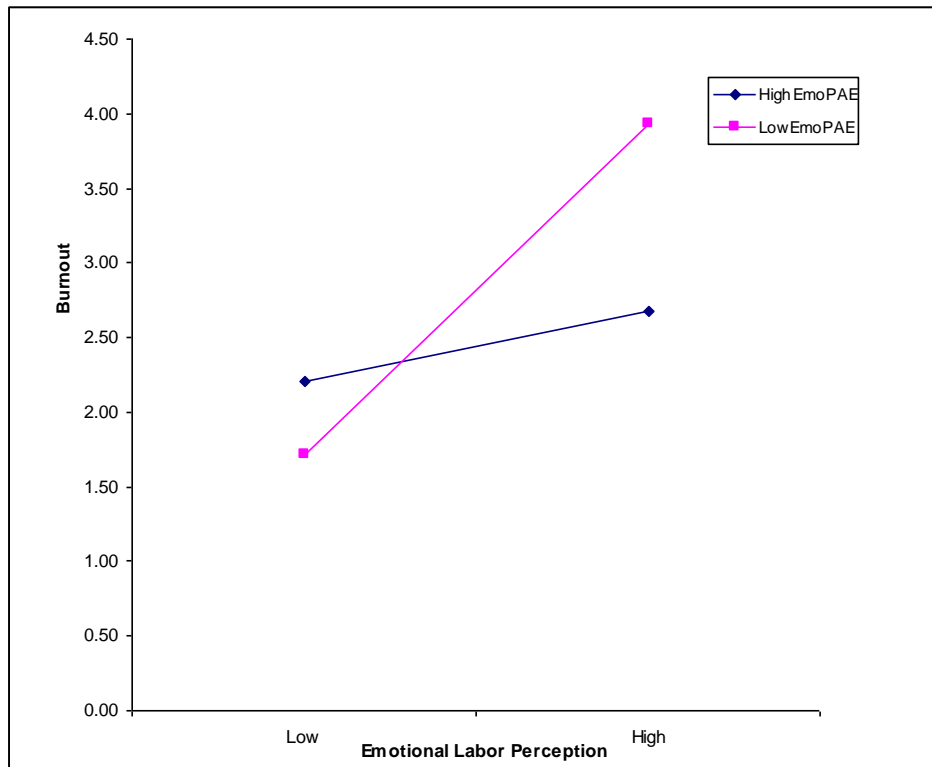
Figure 3
Interactive Effects of Emotional Regulation on the Relationship between
Emotional Labor Perception and Burnout
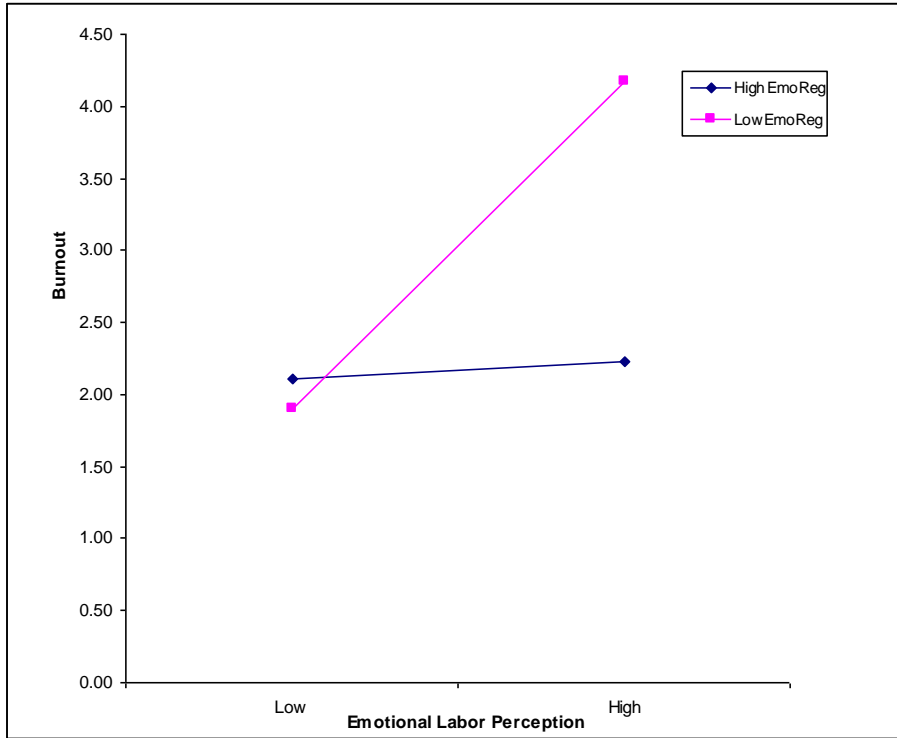
LIFESTYLE BEHAVIORS: EVALUATING BEHAVIORS THAT JUSTIFY INCREASING THE EMPLOYEE'S COST FOR EMPLOYER PROVIDED HEALTH INSURANCE

R. Eugene Hughes, Department of Management, College of Business, East Carolina University; Greenville, NC 27858; e-mail: hughesr@ecu.edu

ABSTRACT

Individuals under the age of 65 rely primarily on employers for their health insurance [9]. As the cost of this employee benefit has increased, employers have instituted a number of cost-savings efforts such as reduced benefits, limited access, increased co-payments, and increased deductibles. Of interest in the present paper are cost abatement efforts that focus on lifestyle behaviors, which adversely influence insurance premiums. If such efforts are to succeed, it will require the acceptance of all employees. The present paper will present information that identifies lifestyle behaviors that might reasonably receive support for such differential treatment.

INTRODUCTION

Some form of health insurance is offered to employees by approximately 60% of private organizations. While 59% of organizations with less than 100 employees offer health insurance, this benefit is offered by 93% those organizations with 100 or more employees. Approximately 24% of all employers pay the full cost of health insurance and 13% pay for the cost of family coverage [11].

The average total monthly cost of health insurance for the employee is $428 and an average of 81% is paid by the employer. The average total monthly cost for family coverage is $1078 with the employer paying approximately 71% of cost [11].

In a survey of 400 firms, it is reported [12] that the average cost of medical insurance provided by these employers was $5924. This amount represented approximately 14.5% of total payroll cost in 2005 and is an increase from the 11.9% reported in 2004.

Employers began to observe increased cost associated with providing health insurance beginning in the 1970s and 1980s [9]. Such increases continue today and it is expected that these cost will increase by approximately 10% in 2008 [1]. As employers were negatively impacted by increasing health benefit costs, they pursued a number of cost control options, which allowed them to continue to provide employee health care insurance.

Cost Control Efforts

Risk management was a major tool for controlling cost prior to the passage and enactment of the Americans with Disabilities Act in 1990. Before ADA, risk reduction associated with the use of health benefits was pursued through pre-employment medical exams, which were, by some

organizations, extended to family members. By selecting low risk employees with low risk families, an organization could significantly reduce its exposure to increased insurance premiums based on employees' health care utilization.

After passage of the ADA, which seems to prohibit pre-employment physical, the use of this form of risk reduction has been severely limited. That is, ADA does allow pre-employment physicals when it is determined that the applicant's health is a bona fide occupational qualification for job performance. In addition, it is obvious that employers may secure health data from other sources [4].

Responding to the loss of this risk reduction tool, employers appeared to focus on cost shifting as a method of cost control. In its most direct and extreme form, the organization simply discontinues the health care benefit. Because of the unfavorable variability of premiums, this course of action appeals primarily to small employers [7]. Larger employers seldom experience wide variations in premiums and, consequently, have fewer reasons to discontinue health benefits. Because of the assumed relation between health benefits and the employer's ability to attract applicants [8], employers appear to view discontinuation of health benefits as a last resort.

Many employers identified cost sharing as a reasoned approach to increased health benefit costs. Such cost-sharing efforts can take a number forms. In essence, however, they resulted in decreased health benefits. A direct reduction effort might involve limits on previously covered health events or the removal of coverage for certain health benefits.

Employers often, however, simply increased the employee's deductibles and/or co-payments. In many situations, employers also began to reduce the employees' choice of medical providers by requiring higher employee co-payments for providers who were not included in the employer's or insurance provider's list of preferred providers. These cost-sharing efforts often were, especially for large employers, the result of the organization's decision to self-insure or to move to a managed health care program [9].

Because of the impact of a large medical claim, self-insurance is a high-risk action for a small firm and, in fact, may jeopardize its survival. However, for large firms self-insurance has the advantage of removing its health benefits from state jurisdiction and places it under federal regulation (ERISA, Employee Retirement Income Security Act). It also allowed the organization to implement some form of individual pricing that charged employees higher premiums or deductibles for recognized unhealthy behaviors or conditions that do not fall under regulations of ADA.

Efforts to charge premiums based on the employee's health were ended by HIPAA (Health Insurance Portability and Accountability Act of 1996), which requires that covered employees be charged the same premium regardless of pre-existing conditions or health. In 2007, employers received some relief from the prohibition when HIPAA rules were modified to allow financial incentives for wellness programs. These incentives or rewards can be as large as 20% of the cost of coverage for the employee [5].

Federal and state regulation of differential premiums and/or incentives is insufficiently precise that legal assistance is required prior to implementation of any premium/incentive programs [5] [14]. However, single company examples of successful efforts to decrease health benefit costs (e.g. [1] [2] [3] [10] [13]) suggest that incentive programs have the potential to reduce health care benefit costs.

None of the above examples suggests, however, that all employees are willing to participate in offered wellness programs. In fact, Dow Chemical [10] has instituted a bonus system for it health staff that is based on their ability to enroll employees in the company's wellness program. To some extent, the lower level of participation may be a function of whether employees agree with the list of unhealthy behaviors that are eligible for incentives. As would be expected, organizations choose the unhealthy behaviors based on health cost. However, employees may choose not to participate in company sponsored wellness programs because of their attitudes toward the unhealthy behaviors.

METHOD

Participation in wellness programs can vary from approximately 75% for intensive intervention programs to not more than 20% for a simple program [13]. A number of explanations may be provided for the low participation rates, but employees' attitudes regarding the lifestyle behaviors may be an important consideration.

As part of a larger study, a questionnaire was developed to investigate this question. The questionnaire described 12 lifestyle behaviors (Appendix A) that are similar to factors for which health risk has been established by epidemiology [6].

The instructions provided information as to how premiums for group health are determined. It then raised the question as to whether it is rational that the premium for each member is the same regardless of their health behavior. The questionnaire then asked the respondent whether it was rational or irrational to consider the individual's health behavior in determining that person's premium. While, as noted above, most programs that differentially price health insurance do so on the basis of incentives, it was thought that this approach would best measure respondents' attitudes regarding the identified lifestyle behavior.

The questionnaire was distributed in both undergraduate (BSBA) and graduate (MBA) classes at a regional state-supported university. The sample (N=106) consisted of 50 females and 56 males with an average age of 25.6 years. Sixty-nine percent indicated management experience of one year or less for an average of 2.63 years. Twenty-six were married and 80 were single. Analysis of the 12 lifestyle behaviors (MANOVA, Wilks' Lamba) showed no significant overall effect associated with these variables (i.e., education, gender, age, management experience, and marital status).

RESULTS

The means and standard deviations for the 12 lifestyle behaviors are shown in Table 1. Table 2 shows the results of factor analysis (principal components, varimax rotation), which identified

three underlying dimensions (eigen values ≥ 1.0) of the 12 lifestyle behaviors. The three factors are defined, respectively, by four, two, and two lifestyle behaviors (underlined and bold). The remaining four lifestyle behaviors exhibited cross loadings that prevent their inclusion in any one of the three factors. Lifestyle scales were named based on the lifestyle behaviors that compose the factors and scale values were computed (average responses for the included lifestyle behaviors). The means, standard deviations, and reliabilities for the Risky Behavior, Prevention, and Tobacco Usage are shown in Table 3.

Table 1

Means and Standard Deviations Measuring the Rationality of Recognizing Individual Behavior

in Setting Health Insurance Premiums for 12 Lifestyle Behaviors

Lifestyle Behavior	*M*	*S.D.*
Smoking	**1.74**	**1.06**
Other Uses of Tobacco	**2.18**	**1.12**
Drinking (Liquor, Wine, etc.)	**3.07**	**1.27**
Unsafe Sex	**3.01**	**1.48**
Not Following Doctor's Orders	3.58	1.45
Unhealthy Eating Habits	3.98	1.38
Unsafe Driving	3.72	1.56
Not Using Seat Belts	3.51	1.72
Lack of Exercise	3.93	1.44
Risky Recreational Behavior (skydiving, auto racing, etc.)	3.77	1.64
Not Maintaining Healthy Weight	**3.49**	**1.21**
Not Getting Annual Physical Exam	**3.29**	**1.51**

Table 2

Factor Analysis of the Rationality of Recognizing Individual Behavior

in Setting Health Insurance Premiums for 12 Lifestyle Behaviors

Lifestyle Behavior	Factors		
	I	II	III
Smoking	.052	.085	**.908**
Other Uses of Tobacco	.101	.216	**.879**
Drinking	.423	.351	.461
Unsafe Sex	.681	.121	.440
Not Following Doctor's Orders	**.716**	.130	.047
Unhealthy Eating Habits	.533	.625	.240
Unsafe Driving	**.809**	.278	.054
Not Using Seat Belts	**.812**	.168	.011
Lack of Exercise	.569	.614	.107
Risky Recreational Behavior	**.721**	.199	.168
Not Maintaining Healthy Weight	.177	**.825**	.209
Not Getting Annual Physical Exam	.134	**.813**	.089

Table 3

Means, Standard Deviations, and Reliability for Three Factors Representing the Rationality of

Recognizing Individual Behavior

in Setting Health Insurance Premiums for 12 Lifestyle Behaviors

	Factor	M	S.D.	Alpha
I.	Risky Behavior	3.64	1.30	.831
II.	Prevention	3.39	1.20	.696
III.	Tobacco Usage	1.96	1.02	.853

DISCUSSION

For discussion purposes, it is reasonable to recognize the response scale values as representing respondents' support or the lack of support for including individuals' lifestyle behavior in determining health insurance premiums. "Support" is defined here as values less than the midpoint of the response scale (3.5), while greater values indicate no support for considering the lifestyle behavior in rate setting. With this definition, only six (bold in Table 1) of the 12 items suggest support for recognizing individual behavior in pricing health insurance. The strongest support is provided for Smoking and Other Uses of Tobacco. Drinking and Unsafe Sex receive modest support, but Not Maintaining a Healthy Weight and Not Getting Annual Physical Exams reflect only very weak support. With one exception, these results are consistent with the cost savings pursued by many employer sponsored wellness programs. The major difference is the low level of support for recognizing weight control.

As expected, data for the three identified factors, Table 2 and Table 3, are consistent with the above discussion. An import difference is that Risky Behavior receives "no support" for inclusions in the rate setting decision. A review of the lifestyle behaviors included in the factor suggests that respondents' may feel that these are, for the most part, off-the-job behaviors. As private lifestyle behavior, it might be assumed that they should not be considered as a part of the employer/employee relation.

CONCLUSIONS

As discussed earlier, employers are pursuing a number of wellness efforts to control their cost of employer provided health insurance. To obtain these cost savings, some employers require employees who exhibit unhealthy lifestyle behaviors to pay higher premiums and others reduce the premiums for health lifestyle behaviors. In the latter incentive system, the employer, in order to obtain the desired cost savings, must have the participation of a majority of the employees. A factor that may influence the level of participation is the extent to which employees agree that the lifestyle behavior should be included as a factor in determining premiums or incentives.

Data were collected to determine whether respondents "supported" the inclusion of 12 lifestyle behaviors, which are consistent with those identified as health risks [6]. Scales based on the results of factor analysis provided support including Tobacco Usage and Prevention (maintaining healthy weight), which, in various forms, are included in most, if not all, wellness programs.

Interestingly, respondents provided no support for the inclusion of the Risky Behavior factor. The lifestyle behaviors included in this factor appear to be a matter of private behavior. As such, respondents may be telling us that these lifestyle behaviors are out-of-bounds for inclusion in the employer's wellness programs.

REFERENCES

1. Covel, S. & Spors, K. K. (2008, June 26). Providing health benefits on a budget. *The Wall Street Journal,* p. B6.

2. Feinberg, D. (2007). Managed Care. *The Journal of Child and Adolescent Psychopharmacology, 17(3)*, 391-392.

3. Hodge, J. (2006). Lowering healthcare premiums by increasing staff wellness. *Nursing Homes, 55(11)*, 66-69.

4. Kapur, K. (2004). The impact of the health insurance market on small firm employment. *The Journal of Risk and Insurance, 71(1)*, 63-90.

5. Knight, V. E. (2008, January 16). Wellness programs may face legal tests. *The Wall Street Journal,* p. D9.

6. Long, D. A. (2006). The cost of lifestyle health risk: Obesity. *The Journal of Occupational and Environmental Medicine, 48(3)*, 244-251.

7. Monheit, A. C., & Schone, B. S. (2003). How has small group market reform affected employee health insurance coverage? *Journal of Public Economics, 88,* 237-254.

8. Monheit, A. C., & Vistnes, J. P. (1999). Health insurance availability at the workplace. *The Journal of Human Resources, 34(4).* 770-785.

9. Park, C. H. (2000). Prevalence of employer self-insured health benefits: National and state variation. *Medical Care Research and Review, 57(3)*, 340-360.

10. Rubenstein, S. (2005, October 24). Keeping workers healthy pays off at Dow Chemical. *The Wall Street Journal Online,* (http://online.wsj.com/article/SB113011180643877125.html)

11. U. S. Department of Labor Statistics (2007). National compensation survey: Employee benefits in private industry in U. S. (http://www.bls.gov)

12. U. S. Chamber of Commerce (2008). Chamber survey employers pay more for benefits. (http://www.uschamber.com/publications/reports/benefits.htm)

13. Wellness; MacAllister Machinery reduces healthcare costs, Improves employee health with CareGuide's predictive modeling and health coaching program, (2007, October 13). *Obesity, Fitness, and Wellness Week,* p. 375.

14. Zhang, J. (2008, June 4). Lawsuits test disabilities act. *The Wall Street Journal,* p. D1, 6.

APPENDIX A

PRICING HEALTH INSURANCE

In general, if you are a member of a group health insurance plan, everyone in the group is charged the same price for the insurance. When members of the group engage in unhealthy or risky behavior that results in medical costs, all members of the group share in any increase in the cost of the insurance. One might ask why all members of the group must pay for the unhealthy or risky behaviors of a few members.

The following questions ask you whether **you think** it would be RATIONAL to consider an individual's unhealthy or risky behavior in pricing group health insurance for that person. In answering the following questions, **consider only the listed behavior, do not be concerned either about the intensity or "how much" of the behavior would be required to initiate an additional cost or how the behavior would be detected.**

	Very Rational					Very Irrational
SMOKING	1	2	3	4	5	6
OTHER USES OF TOBACCO	1	2	3	4	5	6
DRINKING (Liquor, Wine, etc.)	1	2	3	4	5	6
UNSAFE SEX	1	2	3	4	5	6
NOT FOLLOWING DOCTOR'S ORDERS	1	2	3	4	5	6
UNHEALTH EATING HABITS	1	2	3	4	5	6
UNSAFE DRIVING	1	2	3	4	5	6
NOT USING SEAT BELTS	1	2	3	4	5	6
LACK OF EXERCISE	1	2	3	4	5	6
RISKY RECREATIONAL BEHAVIOR (e.g., skydiving, auto racing)	1	2	3	4	5	6

NOT MAINTAINING A
HEALTHY WEIGHT   1   2   3   4   5   6

NOT GETTING ANNUAL
PHSYCIAL EXAM   1   2   3   4   5   6

UNDERSTANDING THE ROLE OF JUSTICE CLIMATE IN SHAPING ORGANIZATION LEVEL INTERPERSONAL BEHAVIORAL NORMS

Andrew Herdman
East Carolina University
College of Business
121 Slay Building
Greenville, NC27858
herdmana@ecu.edu

Walter L. Grubb III
East Carolina University
College of Business
323 Slay Hall
Greenville, NC 27858
grubbw@ecu.edu

UNDERSTANDING THE ROLE OF JUSTICE CLIMATE IN SHAPING ORGANIZATION LEVEL INTERPERSONAL BAHAVIORAL NORMS

Abstract

While a significant literature has developed exploring the antecedents and consequences of individual level justice perceptions, less is known about the role of aggregate organizational justice perceptions, or justice climate. For this reason, the present paper seeks to build on a limited number of recent studies by exploring the role of justice climate as a key determinant of norms of interpersonal behavior at the organizational level. Three specific contributions are offered. First, we seek to replicate and extend recent studies that report a positive relationship between justice climate and cooperative behavior among employees. Second, we provide a first test regarding the role of justice climate in the development of norms of deviant interpersonal behavior. Finally, we test a key theorized process through which these effects occur by measuring and testing organizational commitment as a mediating mechanism between levels of justice climate and the development of cooperative and deviant interpersonal behavioral norms.

Conceptual Overview and Hypothesis Development

Procedural justice describes generalized individual perceptions regarding the fairness of processes used in decisions affecting employees (Konovsky, 2000; Levanthal, Karuza & Fry, 1980; Lind & Earley, 1992;Thibaut & Walker, 1975). Procedural justice perceptions are theorized to be an important determinant of individual commitment to the organization and willingness to expend discretionary effort on behalf of the organization. Fairness heuristic theory (Lind, 2001; Lind & Vande Bos, 2001; Vaden Bos, Lind & Wilke, 2001), for example, suggests that individuals rely on these fairness judgments when faced with daily decisions to cooperate with others in support of the collective good or to act from a place of self-interest.

The cognitive mechanisms believed to underlie this fairness heuristic are typically grounded in one of two theoretic traditions. First, the "instrumental model", suggests that individuals assess the processes through which decisions are made and are more likely to suspend the primacy of self-interest and act in the interest of others when mechanisms are in place to assure that they will not be adversely impacted by these decisions (Lind & Earley, 1992; Lind & Taylor, 1988; Thibaut & Walker, 1975). Next, the "relational model", builds on the predictions of social exchange theory (Blau, 1964). In short, fairness in decision-making serves as a symbolic interaction and is important to an employee's understanding of their place and status in the organization (Scneider & Reichers, 1982; Ostroff & Bowan, 2004; Roussue, 1994, 1996). Further, when individuals believe the organization's decision-making processes are fair,, they will likely believe that they are valued and protected by the organization. In turn, this belief, may create a sense of felt obligation to reciprocate with increased loyalty to the organization and a greater willingness to engage in behavior supportive of the whole. Common to both theoretical perspectives, however, is the assertion that when individuals perceive

procedural fairness in their environment, they are more likely to develop identification with the "whole" in terms of loyalty and behavior. Meta-analytic treatments of this literature generally support this assertion by demonstrating robust relationships between individual perceptions of procedural justice and both organizational commitment and extra-role behavior such as organizational citizenship behavior (Cropozana, Rupp, Mohler & Schnike, 2001; Colquitt, Conlon, Wesson, Porter & Ng, 2001).

However, less attention has been given to understanding the dynamics and consequences of justice perceptions at the group and organizational level, commonly referred to as justice climate (Colquitt, Noe & Jackson, 2002; Nauman & Bennett, 2000). Only recently have a small number of studies empirically investigated these aggregate perceptions (Colquitt et al., 2002; Naumann & Bennett, 2000; Liao & Rupp, 2005; Yand, Mossholder & Peng, 2007). This relative dearth of justice climate research is especially noteworthy because justice perceptions occur in a social context. Nauman & Bennett (2000) provide a rationale for generalizing the predictions of procedural fairness to the organizational level by suggesting that that group level perceptions may exert influence on affect and behavior apart from individual level effects. In sum, when collectively exposed to decision-making practices, employees develop shared perceptions of fairness related to the decision-making processes used within the organization. Group/organizational members, in turn, would be more likely to engage in cooperative behavior without fear that doing so may result in exploiting or compromising their own interest (Mossholder, Bennett & Martin, 1998). As individuals witness co-workers acting for the benefit of the group, these behaviors become self-reinforcing and further strengthen the felt obligation to suspend self-interest and reciprocate (Nauman & Bennett, 2000).

As stated, a limited number of studies have provided first tests of these effects at the group and organizational level, with general support for the theoretical assertions. For example, Naumann & Bennett demonstrated that justice climate provided incremental prediction in helping behavior, above the individual level effects. Similarly, Yang et al. (2007) and Laia & Rupp provide evidence of similar relationships between procedural justice climate and satisfaction, organizational commitment and organizational citizenship behavior.   Taken together, available evidence supports the notion that the established effects of procedural justice indeed strengthened at the group and organizational level.

In the present study, we anticipate replicating these findings by examining the impact of justice climate on both collective organizational commitment and employee reports of coworkers engaging in team-work behaviors. This effort provides further insight into the impact of justice climate on both affective outcomes—organizational commitment and the emergent behavioral norms believed to result from this collective commitment. However, in measuring the interpersonal behavioral norms, unlike past studies (Nauman & Bennett, 2000; Liao & Rupp, 2005; Yang et al., 2007), we assess the norms of interpersonal behavior through direct query of the employee based on their experience with other employees, rather than supervisory reports of levels of helping or citizenship behavior exhibited to benefit the organization. As such, this is arguably a more proximate measure of the actual behavioral norms amongst employees. Specifically, we offer the following hypothesis related the relationship between procedural justice climate and both organizational commitment and cooperative interpersonal behavior:

> *H1- Levels of procedural justice climate will be positively associated with levels of aggregate organizational commitment.*
>
> *H2- Levels of procedural justice climate will be positively associated with levels of cooperative behavior among employees.*

Relative to positive affective and pro-social behavior, the study of counter-productive behavior has received little attention in the justice literature. The corollary of the expected positive relationship between justice climate and cooperative behavior is that lower levels of justice climate should in fact have damaging effects on the social fabric of the organization. While work in the area of procedural justice provides general support for the relationship between lower levels of justice perceptions and counter-productive individual level behavior (Colquitt et al., 2001), no research to date has sought to explore this phenomenon at the organizational level of analysis. In short, lower aggregate perceptions of fairness, should give rise to behavior that subordinates interests of the group to the protection of self-interest. If so, fairness perceptions may serve as an important determinant of the levels of unhealthy and deviant interpersonal behavioral norms. Like cooperative behavior, these patterns of behavior would be expected to be further reinforced through group interaction and, therefore, self-propagate. However, no study to date has sought to explore the relationship between justice climates on levels of deviant interpersonal behavior among employees.

At the same time, the study of incivility, antisocial, deviant and aggressive behavior within organizations, however, has seen an increase in research attention (Dietz, Robinson, Folger, Baron & Schultz, 2003; Neuman & Baron, 1998; Pearson & Porath, 2005). This behavior, broadly defined as "interpersonal deviance", suggests a general incivility and aggressive behavior. This behavior would be consistent with behavioral norms resulting from individual and group level perceptions of lower levels of procedural justice. Existing empirical research on interpersonal deviance has tended to focus exclusively on individual-level but nevertheless suggests that as well as individual-level perceptions of fairness or other "situational" factors are associated with increases in individual level interpersonal deviance

(Colbert, Mount, Harter, Witt, & Barrick, 2004). Group-level studies have shown that aggregate

levels of interpersonal deviance in groups help to predict individual group member acts of

interpersonal deviance (e.g. Glomb & Liao, 2003; Robinson & O'Leary-Kelly, 1998). Therefore,

we propose the following in terms of the relationship between procedural justice climate aggregate levels

of deviant interpersonal behaviors:

> *H3- Levels of procedural justice climate will be negatively associated with aggregate*
> *levels of interpersonal deviance behavior among employees.*

Common to both Hypothesis One and Two is the theoretical assumption that when

varying levels of justice climate are found within organizations, employees experience relative

degrees of freedom to subordinate self-interest to the interest of the collective. It follows that

relative identification or loyalty to the organization is both a consequence of justice climate, as

suggested by hypothesis 1, and an important intermediary mechanism between the justice

perceptions and the emergence of the resultant behavioral norms. While the main effects of the

relationship between both individual and group climate level perceptions of procedural justice

climate and organizational commitment have been supported (Nauman & Bennett, 2000; Liao &

Rupp, 2005; Yang et al., 2005), this basic theoretical assumption has not been tested at the group

or organizational level of analysis.

> *H4- The relationship between procedural justice climate and the organizational level*
> *behavioral norms of cooperative and interpersonal deviance behaviors will be partially*
> *mediated by the aggregate level of organizational commitment.*

Summary of Hypothesized Relationships

Below, a model of the hypothesized relationship to be tested is provided.
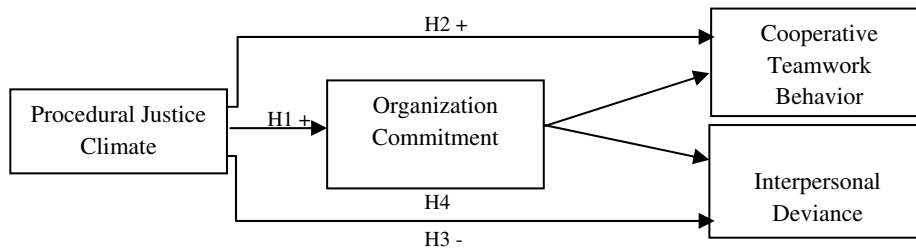
Overview of Methods

Research Protocol and Sample Characteristics

The study was conducted with the cooperation of a large international hotel franchise

company. This company manages, through franchise agreements, approximately 3,600 hotels

comprised of five hotels brands that represent a variety of market orientations including the

extended stay, low cost, business traveler and luxury markets. Each hotel operates autonomously

and is free to adopt and implement management practices and decision-systems of their own

choosing.

The study was conducted in two phases. First, a pilot phase was used to test and refine

the measures. The pilot phase was also used to develop the appropriate administrative processes

involved in the distribution and collection of the surveys. For the pilot phase of the data

collection, hotels were identified by the franchise advisory board of the company for

participation based on diversity of brand and performance. These hotels were personally

contacted by the researcher to describe the project and requirements. These locations provided

employee count information and any language requirements.   Survey packets were then

prepared and sent to each location containing the survey materials, a sealed postage paid

collection box and introductory letter with instructions on the distribution and collection process.

All survey instruments were also reviewed by both senior company and property level HR

Personnel to ensure interpretability of the items and relevance prior to distribution.

In the primary data collection, the same protocol was followed in terms of survey

distribution and collection. In total, 203 hotels representing diverse locations brands and sizes,

participate in the primary data collection. It was necessary to have all items professionally

translated into Spanish, Chinese, Russian and French to accommodate non-English speaking

employees. In all cases, the items were both proofread by independent translators and reverse

translated to assure the meaning and intent of the items was retained. In total, approximately

2,772 of the 5,100 surveyed employees provided usable surveys for a response rate of

approximately 55% and an average group size at each location of 13.67.   For the two employee

surveys, the respondents averaged 3.3 yrs of service; 6.2 years in industry and 61.95% were

female and 4.29% unspecified. Of the 5,549 total responses to the two employee surveys, 1,015

(18.2%) were Spanish translation version, 40 (< 1 %) were Chinese, 11 (< 1 %) were Russian

and 16 (< 1%) were French.

Measures

A Likert type scale was used for all items ranging from "1" indicating strong

disagreement with the statement to "5" indicating strong agreement with the statement.

Procedural Justice Climate- Procedural justice measures were used to capture employee

perceptions of the processes used in decision-making. The items were adapted from past

research (Colquitt, 2001; Nauman & Bennett, 2000) and specifically target the degree to which

decisions are made fairly, consistently and consider affected employees. Examples of items used

are "All decisions in this hotel are made in a fair way" and "When decisions are made about our

jobs, this hotel considers employee needs". The reliability of the scale was α = .83 in the pilot

sample, and α =.89 in the final sample.

Teamwork- The teamwork measures captured the level of cooperative and coordinative

behavior among employees within each organization. The items were adapted from Glaser,

Zamanou, and Hacker's teamwork scale (1987). Sample items include "The people I work with

are cooperative" and "People I work with function as a team". In total, seven items were used in

the course of the pilot. These items produced good reliability in the pilot sample (α= .91). Given

the strong reliability and the need to shorten the survey, one item was eliminated. Additionally,

modest changes to the wording were made in order to simplify the items. The reliability of this

scale in the primary data collection was α = .92.

Organizational Commitment- Affective organizational commitment was designed to

capture the employee commitment and loyalty to the organization. Organizational commitment

was measured using four items adapted from Meyer, Allen & Smith (1991). A sample item is "I

feel a strong sense of belonging to the organization". The items had an acceptable reliability (α

= .80) in the pilot sample. However, given the central nature of the construct, an additional item

"I feel a high level of loyalty to this hotel" targeting the degree to which employees believed

they felt a long-term commitment to the hotel was added during the primary data collection.

Within the primary data collection, the reliability of this final scale was α = .94.

Interpersonal Deviance- Measures of teamwork were taken from Robinson and Bennett

(2000) and were used to capture the degree to which employees perceive the prevalence of

fellow employees engaging in incivility and deviant behavior towards one another. In total, five

items were selected, including "Employees in my department are act rudely to one another". The

reliability of this scale was α = .92.

Control Variables- In order to account for extraneous sources of variance unrelated to the effects of fairness perceptions, a variety of group level characteristics were included as controls. These include the size of the location, the average level of education, average years in industry and average length of service at the location.

Results

Aggregation Analysis

Because all hypothesized relationships are at the organizational level of analysis, individual responses were aggregated to represent these variables at the organizational level. Prior to doing this, agreement will be assessed to demonstrate sufficient consensus among employees prior to representing each construct as the mean response within each location. Intraclass correlation coefficient 1 (ICC 1) and Intraclass correlation coefficient 2 (ICC 2) are ANOVA based measures derived from the components of a one-way random effect ANOVA in which the construct of interest is the dependent variable and the group membership is the independent variable. ICC (1) is interpreted as the degree to which any one member might reliably represent the group (Bliese, 2000). ICC (2) is an indicator of the reliability of the measure across respondents and, as such, provides an estimate of the degree to which the mean accurately represents the group (Bliese, 2000).

Table 1 presents the results of this analysis for each variable. ICC (1) values ranged between .08 for Teamwork Behavior and .12 for Fairness Perceptions. These values are all significant at p < .01 and though at or slightly below the conventional standard of .12, these are consistent with values reported in past research examining group level fairness perceptions and outcomes (Liao & Rupp, 2005; Yang et al., 2005). Likewise, the ICC (2) values, ranging from

.38 to .52, are below recommended standards, but consistent with values report in past research

Liao & Rupp, 2005; Yang et al., 2005).

Test of Hypothesis

Table 2 presents the means, standard deviations and zero-order correlation between the

study variables.

As reflected in Table One, fairness climate is significantly and strongly correlated with

higher levels of organizational commitment ($r = .66$, p< .01) and teamwork behavior ($r = .67$, p

< .01) and lower levels of interpersonal deviance ($r = -.45$, p< .01). However, to provide a more

severe test of these relationships, multiple regression was performed to allow for the inclusion of

controls in the prediction model. As shown in Table 2, fairness perceptions is contributes

significantly, above the controls, to the prediction of organizational commitment ($\Delta R^2 = .43$, $p <$

01), teamwork behavior ($\Delta R^2 = .39$, $p < 01$) and interpersonal deviance ($\Delta R^2 = .13$, $p < .01$).

Therefore hypothesis 1 and 2 are supported suggesting that fairness climate is positively related

to the development of higher levels of organizational commitment and teamwork behavior.

Conversely, fairness perceptions were negatively related to reports of interpersonal deviance

norms among groups, supporting hypothesis 3.

In order to test for possible mediating role of organizational commitment, multiple

regression was again performed. This analysis is presented in Table 4. Considering first the

mediating role of organizational commitment between fairness climate and teamwork behavior,

the regression coefficient for fairness climate fell 23% from $b = .66$ (as reported in Table 3) to b

= .51 when organization commitment was included in the model, though it remained significant

($p < .01$). This suggests that slight partial mediation may be present and that the relationship

between fairness perceptions and higher levels of teamwork behavior may be explained, in part,

by growth in organizational commitment. Similarly, the regression coefficient for fairness climate in the prediction of interpersonal deviance fell 40% from $b = -.40$ to $b = -.25$ when organization commitment was included in the model, again suggesting partial mediation, but not full mediation. Therefore, hypothesis 5 is partially supported.

Discussion

The current paper had three main objectives. First, we hoped to replicate the positive correlations found in recent studies that investigated the relationship between justice climate and cooperative behaviors in the workplace. Hypotheses 1 and 2 were supported and these findings help support previous research that has attributed a positive relationship to justice climate and positive workplace behavior. Next, we investigated the role of justice climate in the development of deviant workplace norms. The results supported our belief that justice climate was negatively related with reports of interpersonal deviance and workplace norms.

Finally, the third objective was to test for a mediating relationship involving organizational commitment between justice climate and teamwork behaviors. The results indicated that there was slight partial mediation when testing the mediating relationship of organizational commitment between justice climate and both positive and deviant workplace behaviors. Although the mediating relationship was not strong, additional future research may assist in clarifying the mediating relationship.

These findings that support the first hypotheses are of particular interest in that the organizations can both increase positive behaviors and decrease deviant behaviors simply by improving the justice climate within their organization. These findings take on additional importance given the current economic trends. As organizations continue to struggle during severe economic times, budgets will be cut and employee behavior may suffer. Interestingly

however, the changes needed to increase the justice climate may cost very little money to implement. Often, increases in the justice climate can be made by simply following organizational justice procedures that have been shown to be effective over time.

Although we are encouraged by our results, we recognize that our study is not without its limitations. The largest of these is concern over issues surrounding receiving the data from self-report sources and common method variance. Although we are uncertain of the impact of common method variance and same source data on the present study, effort was taken to reduce the impact of these factors when possible. As an example, deviant behavior information was collected by asking employees to report on their perception of the behaviors in their area and not whether or not they engaged in certain types of deviant behavior. Again, while the data collection methods are a limitation to the study, they have likely caused us to overestimate the relationships. However, given the strength of the primary relationships reported in the current study we do not feel that the data collection methods impact would significantly alter the primary findings.

REFERENCES

Anderson, J. C., & Gerbing, D. W. (1998). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411-423.

Blau, P. (1964). *Exchange and power in social life.* New York: Wiley.

Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 349– 381). San Francisco: Jossey-Bass.

Colbert, A. E., Mount, M. K., Harter, J. K., Witt, L. A., & Barrick, M. R. 2004. Interactive effects of personality and perceptions of the work situation on workplace deviance. *Journal of Applied Psychology*, 89: 599.

Colquitt JA. (2001). On the dimensionality of organizational justice: A construct validation of a measure. *Journal of Applied Psychology, 86,* 386-400.

Colquitt, J. A., Conlon, D. E., Wesson, M. J., Porter, C. O. L. H., & Ng, K. Y. (2001). Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. *Journal of Applied Psychology, 86,* 425–445.

Colquitt, J. A., Noe, R. A., & Jackson, C. L. (2002). Justice in teams: Antecedents and consequences of procedural justice climate. *Personnel Psychology, 55,* 83–109.

Cropanzano, R., Rupp, D. E., Mohler, C. J., & Schminke, M. (2001). Three roads to organizational justice. In J. Ferris (Ed.), *Research in personnel and human resource management,* Vol. 20, 1–113). New York: JAI Press.

Dietz, J., Robinson, S. L., Folger, R., Baron, R. A., & Schultz, M. (2003). The impact of community violence and an organization's procedural justice climate on workplace aggression. *Academy of Management Journal*, 46: 317-326.

Glaser, S.R., Zamanou, S. and Hacker, K. (1987) Measuring and interpreting organizational. culture. Management Communication Quarterly 1(2), 173- 198.

Glomb, T. M. & Liao, H. (2003). Interpersonal aggression in work groups: Social influence, reciprocal, and individual effects. *Academy of Management Journal*, 46: 486-496.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

James, L. R., Demaree, R. G., & Wolf, G. (1993). *r*wg: An assessment of within-group interrater agreement. *Journal of Applied Psychology, 78,* 306–309.

Konovsky, M. A. (2000). Understanding procedural justice and its impact on business organizations. *Journal of Management*, *26*, 489-511.

Leventhal G.S., Karuza J, Fry W.R. (1980). Beyond fairness: A theory of allocation preferences. In Mikula G (Ed.),/Ulrica «nii; .yocia/mteracft'on (pp. 167-218). NewYork: Springer-Verlag.

Lind EA. (2001). Fairness heuristic theory: Justice judgments as pivotal cognitions in organizational relations. In Greenberg J, Cropanzano R (Eds.), *Advances in organizational justice* (pp. 56-88). Stanford, CA: Stanford University Press.

Lind, E. A., & Earley, P. C. (1992). Procedural justice and culture. *International Journal of Psychology*, *27*, 227-242.

Lind, E. A., and Tyler, T. R. (1988). The Social Psychology Of Procedural Justice, New York: Plenum Press.

Liao, H., & Rupp, D. E. (2005). The impact of justice climate and justice orientation on work outcomes: A cross-level multifoci framework. *Journal of Applied Psychology, 90,* 242–256.

Naumann SE, Bennett N. (2000). A case for procedural justice climate: Development and test of a multilevel model. *Academy of Management Journal, 43*, 881–889.

Meyer JP, Allen NJ, Smith CA. (1993). Commitment to organizations and occupations: Extension and test of a three-component conceptualization. *Journal of Applied Psychology, 78*, 538–551.

Mossholder, K. W., Bennett, N., & Martin, C. L. (1998). A multilevel analysis of procedural justice context. *Journal of Organizational Behavior, 19,* 131–141.

Neuman, J. H. & Baron, R. A. 1998. Workplace violence and workplace aggression: Evidence concerning specific forms, potential causes and preferred targets. *Journal of Management*, 24(3): 391-419.

Ostroff, C., & Bowen, D. E. (2000). Moving HR to a higher level: HR practices and organizational effectiveness. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 211–266). San Francisco: Jossey-Bass.

Pearson, C. M. & Porath, C. L. (2005). On the nature, consequences and remedies of workplace incivility: No time for "nice"? Think again. *Academy of Management Executive,* 19: 7-18.

Robinson, S. L. & Bennett, R. J. 1995. A typology of deviant workplace behaviors: A multdimensional scaling study. *Academy of Management Journal*, 38: 555-5722.

Robinson, S. L. & O'Leary-Kelly, A. M. (1998). Monkey see, monkey do: The influence of work groups on the antisocial behavior of employees. *Academy of Management Journal*, 41: 658-672.

Rousseau D. (1995). Psychological Contracts in Organizations: Understanding Written and Unwritten Agreements. Newbury Park, CA: Sage Publications

Schneider, B.,& Reichers, A. (1983). On the etiology of climates. *Personnel Psychology*, *36*, 19-40.

Thibaut J., & Walker L. (1975). *Procedural justice: A psychological analysis.* Hillsdale, NJ: Erlbaum.

Van den Bos K, Lind EA, Wilke HAM. (2001). The psychology of procedural justice and distributive justice viewed from the perspective of fairness heuristic theory. In

Yang, J., Mossholder, K.W. & Peng, T.K. (2007). Procedural justice climate and group power distance: an examination of cross-level interaction effects. Journal of Applied Psychology, 92(3), 681-692.

Table 1- Agreement analysis for aggregated variables.

	ICC(1)	ICC(2)	F	
Fairness Climate	0.12	0.51	2.03	p < .01
Organizational Commitment	0.08	0.45	1.63	p < .01
Teamwork Behavior	0.09	0.41	1.71	p < .01
Interpersonal Deviance	0.07	0.42	1.72	p < .01

Table 2- Means, standard deviations and zero-order correlations for study variables

		μ	σ^2	1	2	3	4	5	6	7	8
1	**Size**	159.02	90.61								
2	**Length of Service**	2.88	2.26	*0.49*							
3	**Years in Industry**	5.41	3.10	*0.45*	*0.74*						
4	**Education Level**	2.35	0.40	0.08	0.02	0.02					
5	**Fairness Climate**	3.73	0.43	*-0.30*	*-0.20*	*-0.23*	-0.06	0.88			
6	**Org. Commitment**	4.18	0.39	-0.11	-0.12	-0.05	-0.07	**0.66**	0.90		
7	**Teamwork Behavior**	3.70	0.43	*-0.20*	*-0.17*	-0.11	-0.01	**0.67**	**0.57**	0.92	
8	**Interpersonal Deviance**	2.36	0.54	*0.27*	*0.19*	0.11	**-0.15**	**-0.45**	**-0.41**	**-0.49**	0.87

Note: N = 203; Reliabilities indicated on the diagonal; Correlations significant at p < .05 indicated bold, correlations significant at p < .01 indicated in bold italics

Table 3- Regression results for relationship between fairness perceptions and outcomes.

Variable	Model 1 Controls Only			Model 2 Organizational Commitment			Model 3 Teamwork Behavior			Model 4 Interpersonal Deviance		
	b	Std. Error	b	b	Std. Error	b	b	Std. Error	b	b	Std. Error	b
Constant	4.36	0.17		1.80	0.24		1.10	0.27		4.72	0.39	
Size	0.00	0.00	-0.07	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	**0.15**
Length of Service	-0.02	0.02	-0.14	-0.03	0.01	-0.17	-0.03	0.02	-0.14	0.03	0.02	0.14
Years in Industry	0.01	0.01	0.08	0.02	0.01	0.19	0.02	0.01	0.15	-0.03	0.02	-0.15
Average education	-0.05	0.07	-0.05	-0.03	0.05	-0.04	0.04	0.06	0.04	-0.25	0.08	**-0.19**
Fairness Climate				0.63	0.05	*0.69*	0.66	0.06	0.66	-0.50	0.08	*-0.40*
R			0.15			**0.67**			**0.66**			*0.50*
R^2			0.02			**0.45**			*0.44*			*0.25*
Adj. R^2			0.00			*0.43*			*0.42*			*0.23*
F			1.23									
df			(4, 197)			(5, 196)			(5, 196)			(5, 196)
ΔR^2						*0.43*			*0.39*			*0.14*
ΔF						*152.6*			*137*			*37.65*

Note. N = 203; Values significant at $p < .05$ indicated bold, Values significant at $p < .01$ indicated in bold italics
.

Table 4- Regression results for test of mediation

	Model 1 Teamwork Behavior			Model 2 Interpersonal Deviance		
Variable	b	Std. Error	b	b	Std. Error	b
Constant	0.68	0.30		5.25	0.43	
Size	0.00	0.00	-0.02	0.00	0.00	**0.17**
Length of Service	-0.02	0.02	-0.11	0.03	0.02	0.11
Years in Industry	0.01	0.01	0.11	-0.02	0.02	-0.11
Average education	0.05	0.06	0.04	-0.26	0.08	***-0.20***
Fairness Climate	0.52	0.07	***0.51***	-0.31	0.11	***-0.25***
Org. Commitment	0.23	0.08	***0.21***	-0.30	0.11	***-0.22***
R			***0.68***			**0.53**
R^2			***0.46***			**0.28**
Adj. R^2			***0.44***			***0.25***
df			(5, 196)			(5, 196)

Racial Attitudes and Ethical Considerations and Challenges

of the Millenial Generation

Dr. Janice Witt Smith, SPHR

Department of Management and Marketing

School of Business and Economics

Winston-Salem State University

Winston-Salem, NC 27411

(336) 750-2350

smithjw@wssu.edu

ABSTRACT

Study examines attitudes of African-American Generation Yers (Millenials) matriculating in School of Business at southeastern Historically Black College. While Millenials have been widely studied over the last several years, this population has not been specifically studied. Sample group is matriculating at institution whose historical roots are grounded in Christianity, university is located in "Bible Belt." The overall research agenda looks at similarity of this group to reported characteristics of Millenials; attitudes toward other racial and ethnic groups; and their ethical behavior. The focus of reported research examines their attitude toward new largest U.S. minority and other racioethnic minority groups.

Introduction

The cultural diversity, mentorship, power and privilege, criminal justice, and mentoring literatures identify a number of intragroup relationships and individual and organizational challenges and opportunities associated with having men and women of color joining Caucasian (males) in the United States Workforce.   For a detailed review of this literature, please see work by Taylor Cox, Stella Nkomo, Anne Tsui, Stacey Blake, and others. For the purposes of this research study, it is well settled that there are differential returns in human capital investments for racioethnic minorities and women compared to their Caucasian male counterparts (Smith & Calasanti, 2004). One of the great societal "equalizers" is supposed to education which exposes individuals to people and ideas that are both very similar and extremely different from their own backgrounds and experiences. One of the touted benefits of a college education is the exposure of students to expanded thinking and opportunities to interact with people who are different from them in terms of race, gender, ethnicity, socioeconomic status and the like.

The Association to Advance College Schools of Business/International Association for Management Education (AACSB-IME) has required ethics instruction for students in business education programs since 1979. In addition, they have strongly encouraged member schools to increase their commitment to and focus on ethics awareness and development of ethics (2004). While this renewed focus on ethics in the classroom is intended to help students formulate high ethical standards and to become better corporate citizens, their own experiences, religious training, family backgrounds, the media, and the high-profile, negative behavior of corporate leaders may override or undermine this initiative. As an example, in the field of communication studies, one's body language will counteract or contradict what is being said verbally. This is true as well for observed behavior of individuals in society. If the "ethical rules" indicate one standard, but what is rewarded or punished indicates a different standard, the rules are less likely to be followed.

The popular press is rife with examples of corporate leaders who espouse to follow one ethical standard but whose behavior contradicts that rhetoric. A quick perusal of the reported corporate leader mis-deeds include the deliberate mis-reporting of financial data (resulting in a number of companies are having to "re-state" their data); the sub-prime

mortgage debacle and its subsequent negative impact on the U.S. and world economies; corporate spying on executives and members of Boards of Directors (e.g., Hewlett-Packard); insider trading (e.g., Martha Stewart) and other unethical practices (e.g., Enron); sexual misconduct (e.g., former presidential candidate John Edwards); accepting bribes and racketeering (indicted and convicted Detroit mayor). The list goes on and on. Students and others look at what others are doing and they filter this information through their ethical code of behavior (again, based on own experiences, family religion, etc.). They form attitudes which may lead to corresponding behaviors consistent with those attitudes.

Business students may be presented with information in the classroom to suggest a higher moral standard, while their perusal of current events and media reports indicate a much different picture in the "real world." As a result, they may be experiencing cognitive dissonance – a difference between what they are being taught and what is done and rewarded in the business and political environments. In addition, their experience within their own communities may demonstrate that unethical behavior ("down low" behavior, illegal gifts to athletes, "good life" lifestyles of drug dealers, cheating on taxes, welfare fraud, speeding and traffic violations, etc.) may go unpunished and may even be rewarded. If the punishment for unethical behavior is less than the perceived reward, students may be influenced to make choices that violate the ethical standards and principles that are being taught. For African-American students, in particular, there is a double standard – what others get away with, and what their expectation of their own treatment would be for the same behavior.

For example, white-collar crimes in which millions of dollars or more are embezzled are punished far less severely than crimes of robbing a convenience store of $50. An individual embezzling millions from a corporation might receive a short jail sentence at a "country club" jail, while an individual robbing a 7-Eleven of $100 might receive 3-5 years in prison. The person robbing the convenience store is more likely to be African-American than Caucasian, while the embezzler, is more likely to be Caucasian. In addition, criminal justice literature is rife with examples of inequitable punishment based on race and ethnicity, coupled with financial resources. A crack dealer in the African-American community will receive a far harsher sentence than a cocaine dealer in a

middle- or upper-class Caucasian community. The reality of their life experience will outweigh the "ethical behavior" modules taught in business courses.

Within this cultural context, racial groups form both positive and negative opinions and impressions about each other. While some diversity researchers have argued that frequent contact among racial groups would ameliorate racial tension and increase positive affect between racial groups, others have argued the opposite. A recent research study examined the attitudes of racioethnic groups toward each other (HR Magazine February 2008). A multilingual poll of African-American, Hispanic and Asian Americans suggests considerable tensions exist among these ethnic groups, including mistrust and stereotyping—feelings that may spill over into the workplace.

Each of these groups indicated that they were more trusting of Caucasians than each other. In fact, 61% of Hispanics, 54% of Asians and 47% of African-American respondents would rather do business with whites than members of the other two groups. Approximately 46% of Hispanics and 52% of African-Americans believe "most Asian business owners do not treat them with respect.   Furthermore, 50% of African-Americans feel threatened by Latin American immigrants because "they are taking jobs, housing, and political power away from the African-American community."   Finally, 47% of Asians and 44% of Hispanics say they are "generally afraid of African-Americans because they are responsible for most of the crime" (HR Magazine, March 2008).

Coupled with the foregoing, the level of racism exposed throughout the 2008 U.S. Presidential campaign also brings race back to the forefront. While the election of Illinois Senator Barack Obama as the first African-American President has been seen as a beacon of hope, it also sets up expectations of racial unity that may not, in fact, exist. It is within this back drop that students face the 21st century workplace and make decisions about what, if any, career opportunity they may enjoy. The irony of the election of the first African-American U.S. president in the worst times in recent U.S. history is not lost on the African-American population. Some religious leaders suggest that desperate times call for desperate measures – that President-Elect Obama couldn't do any worse than what is currently going on – two wars, bottomed out economy, extremely high unemployment rate, recession, loss of prestige at home and abroad, and so forth. The election process was more personal to African-Americans than perhaps any other group. The tears of joy are

tempered with the realization that there will be no second chance. Similar to the Civil Rights movement of the 1960s, there is an awareness of the price to pay for supporting President-Elect Obama. Many Millenials were actively involved in the political process and voted for the first time, with much enthusiasm.

The latest census demographics indicate that by 2042, Hispanics will be the majority group in the United States, followed by Caucasians, African-Americans and Asian-Americans. With the negative opinion that the racioethnic minority groups hold of each other, the "flavor" of the melting pot will drastically change and potential for increased conflict will continue to escalate.

Relevant Literature.

Generation Y Characteristics. Generation Y (or Millenial Generation) consists of individuals who were born between 1979-1999 and would currently be teenagers and in their 20s (en.Wikipedia.org, 2006). In general, Generation Yers expect the following benefits as part of their employment: Group medical insurance, paid vacation, 401(k) retirement plan, personal/sick time, flexible work schedules and awards. In addition, the values that their potential employer/company should have are social responsibility, loyalty to the individual employee, and integrity (Armour, 2006; Dougherty, Harder, Hill, Kirk & Miller, 2006).

Both anecdotal and empirical evidence indicate that Generation Yers need public praise and to be constantly rewarded. They are accustomed to constant feedback and compliments. They expect promotions frequently or sooner and want to be at the top of the chain of command right away. This group prefers to work in teams whenever possible, *is tolerant towards diversity*, and is comfortable working with innovative technology. They are open to the use of mentors and have high expectations of themselves/higher value of self fulfillment. On average, members of this group need customized career paths, are multi-taskers, and look for ongoing training. In addition, they want jobs with telecommuting options and to have the ability to work part-time. Members of Generation Y are also future-oriented regarding employment and avoid, if possible, working overtime (www.vlerick.be, 2006).

The first part of this study examines the extent to which participants in our study reflect the beliefs and attitudes of that reported about the Millennials. Specifically, do the

generalities about tolerance toward diversity hold true in practice as well as in the abstract? That is, when Generation Xers are asked how they feel ab out other groups in general, their responses are more accepting. When identifying a specific instance where another racioethnic group may receive a greater benefit or less negative consequence than they, is that tolerance toward diversity still true? We add to the literature by focusing on an under-represented group, African-Americans. We provide additional insight on the way the sample Millenials view other racio-ethnic minorities.

Some would argue that it is in the best interests of the majority population to create discord among minority groups. In this way, the majority retains its power base and ability to make decisions which impact all groups. In addition, media portrayals of African-Americans and Hispanics, in particular, have been extremely negative. Perusal of any local or regional newspaper will highlight this in its reporting: "Black male, 6 foot 2 inches tall, with scar, arrested for" or "Hispanic male, 5 foot 11 inches tall, charged with DWI," and "male, 5 feet 11 inches tall," with no mention of race. Anecdotal evidence suggests that the Crime Stoppers exposure of persons of interest for crimes will often display African-American or Hispanic suspects at a higher level than Caucasian suspects. If the racioethnic minorities distrust each other and prefer to work with Caucasians, even when Caucasians are the numerical minority, they will be in power. This dynamic played out in South Africa, where the minority group (white South Africans) controlled the factors of production and the economy.

The mentoring literature provides many examples of differential impact of mentoring by race and gender (Smith & Calasanti, 2005; Smith, Smith, & Markham, 2000). Livers and Caver (2003) discussed the impact of race and gender on the career and psychosocial success of managers and reported the *miasma* that African-American managers experience in the U.S. workplace. Racioethnic minorities tend to have a lower return on their investment in their own futures than the corresponding investment among their Caucasian counterparts (Smith & Calasanti, 2005).

The latest information from the Department of Labor indicates that the wage/salary levels for women and racioethnic minorities, while improving, still lag behind their Caucasian (male) counterparts even when the same human capital investment is made (Calasanti & Smith, 1998, 2002; Smith 2005).

These phenomena create an interesting environment in which individuals' ethical values and attitudes are further formulated and shaped. Kohlberg (1984, 1987) suggested that moral reasoning (defined by Kail and Cavanaugh (2000:346) as "the rules of ethical conduct that people bring to bear on a problem to justify their solution to the problem") develops over an individual's lifetime in a universal, invariant sequence of six stages. Tsui (1996) found that the higher the level of the individual's ethical reasoning, the more likely they were to engage in independent behavior and the less likely to give into pressure to engage in immoral or illegal behavior. Mutjtaba (2006) reported in his study both that (1) informal social processes to shape ethical attitudes of full-time employees were less effective than those of their managers who were socialized using a formal approach and (2) employees were not as bothered by unethical behavior as their managers were.

The U.S. economy is experiencing a number of major challenges, and as a result, a number of companies have laid off employees; unemployment rate in many areas is at a post-depression high. In addition, the Millennial Generation is the first generation to believe that they will not match or exceed the success of their parents. Recent reports in the popular press indicate that even millionaires are thinking about whether or not they can afford to buy consumer goods and are downsizing their "wish lists."

It is in this corporate environment and cultural context that students trained in schools of business aspire to work. The target population for this research consists of predominantly African-American Generation Y students matriculating in a southeastern university's School of Business. While this group has been widely studied over the last several years, this proposed research will contribute to the extant literature by looking at African-American Generation Y'ers at a Historically Black College or University (HBCUs) within the "Bible Belt" of the southeastern United States. What is their attitude toward the new largest U.S. minority and other racioethnic minority groups?

<u>Study Sample</u>

The sample consisted of a group of undergraduate students from a single Master-Level 1 HBCU in the southeastern United States. Approximately 90% of the students are African-American. At total of 244 students completed the survey, and 100% of the surveys were usable.

Research Measures and Methods:

The larger study examined student attitudes toward being less than truthful in their job search and about their attitudes toward other racioethnic minority groups. As part of that study, students were provided with three open-ended questions concerning their perceptions of their own and other groups. This study focuses on the attitude of the Millenial group of interest toward other racioethnic minority groups. The students responded to a pen-and-paper survey and were given course credit for its completion and extra credit for having other students across campus complete the survey. They turned in the surveys, a list with identifying information from the other students who responded, and contact information for a verification check. The lead researcher randomly selected 20% of the "other" students to confirm that they had, in fact, completed the survey. We asked students to identify what, if anything, they would lie about as they pursue professional career opportunities. In particular, they were asked to rank several items in order in which they would be most likely to embellish the truth.

Research Question: What are their attitudes toward their own and other racioethnic minority groups?

Preliminary Results:

The qualitative results were very interesting and are reported here. There were 124 responses to Question 4, "There are many attempts to reform immigration policy in the United States. Which groups do you feel should be restricted in terms of entering the United States?" Fifty-three of the students or 42.7% felt that Latinos or Mexicans should be restricted in terms of entry to the United States. Fifty-eight students or 46.77% felt that no restrictions should apply. Three students (2%) felt that Middle Easterners should be barred, one that terrorists be barred. Two (or 1.6%) thought that Japanese or Asians should not be allowed into the United States. The other students left this answer blank. Students were not asked why they felt that restrictions should or should not apply. The media had at least 3 articles in the local newspaper and 2 news reports on the local television channels related to immigration reform. This question examined whether or not students were aware of the battle around immigration reform; and, based on their own knowledge, experience, education, and training, what was their response related to immigration reform.

A second qualitative question asked "Which group(s) do you feel would be most disadvantaged by any increase in restrictions around immigration?" The one hundred responses were similar, with responses that Hispanics/Mexicans would be most disadvantaged (making up 75% or seven-five responses); Asians, 10% (10 responses), African-Americans, 11% (11 responses), and Haitians identified three times or (3%).

The third question asked which race had the highest favorable media coverage in the United States. Over 179 students responded to this question, and 117 (65.4%) felt that Caucasians received the most favorable media coverage, followed by 54 (30.2%) for African-Americans, 6 (3.3%) Asians and 2 (1.11%) for Hispanics. African-Americans were identified as the group having the lowest level of favorable media coverage, followed by Hispanics, Caucasians, Native Americans, Asians and Middle Easterners (116, 27, 11, 6, 4, and 3, respectively). A total of 167 responses were recorded, and the percentages in the same order are 69.5% for African-Americans; 16.2% for Hispanics; 6.6%, Caucasians; Native Americans, 2.4%; and Middle Easterners, 1.8%.

Discussion

As expected, African-Americans readily identified the negative media portrayals of themselves and Hispanics. In addition, they were in tune with the difficulties that Hispanics have, but they did feel that immigration should be restricted for this group. When Hispanics became the largest minority group in the United States, this displaced African-Americans and changed the balance of power. Hispanics now receive funding and attention which previously had been provided to African-Americans (in some cases, both negative and positive). Additionally, while African-Americans and Hispanics had previously enjoyed more collegial relationships, there seems to be a different attitude toward each other now. The push toward adding Spanish as a national language after the negative publicity concerning "Ebonics" and the requirement to learn Spanish to gain entrée into the business world are two factors that widen the chasm between African-Americans and Hispanics.

It was interesting to note that Haitians and Africans were singled out in the research as a separate category, clearly different from "African-Americans." The media did not separate their descriptions of "brown" people who were naturalized or native born – if they

looked "brown," they were classified as African-Americans. Several students made a clear distinction.

What is clear to the group is that it is a "given" that Caucasians will be given an advantage and perceived more favorably than any other group. Ad hoc discussions with a number of respondents resulted in a type of "shrug" and "that's the way of the world, get over it" attitude. Even when racioethnic minority groups know that they will be disadvantaged as compared to Caucasians, they also do not indicate a need to bond as a group to create an advantage that Caucasians enjoy as the majority group.

This is preliminary data from a demographically restricted sample. It does provide additional insight into this population and their attitudes toward the world of work and other groups within the workplace. There are several interesting notes to make from this research, despite its exploratory nature:

(1) It is not a secret that Caucasians enjoy favorable treatment in the United States, and these students accepted it as a way of life.

(2) If the census data is correct, and the United States will be "brown" in less than 50 years AND the groups have less respect for each other than they have for the minority Caucasians, what will their experiences in organizations be like? In what ways will they capitalize on their own unique gifts and talents? What about the organizational culture will be positive for them? Will they begin (or continue) to see themselves through a Eurocentric, Caucasian viewpoint? What impact does this have on creativity and innovation? What voices may never be heard in the organization? What strategic opportunities are lost because we continue to recycle what has proven to be, in the current economy, disastrous view of the world and the economy?

(3) Finally, what benefit is there to a college education and exposure to great thinkers and ideas, if the individual leaves the academic environment knowing that their value is still attached to their race and gender and not their qualifications, education, experience and training? It is often said that there is always money for prisons and little for education. Can the United States afford to continue to have throwaway people based on demographics over which the individual exercises no control?

Future Research: Analyze the quantitative data to examine the attitudes of the group around their aspirations and desires in employment and their response to ethical dilemmas.

References

AACSB International. (2004). *Ethics Education in Business Schools*.

Armor, S. (2006, November 6). Generation Y: They've arrived at work with a new attitude. USATODAY.com. http:///www.usatoday.com/money/workplace/2005~11-06-gen-y_x.htm.

Armstrong, M. (1987). Moral development and accounting education. *Journal of Accounting Education* 5(Spring): 27-43.

--- (1993). Ethics and professionalism in accounting education: A sample course. *Journal of Accounting Education* 11(Spring): 77.

Calasanti, T. & Smith, J.W. (December 2002). Latina Faculty. In Ana M. Martinez Aleman & Kristen A. Renn (Eds.). Women in higher education: An encyclopedia. ABC-CLIO Press: Santa Barbara, CA.

Calasanti, T. & Smith, J.W. (1998). A critical evaluation of the experiences of women and minority faculty: Some implications for occupational research. In Helena Z. Lopata (Ed.), Current research on occupations and professions. Vol. 10, 239-258. Greenwich, CT: JAI Press.

Cullen, L.T. (2006) Getting wise to lies. Time. New York: May 1, 167(18), p. 59.

Dougherty, K., Harder, R., Hill M., Kirk, H., & Miller, T. (2006). The Echo Boom: What Generation Y has in Store for the HR Community. Retrieved November 21, 2006, from University of North Carolina, Wilmington website: www.uncw.edu/stuaff/career/documents/EchoBoom.pps.

Daft, R.L. (2005). Leadership Experience (3d Edition). Thomson/Southwestern: Mason, OH.

Flynn, F.J., Chatman, J.A., and Spataro, S.E. (2001). Getting to know you: The influence of personality on impressions and performance of demographically different people in organizations. *Administrative Science Quarerly*, VOl. 46, No. 3, pp. 414-446.

 "For which reasons does Generation Y work?" 13 Oct. 2006: http://www.vlerick.be/news/more/2006/20061013_pressrelease_generationy_en.htm.

--- (1992). Judging the morality of business practices: The influence of personal moral philosophies. *Journal of Business Ethics* 11(5): 461-470.

Generation Y." 21 Nov. 2006. http://en.wikipedia.org/wiki/Generation_Y.

Gilligan, C. (1982) *In a different voice: Psychological theory and women's development.*
Cambridge, MA: Harvard University Press.

Kail, R.V. and Cavanaugh, J.C. (2000). Human Development: A Lifespan View, 2d
Edition,   Stamford, CT: Wadsworth Press.

Kohlberg, L. (1984). Essays on moral development: Vol. II: The psychology of moral
development. San Francisco: Harper & Row.

Kohlberg, L. (1987). The development of moral judgment and moral action. In L.
Kohlberg (Ed.), Child psychology and childhood education: A cognitive-developmental
view (pp. 259-328). New York: Longman.

Mangan, K. (2006). Most MBA Student Believe Companies Should help improve society,
survey finds. *Chronicle of Higher Education, November 3, 2006, Vol. 53, Issue 11, p. 36.*

McGuire, M. (2006). Amid growing scrutiny, numerous fraudulent resume claims are
exposed. Knight Ridder Tribune Business News. Washington: Mar 6, p. 1.

Snarey, J. R. (1985). Cross-cultural universality of social-moral development: A critical
review of Kohlbergerian research. *Psychological Bulletin*, 97, 202-232.

Smith, J.W., Smith, W.J. and Markham, S.E. (2000). Diversity issues in the mentoring of
academic faculty. *Journal of Career Development*, Vol. 26(4).

Smith, J.W. and Calasanti, T. (2005). The influence of gender, race, and ethnicity on
workplace experiences of institutional and social isolation: A study of faculty in the
Academy. *Sociological Spectrum.*

Wall Street Journal. R.H. Donnelley corrects details on CEO's college background. New
York, NY: Sep. 12, 2006, p. A12.

COGNITIVE FRAMES FOR WORKPLACE GRIEVANCES:
A PRELIMINARY INVESTIGATION

Kurt Henry Loess
Box 70625
Department of Management and Marketing
College of Business and Technology
East Tennessee State University
Johnson City, Tennessee, USA   37614
(423) 439-5389 / kloess@etsu.edu

ABSTRACT

The purpose of this paper is twofold. The first is to pilot test the efficacy of a thematic coding scheme in its developmental stages to collect data about cognitive frames employees use to understand their workplace grievances. The second is to conduct a preliminary investigation of the extent to which gender differences are evident using the coding scheme. A gender-blind process was used to analyze first-person written accounts of workplace conflict and identify perspectives from which it is often viewed. Although preliminary, the results suggest gender differences in both type and number of perspectives used in framing grievances.

Introduction

Conflict and its effects continue to intrigue us at interpersonal, organizational, and international levels of analysis. Whether the effects of organizational conflict are positive or negative depends upon the managerial responses they receive. These responses in turn depend upon managers' awareness of the signs of conflict as they occur. Awareness that conflict is occurring, however, is alone insufficient for developing adequate responses. The origins of conflict trace back to the perspectives from which individuals formulate the issues and events that affect them. An understanding of these origins is needed so that managers can respond more effectively when the signs of conflict emerge as individuals act from these perspectives.

The present study contributes to such an understanding by thematically analyzing first-person accounts of workplace grievances to explore any differences between men and women. The coding scheme used in this study in development by inductive method. At this point, the model includes four perspectives from which individuals perceive and formulate their understanding of workplace issues and events. While grievances tend to be formulated from a dominant perspective they apparently may also involve one or more secondary perspectives.

Purpose

The purpose of this paper is to pilot test the coding scheme currently being developed, and conduct a preliminary investigation of the extent to which gender differences are evident using the coding scheme. The coding scheme has been developed <u>without</u> regard to gender. The unit of interest in this study is the individual grievant. The unit of analysis is the individual's written

descriptive account of a recent grievance. Each account is classified on the basis of themes detected by the coding scheme.

The Grievance Formulation Model

The thematic coding scheme is based on the theory that reality is socially constructed. According to this theory 'social reality' involves implicit and explicit agreement among individuals whose interaction validates the agreement. Social reality changes as individual perspectives change in response to life circumstances both in and out of the organization. Social reality is a dynamic process, continuously in the making.

General acceptance of this continually changing social reality constitutes an equilibrium, or accepted state, for an employee. When this equilibrium is disrupted, however, the social contract is threatened or violated and consensus is displaced by conflict. Perception of this conflict involves the formulation, or cognitive framing, of a grievance regarding such a disruption of the accepted state.

From first-person descriptions of grievance situations, or disruptions in the accepted state, four perspectives appear to characterize the vantage points from which employees perceive conflict and formulate their grievances.

The Content Perspective

Those with a content perspective view problems according to a legal standard or contractual rule. The accepted state depends upon adherence to work place regulations, organizational structures, and rules or norms that establish work design, work content, etc. Those with a content perspective formulate grievances from the standpoint of work rules -- wages, job environment, working conditions, job evaluation, vacation and sickness regulations, job specifications, etc. Their accepted state is disrupted when these rules or norms have been violated.

The Relational Perspective

Those with a relational perspective view problems in terms of the relationships among parties in a grievance. Problems with communication are often involved in formulations made from the relational perspective. Whether a work rule has been violated or a procedure ignored is not as important as the nature of the relationship between members of the organization. Equilibrium can be disrupted even in the absence of a rule violation or procedural mistake. The focus here is upon the relational aspects of organizational life.

The Procedural Perspective

Those with a procedural perspective depend upon the fairness and efficacy of 'due process' for equilibrium in their accepted state. Conflict will be perceived by whether decisions or actions leading up to the conflict adhered to existing due process mechanisms or conformed to norms of fairness. This is distinct from the content perspective and the violation of work rules. A person with a procedural perspective would not experience disruption on the basis of rules violations

within the organization, as long as due process and norms of fairness were observed in handling the violation. If, on the other hand, there is an absence of due process and norms of fairness are violated, or existing provisions are themselves ignored, a person with this perspective would likely experience a disruption in his or her accepted state.

The Expressive Action Perspective

For those with an expressive action perspective issues of power and authority are central. Those who view organizational life from this perspective are disposed to act forcefully, and often rather rapidly and impulsively. This perspective is more reactive and less reflective than the others. It resembles the relational perspective in its emphasis on the interaction between two or more persons. The focus of this perspective, however, is more on spontaneous reaction and the exercise of power and less on the interpersonal aspects of communication. Viewing a disruption from the standpoint of power and authority there is little concern for the reconciliation and improved communication that characterizes a relational perspective.

The Four Perspectives

It is important to mention that the four perspectives described here represent dominant orientations rather than exclusive ones. We are also interested in the extent to which characteristics of the other three perspectives combine in the formulation of a grievance.

Methods

Evening MBA students who held full-time jobs were asked to volunteer for the study. With assurance of confidentiality, twenty-six women and twenty-seven men agreed to participate. They were asked to describe in writing a situation they were involved in at work that upset them enough to break their silence about it and tell someone. It did not matter who they told, even if the person they told was not a member of the organization. No formal action taken upon the complaint was required.

Participants were instructed to describe how they saw the situation at the time it was happening. They were asked to describe the beginnings of the complaint, what they thought about the situation, what they did, and why. They had not been presented with any model of grievance formulation or conflict management that would influence their description of the grievance.

A 90% reliability for raters was established with reliability (R) calculated as:

$$R = \frac{2 \times \text{\# themes in agreement between Rater \& Expert}}{\text{\# themes Rater found } + \text{ \# themes Expert found}}$$

Cases were examined before coding and references that might identify the gender of the subject were neutralized or removed. Each case was then coded for the presence of one or more of the four perspectives. The dominant perspective was determined by the thematic focus of the description. Gender groups were then identified and compared.

Results

Table 1

	Content	Relational	Procedural	Exp. Act.
Women	18	23	17	3
Men	14	16	20	8

Looking first at the number of perspectives identified overall by gender (Table 1), without regard to dominance or rank, content and relational perspectives were used more frequently by women than men, while procedural and expressive-action perspectives were used more frequently by men than women. The relative frequencies of these pairs are comparable for men and women -- the relational is more frequent than the content, and the procedural is more frequent than expressive action perspectives. The range of frequencies, on the other hand, is greater for women (23-3) than it is for men (20-8).

Table 2

	Content	Relational	Procedural	Exp. Act.
Women	8 / 6	15 / 2	3 / 14	0 / 2
Men	3 / 8	10 / 5	13 / 7	1 / 4

Table 2 indicates the frequencies of each perspective as dominant and secondary perspectives (d/s) for men and women. Consistent with the overall frequencies in Table 1, the relational and procedural are the most frequently occurring dominant perspectives for men and women, respectively. There is a notable difference in the ratio of dominant/secondary frequencies for these, however. For women it is more than 7:1. For men it is less than 2:1.

Table 3

WOMEN			
Dominant	Secondary	3rd	4th
REL – 15	PROC – 14	REL – 6	EXP - 1
CONT – 8	CONT – 6	CONT – 4	
PROC – 3	REL – 2		
	EXP – 2		
26	24	10	1

Tables 3 and 4 refine this difference by breaking down the frequency distribution further still. In Table 3 the relational perspective is clearly the highest ranking dominant perspective for women, occurring nearly twice as often as the 2nd ranking content perspective. Moreover, when the relational perspective is not the dominant perspective for women, it is more likely to be a distant 3rd than it is a secondary perspective, by a ratio of 3:1.

By contrast, Table 4 indicates that the procedural perspective is the highest ranking dominant perspective for men, but by a smaller margin over the 2nd ranking relational perspective. Also

by contrast, if the procedural perspective is not involved in a grievance formulation as a primary or secondary perspective for men, it is not involved at all.

Table 4

MEN		3rd	4th
Dominant	**Secondary**		
PROC – 13	CONT – 8	EXP – 3	CONT - 1
REL – 10	PROC – 7	CONT – 2	
CONT – 3	REL – 5	REL – 1	
EXP – 1	EXP – 4		
27	24	6	1

Another notable difference emerges in a comparison of Tables 3 and 4. The frequencies for the highest ranking dominant and secondary perspectives for women are nearly equal (relational-15 and procedural-14). The content perspective is consistently ranked a distant #2 for both dominant and secondary perspectives.

The pattern for men in Table 4 is markedly different. The frequencies for the highest ranking dominant and secondary perspectives are not nearly as close (procedural-13 and content-8) as they are for women, and the perspective that ranks #2 is neither consistent (relational and procedural) nor very distant.

Table 5

Dom \ Sec	REL	CONT	PROC	EXP
REL		5 / 2	7 / 6	1 / 0
CONT	1 / 2		7 / 1	
PROC	1 / 3	1 / 5		1 / 4
EXP		0 / 1		

Table 5 indicates the frequency with which women and men (w/m) had combinations of dominant (row) and secondary (column) perspectives. For example, 5 women and 2 men had a dominant-relational and secondary-content combination. Multiple perspectives were involved in all but 5 of the 53 cases (3 men and 2 women).

Discussion

The purpose of this study was to investigate several research questions. Do men and women differ in the dominant perspective from which they tend to formulate their grievances? The evidence reported in Table 2 suggests that they do differ. For women the relational perspective is dominant; for men the procedural.

Do men and women differ in the number of perspectives they tend to include in their formulations? The evidence suggests that the answer is: probably not. The column totals in Tables 3 and 4 sum to 61 and 58 respectively, for averages of 2.35 for women and 2.15 for men.

Are there differences in the ordering of dominant and secondary perspectives when multiple perspectives are involved? Adding the lowest numbers in each cell of Table 5 indicates a co-incidence of 13 men and 13 women in the dominant/secondary ordering, for a rate of 50%. The results of this study suggest several intriguing directions for further investigation. Why, for example, do the relational and procedural perspectives emerge so distinctly as dominant and secondary perspectives for women? Why does the procedural perspective occur so infrequently as a dominant perspective? Is there a stigma that discourages it as a dominant perspective? Are women simply more comfortable than men in owning the relational aspects of their grievances? And why does the content perspective consistently rank #2 for women as a dominant, secondary, and tertiary perspective?

Why do the procedural and relational perspectives rank so closely as dominant perspectives for men? Why is the procedural (fairness) perspective secondary when relational issues are involved, but dominant when content issues are involved? Why are men more likely to have expressive action as a secondary perspective when procedural (fairness) issues are involved than when relational issues are involved? What can men and women learn from each other in formulating their grievances?

Conclusion

This preliminary investigation suggests that the thematic coding scheme for identifying cognitive frames for grievance formulations appears to be sufficiently developed to serve a useful purpose in collecting data about cognitive frames in grievance formulation and testing for group differences. The standard limitations on generalizing results beyond the sample apply, in this case evening MBA students. Perhaps more importantly, the results suggest directions for further investigation not only in exploring gender differences, but also in further developing and refining the thematic coding scheme itself.

References (available upon request)

PREDICTORS OF GOOFING OFF AT WORK

ABSTRACT

Male college students, to a greater extent than females, reported having engaged in "goofing off" at work. However, the opportunity to goof off (low workload and minimal supervision) and a lack of intrinsic motivation were better predictors of such behavior than were gender and ratings of the supervisor's leadership. The correlation between viewing one's work duties as resembling play or a game and goofing off was positive and statistically significant, but relatively low, suggesting the two are largely independent. While personal values are likely to have a significant influence on goofing off, managers can more easily control the opportunity to goof off and some motivational aspects of the job. The value of management-initiated "fun programs" is discussed.

INTRODUCTION

Although many people believe work and play on the job to be incompatible, there is a growing body of literature disputing that notion. Both opinion pieces and empirical studies have proclaimed the benefits to organizations of fun at work. Holden (1993) asserted that, "The most successful people in business do not go out to work; they go out to play!" (p.17). Many authors have recommended that managers strive to promote fun at work. Fun has been credited with benefits that include the lowering of anxiety and stress, alleviation of boredom, the elevation of morale and decreases in conflict (Newstrom, 2002). Similarly, Gropper and Kleiner (1992) argued that enjoyable work can help motivate, as well as reduce boredom, fatigue, and conflict. Managers surveyed by Ford, Newstrom, and McLaughlin (2004) overwhelmingly believed that fun in the workplace enhances levels of enthusiasm, satisfaction, creativity, communications

among employees, and feelings of group cohesiveness. Karl and Peluchette (2006) found that for health care workers experiencing greater levels of fun at work emotional exhaustion had a less negative effect on job satisfaction. Furthermore, Abramis (1990) obtained evidence that making work more like play increases learning and mastery of the job.

Some work and play may be compatible because elements such as competition, teamwork, spontaneity, and feedback seem to be contained in at least some work as well as play (Newstrom, 2002). However, play on the job has been dichotomized as work that is like play or a game and "goofing off", i.e., play that involves no work activities (Abramis, 1990). Although the latter would seem to be less desirable for the organization than the former, "goofing off" may have value if it provides a break after which employees are refreshed, reenergized, and ready to be highly productive (Block, 2001). Abramis (1990) obtained a moderately high correlation between goofing off at work and experiencing feelings of play in doing work. This could mean work that is like play leads to goofing off. However, the questions used may not have clearly distinguished between play (goofing off) while at work vs. play inherent in doing work. The work as play items all contained the phrase "my work is…" which could be interpreted as referring to the job in general rather than the actual work duties. The issue of the relationship of work containing elements of play and goofing off behavior merits further investigation as does the study of factors associated with goofing off.

Since numerous studies have obtained gender differences in various measures of values and "citizenship behaviors", it may well be that the amount of goofing off at work varies with the gender of the respondent. Studies of gender differences in ethical decision-making have yielded mixed results, but researchers obtaining differences have most often found women to be more ethical than men (Beu, Buckley, & Harvey, 2003; O'Fallon & Butterfield, 2005; Singer &

Singer, 1997). Similarly, Decker and Calo (2007) found women had less favorable impressions of unethical actors and more favorable impressions of whistle-blowers than did male students. Furthermore, women have been found to score higher than men on tests of moral development (Bernardi & Arnold, 1997; White, 1999). Also, Schmidt and Posner (1992) concluded that women are more loyal to their work than are men, as women were found to be more willing to pass up attending an important function at home if it conflicted with an important job-related function and to move their family to a new location or change their lifestyle for a better job. The previous findings concerning various "citizenship" behaviors and values led to the hypothesis that men would self-report engaging in more goofing off at work than would women.

Prior research has investigated a very limited number of possible causes of the experiences of both kinds of play, especially of goofing off. Abramis (1990) did find lack of challenge and lack of organizational involvement to be correlates of goofing off. With the goal of aiding managers in controlling the amount of fun in the workplace the present study investigated the influence of supervisors' leadership, as well as career goals, satisfaction with various aspects of the job, social needs, and the opportunity to goof off. It was expected that those goofing off more would rate their supervisors lower, seek more pleasure from their jobs, enjoy their work duties less, and have greater opportunity to goof off than would those goofing off less.

METHOD

Materials

Page 1 of a six-page questionnaire gave respondents information as to the general purpose of the study, that it was a study intended to help in the understanding the role of play in work. Further, it was stated that every effort would be made to keep the information provided

confidential, as respondents would not write their names on the questionnaires and data would only be reported in aggregate form. Respondents were informed that participation was strictly voluntary and the choice to participate or not to participate would in no way affect their course grades.

Page 2 contained personal information items concerning age, gender, education, and current employment. Also on Page 2 were directions instructing respondents to base their answers to the job-related questions that followed on their current job or, if not currently working, their most recent job.

Pages 3-6 contained 56 questions concerning goofing off and play at work as well as possible reasons for such activities or experiences. Examples included, "To what extent do you waste time at work?", "How much is performing your job duties like playing a game?", "How closely does your immediate supervisor monitor you while you work?", and "How would you rate the amount of work your job requires you to do?". The items included seven-point, rating scales with bipolar anchors. For 39 of the questions the anchors were "Not at All" vs. "Very Much". "Very Low" vs. "Very High" were the anchors for the remaining items.

Respondents

Questionnaires were distributed to 351 students in upper-division, undergraduate Management classes at a mid-Atlantic university. There were 192 men, 158 women, and 1 person not answering the gender question. Nine respondents were under 20 years of age, while 305 were 20-24, 27 were 25-29, and 10 were 30 or over. Forty-three reported current full-time employment, 209 listed part-time employment, and 99 stated that they were not currently employed. All of the unemployed respondents reported having been employed in the past. A total of 33 persons reported that they had held full-time, managerial jobs, 74 were employed in

full-time, non-managerial employment jobs, 31 had part-time, managerial jobs, while 216 listed

part-time, non-managerial employment. (The frequencies for the four job categories sum to 354

because three persons reported holding positions in two categories.)

RESULTS

The responses to the 56 rating scales were factor analyzed using a Principal Components

Analysis with a Varimax rotation. A 13-factor solution explained 62.48 percent of the variance.

In order to develop scales from the factors, loadings of .50 or higher were considered sufficient

to include an item in a particular scale. Scales were required to contain three or more items to be

used in further analyses. Seven scales (including a total of 35 items) met these criteria. The

responses to the items comprising each factor were averaged in order to maintain a possible

range of scale means of one to seven.

The seven scales appeared to represent the respondent's 1) proneness to goof off at work

(6 items), 2) view of the extent to which his/her job resembles play or a game (4 items), 3)

ratings of his/her supervisor's leadership qualities (10 items), 4) workload (3 items), 5)

monitoring by his/her supervisor (4 items), 6) intrinsic motivation from the job (5 items), and 7)

opinion of the importance of deriving pleasure from work (3 items). Examples of questions

comprising each scale appear in Table 1.

Insert Table 1 about here

The reliability coefficients (Cronbach's alpha), means, standard deviations, and inter-

correlations are presented in Table 2. The Goofing Off scale was significantly correlated ($p <$

.05) with all other scales, except the Pleasure Importance scale. The Pleasure Importance scale

also had an exceptionally low reliability coefficient. Therefore, the Pleasure Importance scale was excluded from the regression analysis. The Goofing Off scale correlated negatively with Supervisor Rating, Monitoring, Workload, and Intrinsic Motivation, but positively with the Work as a Game scale. Also, men self-reported goofing off more than did women.

Insert Table 2 about here

A stepwise regression analysis to predict Goofing Off yielded a model including Workload, Monitoring, Intrinsic Motivation, and Work as a Game (see Table 3). The model excluded Leadership and Gender. It accounted for 31.0% of the variance.

Insert Table 3 about here

DISCUSSION

The best predictors of goofing off at work were the opportunity to do so (low workload and minimal supervision) and a lack of motivation. Appreciation of the supervisor's leadership had a minimal impact on the proneness of employees to goof off at work. The same is true of gender. Although leadership and gender were correlated significantly with goofing off (leadership was negatively correlated and men goofed off more), the correlations were relatively small and the regression model excluded them. Not examined in the present study, but likely to have a significant impact on goofing off at work, are the employee's personal values such as work ethic. While personal values are likely to have a highly significant influence on goofing

off, the present study has practical implications in that managers can more easily control the opportunity to goof off and some motivational aspects of the job.

While the extent to which the respondent perceived his/her work as resembling play or a game was included in the regression model, the correlation between this variable and self-reported goofing off was considerably less than that reported by Abramis (1990) ($r = .154$ vs. $r = .398$). As noted above, the items used in the Abramis study may have been somewhat ambiguous, not clearly distinguishing play while *at work* (goofing off) vs. play while actually *doing work*. Meyer (1999) warned that some employees may perceive a fun atmosphere as an opportunity to goof off more than management desires them to and that customers may avoid fun companies, perceiving them as being insufficiently serious minded. However, the low correlation between goofing off and perceiving one's work as being like play or a game suggests that attempts to make work more fun may not run much risk of fostering goofing off. Also, a small amount of goofing off may be a form of temporary release that actually enhances performance in the long run (Block, 2001).

Although proponents of fun often recommend structured fun programs, Redman and Mathews (2002) obtained evidence that while some employees viewed management's fun initiatives positively, others saw them as oppressive and found compliance to be hard work. Similarly, Fleming (2005) reported a case study in which about half of the employees displayed some negativity concerning a fun campaign. Some saw it as condescending, treating them like children, and some thought it lacked authenticity.

Employee-initiated fun, including goofing off, may be more desirable than fun that is management-initiated. As Fleming (2005) suggested, organizational fun may be best facilitated by genuine self-management. This is consistent with the notion that fun typically involves

spontaneity, surprise and defiance of authority (Fineman, 2006). Therefore, managers may want to "look the other way" to some extent, allowing employees to goof off. Of course, managers must know when to rein in employees who go too far in having fun.

One limitation in the present study is the use of self-reported measures. Also, there is a need for studies of the relationship of goofing off and performance. Another limitation is that the respondents were college students. However, it seems the study of college students is worthwhile since students are adult members of society and many organizations employ them. It is safe to say that most of our respondents are not currently employed in the profession to which they aspire. The results, therefore, are limited to jobs that are not in line with the employee's long-term career goals. Certainly, the study of other populations is warranted.

In conclusion, while managers may want to allow employees to goof off to some extent in hopes of enhancing later performance, the present study offers insights into how goofing off can be limited. Enrichment of jobs to increase motivation is one alternative, but for the typical jobs held by college students limiting the opportunity to goof off by monitoring behavior and assigning a relatively "full plate" of work duties seem to be more feasible options.

REFERENCES

Abramis, D. J. (1990) Play in work: childish hedonism or adult enthusiasm. *American Behavioral Scientist*, 33(3), 353-373.

Bernardi, R. A., & Arnold, D. F. (1997) An examination of moral development within public accounting by gender, staff level, and firm. *Contemporary Accounting Research,* 14(4), 653-668.

Beu, D. S., Buckley, M. R., & Harvey, M. G. (2003) Ethical decision-making: A multidimensional construct. *Business Ethics: A European Review*, 12(1), 88-107.

Block, W. (2001) Cyberslacking, business ethics and managerial economics. *Journal of Business Ethics*, 33(3), 225-231.

Decker, W. H., & Calo, T. J. (2007) Observers' impressions of unethical persons and whistleblowers. *Journal of Business Ethics,* 76(3), 309-318.

Fineman, S. (2006) On being positive: concerns and counterpoints. *Academy of Management Review*, 31(2), 270-291.

Fleming, P. (2005) Workers' playtime? Boundaries and cynicism in a "culture of fun" program. *Journal of Applied Behavioral Science*, 41(3), 285-303.

Ford, R. C., Newstrom, J. W., & McLaughlin, F. S. (2004) Making workplace fun more functional. *Industrial and Commercial Training*, 36(2/3), 117-120.

Gropper, C. M., & Kleiner, B. H. (1992) Making work play. *Work Study*, 41(7), 14-16.

Holden, R. (1993) Enjoyment in employment: How to utilize the power of laughter, humour and a winning smile at work. *Employee Counselling Today*, 5(4), 17-20.

Karl, K. A., & Peluchette, J. V. (2006) Does workplace fun buffer the impact of emotional exhaustion on job dissatisfaction? A study of health care workers. *Journal of Behavioral and Applied Management*, 7 (2), 128-141.

Meyer, H. (1999) Fun for everyone. *Journal of Business Strategy*, 20(2), 13-17.

Newstrom, J. W. (2002) Making work fun: an important role for managers. *S.A.M. Advanced Management Journal*, 67(1), 4-8, 21.

O'Fallon, M. J., & Butterfield, K. D. (2005) A review of the empirical ethical decision-making literature: 1996-2003. *Journal of Business Ethics*, 59(4), 375-413.

Redman, T., & Mathews, B. P. (2002) Managing services: should we be having fun? *Service Industries Journal,* 22(3), 51-62.

Schmidt, W. H., & Posner, B. Z. (1992) The values of American managers then and now. *Management Review*, 81(2), 37-40.

Singer, M. S., & Singer, A. E. (1997) Observer judgements about moral agents' ethical decisions: The role of scope of justice and moral intensity. *Journal of Business Ethics*, 16(5), 473-484.

White, R. D. (1999) Are women more ethical? Recent findings on the effects of gender on moral development. *Journal of Public Administration Research and Theory*, 9(3), 459-471.

TABLE 1

EXAMPLE ITEMS COMPRISING EACH SCALE

_____

 Scale/Items
_____

Goofing Off
>How much do you goof off on the job?
>To what extent do you waste time at work?

Supervisor Rating
>How would you rate your immediate supervisor's leadership abilities?
>How would you rate your immediate supervisor's concern for employees' productivity?

Intrinsic Motivation
>Are your job duties enjoyable?
>Are your job duties interesting?

Workload
>To what extent does performing your job duties take up the time you spend at work?
>How would you rate the amount of work your job requires you to do?

Monitoring
>How closely does your immediate supervisor monitor you while you work?
>How would you rate the likelihood of getting caught if you were to goof off at work?

Work as a Game
>How much is performing your job duties like playing a game?
>How similar are your work duties to sports?

Pleasure Importance
>How would you rate the importance of having fun at work?
>Do you feel it is important for a person to obtain pleasure from his/her job?

_____

TABLE 2

**SCALE RELIABILITIES, MEANS, STANDARD DEVIATIONS,
AND INTER-CORRELATIONS**

| | Cronbach's | | | Scale Correlations | | | | | | |
Scales	α	*M*	*SD*	1	2	3	4	5	6	7
1. Goofing Off	.855	3.55	1.22							
2. Supervisor Rating	.925	5.38	1.18	-.113*						
3. Intrinsic Motivation	.816	5.20	1.17	-.336‡	.394‡					
4. Workload	.668	4.81	1.18	-.391‡	.067	.328‡				
5. Monitoring	.613	3.59	1.12	-.352‡	.049	.081	.235‡			
6. Work as a Game	.722	3.02	1.26	.154†	.171†	.200‡	.091	-.050		
7. Pleasure Importance	.489	6.36	.66	.086	.126*	.230‡	.105	.007	.100	
8. Gender				-.125*	-.118*	.048	.048	-.014	.036	.067

*p < .05, † *p* < .01, ‡ *p* < .001; n=351

TABLE 3

REGRESSION MODEL: PREDICTORS OF GOOFING OFF

Scale	Unstandardized Coefficients		Standardized Coefficients	
	B	Std Error	Beta	*t*
(Constant)	40.15	1.96		20.46‡
Workload	-.54	.10	-.26	-5.41‡
Monitoring	-.42	.08	-.26	-5.61‡
Intrinsic Motivation	-.34	.06	-.27	-5.72‡
Work as a Game	.32	.07	.22	4.83‡

‡$p \leq .001$

CRISIS MANAGEMENT IN THE NEW STRATEGY LANDSCAPE

William "Rick" Crandall
School of Business
University of North Carolina at Pembroke
Pembroke, NC 28372
rick.crandall@uncp.edu
(910) 522-5786

John A. Parnell
School of Business
University of North Carolina at Pembroke
Pembroke, NC 28372
john.parnell@uncp.edu
(910) 521-6465

John E. Spillan
School of Business
University of North Carolina at Pembroke
Pembroke, NC 28372
jspillan@uncp.edu
(910) 521-4357

ABSTRACT

This paper examines the emerging trends in the new crisis management landscape. A four-stage framework is used that follows the progression of a modern crisis management approach. The four stages examined are: landscape survey, strategic planning, crisis management, and organizational learning. Each stage is examined in terms of its impact on the internal and external environments of the organization.

CRISIS MANAGEMENT IN THE NEW STRATEGY LANDSCAPE

The field of crisis management has grown rapidly over the past twenty years. This emerging discipline area seeks to prevent and mitigate crisis events in organizations. Crises are usually defined as low probability, high impact events whereby the organization can be seriously impaired (Pearson & Clair, 1998). Examples include fires, workplace violence incidents, industrial accidents, terrorist attacks, ethical breaches by management, and extreme weather events.

The practice of crisis management is often viewed as a three-stage process: Pre-crisis, crisis, and post-crisis. Pre-crisis activities include convening the crisis management team and writing a crisis management plan. The charge of the team in this stage is to be proactive in anticipating

potential crisis events, and drawing up preliminary plans on how to manage those events. Efforts are also focused on prevention. The crisis stage focuses on managing the event when it does occur. Typically, the crisis team is activated and management activities center on returning the organization back to normal operating conditions. The post-crisis stage involves reflecting on the events that have transpired and learning how to best manage crises in the future.

We anticipate a number of new trends in the field of crisis management. This paper overviews these trends within the framework of what we have labeled "the new crisis management landscape." We begin by extending the three-stage process to a more comprehensive, four-stage framework of crisis management. The resulting framework views crisis management in terms of the landscape survey, strategic planning, crisis management, and organizational learning. Using the framework as a lens, we overview the emerging trends that are occurring in this growing field of management.

A CRISIS MANAGEMENT FRAMEWORK

Figure 1 depicts the crisis management framework that will be used in this paper. In this framework, crisis management is viewed as a four-stage process consisting of the landscape survey, strategic planning, crisis management, and organizational learning. The first stage, landscape survey, identifies the crises threats that exist inside and outside the organization. This analysis becomes the input for the next stage, strategic planning, the process where crisis events are anticipated and planned for. This is the stage where the organization forms its crisis management team and plan. Crisis management, the third stage, is the reactive phase where management addresses the crisis at hand. Of key importance is the management of the organization's internal and external stakeholders. Organizational learning, the last stage, seeks to derive lessons that can be learned from the crisis.

Insert Figure 1 Here

EMERGING TRENDS IN THE CRISIS MANAGEMENT LANDSCAPE

Figure 2 depicts the emerging trends that are occurring in the field of crisis management. Each of the four stages of the framework is examined next.

Insert Figure 2 Here

The Landscape Survey

The landscape survey process looks at the environment an organization resides in, and identifies the trends that are currently transpiring in that environment. The internal landscape looks at the state of the organization, and its ability to withstand a crisis, and in some cases, even be the cause of the crisis. What follows is an identification of emerging internal landscape trends, and how they will impact managers in the future.

Enthusiasm for crisis management planning will increase within organizations. Figure 3 shows an indicator of how interest in crisis management has been growing in recent years. The

figure depicts the number of articles published on crisis management on a yearly basis. Article counts (more formally called bibliometric data) are often used as a proxy for interest in a particular area of management (Carson, et. al., 2000). Figure 3 shows how the number of articles on crisis management was steady from 1980 to 1992. From 1993 to 2001, there was a slow, but steady increase in article publications. Starting in 2002 through 2006, the number of articles has increased dramatically. This figure also shows the number of mainstream vs. academic articles that have been published. Mainstream articles hit a broader audience of managers and other types of working practitioners. Academic articles are written mainly by and for those who conduct research on crisis management. The figure shows a higher number of mainstream articles than academic articles. In addition, the number of mainstream articles has risen sharply while the number of academic articles has risen more gradually.

Insert Figure 3 Here

One reason for this escalation in written articles may involve the manager's attitude toward vulnerability. The traditional viewpoint towards an organizational crisis was simple – "it can't happen to us" (Barton, 2001; Pearson & Mitroff, 1993). Many of these managers felt that even when a negative event occurred in an industry, it always happened to the other guy (Lockwood, 2005).

With the recent sharp increase in interest in crisis management, the prevailing viewpoint is changing to a more cautious "it might happen to us" mentality. Certainly, the September 11th terrorist attacks and Hurricane Katrina showed managers that just one crisis can affect a large number of stakeholders with remarkably high risks in terms of human and property loss. Even if an organization was not a direct hit from the terrorist attacks or the hurricane, many were adversely affected by their association with the directly affected organizations.

The surge in interest has a major impact on students and practitioners. Never before in modern history, has there been a more focused interest on crisis management. New managers entering the workforce, as well as current ones, must educate themselves on the basics of crisis management practices. We label this an emerging trend because currently, a number of organizations are not prepared for a crisis. They do not have crisis management plans or teams, and not have thought through the potential of worst-case scenarios.

Crises will increasingly be seen as moral failure on the part of the organization. Some have taken the viewpoint that crisis events can be likened to moral failures on the part of one or more stakeholders to the organization, inferring that the crisis is human induced. Dan Millar, senior consultant for the Institute for Crisis Management, has noted that the majority of organizational crises are human induced with management initiating over 53 percent of all crises, while employees account for 28 percent (Millar, 2003). Millar further classifies crises according to a category called "smoldering". Such crises start out small, internal, and manageable. However, these situations escalate and become a crisis that is discernable to the public. A greater emphasis has been placed on addressing these smoldering crises before they become full blown.

Based on the nature of human behavior and its past record of ethical breaches leading to crisis, we believe that such breaches will only continue, despite the best efforts of business schools,

religious leaders, and management writers. What does appear to make a difference in reducing such moral shortcomings in a specific organization is the example set by upper management (Carroll & Buchholtz, 2003). The implication for management is to set the ethical tone of the organization at the top levels of the company hierarchy. In the absence of knowing what to do, employees will look one level higher to get their cues on how to respond in a certain situation. Thus, promoting good business ethics at the top of the organization can go a long way in preventing an organizational crisis.

The External Landscape

In the external landscape, emerging issues are focusing in two areas; the growing power of crises victims and the eroding trust stakeholders experience when an organization goes through a crisis.

Victims of crises will become more visible and powerful as stakeholders. In the past, victims of crisis events have been acknowledged to some degree, but were eventually forgotten. Indeed, certain victims, particularly those from a natural disaster, are poor and considered outcasts in society. As a result, these types of victims are not long remembered. Patrick Lagadec (2004) makes this observation in looking at the fatalities from the killer heat waves in France (2003) and Chicago (1995). In both events, those who died were often the poor, the elderly, and those who were isolated to some degree from society.

Recently, however, victims have become more vocal, visible, and noticed (Hart, Liesbert, Arjen 2001). After Hurricane Katrina, victims of the storm began to receive much media attention. One of the reasons why these victims were heard was because of the ineptness of government agencies in properly responding to this disaster. While it is true that the United States had never seen a hurricane of this magnitude, public sympathy was not on the side of the government, but on the side of the victims.

The implication for managers is to realize that all parties that are impacted by the crisis are viable stakeholders. Furthermore, if the organizational response to the crisis is weak, public scrutiny will move against the organization, and onto the victims. Ineptness in handling a crisis is not an option.

An organizational crisis will be increasingly seen as a trust issue. The traditional viewpoint of a crisis is that the organization is the victim of that crisis. This mindset would particularly hold true in the event of a natural disaster, but of course, less so if the crisis was human induced from within the organization. Events such as hurricanes, fires, earthquakes, or some other accident are thought to be things that "happen" to the organization.

Any crisis can be an issue of trust, however (Hart, Liesbert, Arjen, 2001). This viewpoint maintains that the organization shares some of the blame for the crisis, either in terms of causing the crisis, or in how it managed the crisis response. Even if a natural disaster occurs, the organization is blamed for not being adequately prepared. Such a viewpoint assumes that organizations get what they deserve, and this, in proportion to the degree of blame. While such an attitude does not always seem fair, the onslaught of media attention that accompanies crisis events certainly seeks a scapegoat. Whether accurate or not, a scapegoat mentality does help add

meaning to an otherwise meaningless situation. Even if an organization is not to be directly blamed for the results of a crisis, a loss of confidence from the public is still a likely outcome (Bertrand & Lajtha, 2002).

The implication may seem overwhelming to managers, but it is nonetheless, an emerging trend. Management is a symbol of trust that the organization has with its stakeholders. Internally, the organization must be trusted by its employees to manage the crisis in the best manner possible. Employees also expect that management will not induce a crisis, for example, in the area of worker safety. Such a crisis would be a trust issue if management cut back on safety training or equipment, simply to reduce expenses and enhance the bottom line. Should an employee be injured due to a cutback of this sort, then employee trust of the organization would be compromised. External stakeholders also trust the organization to prevent crises, as well as mitigate them when they do occur. If stakeholders lose trust in the organization, its ultimate survival may be in jeopardy.

STRATEGIC PLANNING

Strategic planning is that proactive stage where management has a chance to plan ahead for crisis events. The trends and implications in these important areas are discussed next.

The Internal Landscape

Crisis management plans will move from bound, static notebooks, to dynamic electronic documents. Crisis management plans have long been advocated in the literature. A crisis plan typically includes a selection of worst-case scenarios and how the organization should respond if they occur. In addition, contact information of the key stakeholders to the organization is included. Prior to the popularity of the Internet, crisis management plans were documented in bound guidebooks. Such notebooks were similar to other standard operating procedure (SOP) materials that organizations kept on the bookshelves. Today, many organizations are increasingly posting these plans on their websites. This approach makes the plan readily available to all connected stakeholders, and the wide distribution also insures the plan can be accessed in a wider geographic context. It also enables crisis planners to evaluate other published plans when formulating or revising their own ones. Finally, because these plans are electronic documents, they can be easily changed and redistributed, unlike bound documents in notebooks, which take more effort to change.

One implication of this change is that the organization's Information Technology (IT) department must be actively involved in the distribution of the crisis management plan. This relationship is actually a welcome one, since IT is an integral part of crisis recovery anyway. Another implication is that all employees must be web savvy and comfortable reviewing electronic documents.

Crisis management planning will become part of the organization's regular strategic planning process. The planning process for a crisis has traditionally been carried out through crisis management teams (Barton, 2001; Penrose, 2000). Such teams have typically operated outside of the strategic management process (Preble, 1997). Team members usually include

representatives from the key functional units of the organization. Planning is usually focused on the development of worst-case scenarios and contingencies for dealing with these potential crises.

An important emerging trend is to make crisis management planning an actual part of the strategic planning process (Coombs, 2006; Preble, 1997; Wang & Belardo, 2005; Chong, 2004). The advantage of this approach is that it makes crisis awareness an ongoing process that is reviewed in conjunction with the organization's long range plans. Worst-case scenario planning is incorporated into the SWOT analysis component of planning. This extended viewpoint insures the weaknesses of the organization and outside external threats--the W and T of SWOT analysis--are considered in a regular, systematic manner.

The implication for management is to insure that the entire crisis management process does not occur in a far corner of the organization, away from the main players who need to part of the process. Crisis management should be part of the strategic planning process, not a separate activity that occurs only occasionally.

The External Landscape

In the strategic planning area, one of the main trends we see is the interaction of the crisis management team with teams outside of its organizational unit.

Crisis management teams will be interacting more with other crisis teams from outside their organization. Traditionally, one crisis team is organized per unit. For example, a large company with several plants may have one crisis team for each manufacturing facility. In addition, there may also be an overall team for the entire organization. This type of arrangement works well when the crisis event is of a relatively small scale.

As crises become more complicated and geographically diverse, organizational crisis management units must interact with similar teams from other organizations. In addition, a host of government agencies may also be involved in this network of crisis teams. These interlinking crisis teams that form during an event have been called hastily formed networks (Denning, 2006). Hurricane Katrina led to the formation of a number of hastily formed networks among aid agencies, crisis management teams, military units, emergency response teams, and local governments.

The implication of this trend is important. Crisis management leaders must begin networking with their counterparts in other organizations. The opportunities for knowledge transfer are ripe, and even the planning of disaster drills. The time to interact with these groups is before the crisis occurs. In this way, crisis team members are familiar with their counterparts and have already developed a working relationship.

The focus efforts of crisis management will expand to include a wider range of stakeholders. The traditional focus of crisis management has been on media relations (Hart, Liesbert, Arjen 2001; Marra, 1998). The rationale is that a good relationship with the media will insure that the company is putting its best foot forward when communicating with the public.

An emerging trend is that crisis management is adopting a broader stakeholder approach. This approach advocates meeting the needs of the multiple groups that have distinct vested interests in the organization (Carroll & Buchholtz, 2003). Certainly, employees represent one such stakeholder (Barton, 2001; Lockwood, 2005). This sometimes forgotten group needs to know both the good and bad news that occurs during a crisis. Employees are a key resource and can help rally the firm through a perilous time.

However, other stakeholders that may be affected by a crisis include shareholders, customers, the local community, suppliers, and social activist groups (Carroll & Buchholtz, 2003). The response of several large private-sector companies to Hurricane Katrina in New Orleans and the surrounding areas provides an example. Wal-Mart, Home Depot, and FedEx were the big three that tracked the hurricane and aggressively moved to meet community needs after the storm hit (Olasky, 2006). Obviously, their goal was to generate business, but more importantly, they were poised to offer a humanitarian role in the aftermath of the storm.

The implication for organizational crisis decision makers is to expand the scope of response of the company to include helping local stakeholders if possible. Such a move is especially welcomed when a local geographical area has been the victim of a natural disaster. This response will vary according to the type of business services offered by the company. Several applications become apparent:

- Food service establishments can offer food and beverage during times when these items may be scarce in the community. Offering these items for free or at a reduced cost may be feasible. Purposely raising the price though, because resources are scarce, will be viewed by many as a form of inappropriate opportunism and will create community ill-will.
- Retailers can offer staple items that may be of immediate use, such as flashlights, batteries, and portable stoves. While it is expected that retailers would do this anyway, what needs to be anticipated is that adequate supplies will be on hand as the time of need arrives. Purchasers must be able to anticipate the kind of emergency items that will be needed and order accordingly. Again, raising the price of a much needed item will create bad feelings in the community. While it can be argued that such a move is legal and the option of any business operator, doing so in a time of need is also bad business ethics and can itself, create an additional crisis.
- Those organizations with access to fleets may be able to offer transportation for the elderly or needy. Such a move could be applied by offering pick up and delivery of needy citizens to local stores, similar to what a bus service would offer in a city. While even offering this type of service may sound preposterous to some managers, doing so on a temporary emergency basis will be appreciated and well received by the community.

The point of this discussion is to remember that planning for a crisis should not just mean looking after the company's interest only, but also to needs of stakeholders in the community.

CRISIS MANAGEMENT

Crisis management is the reactive phase of the four-stage model outlined in this framework. Specifically, it is the stage where the organization responds to a specific crisis. Emerging trends within the internal landscape are discussed next.

The Internal Landscape

Contingency responses to specific crisis events will become more common. The reliance on crisis management teams and plans are a good step in moving an organization towards a firm base in formalized crisis planning. Conventional crisis planning has followed a standardized procedure format in addressing incidents. As a result, most crisis plans contain specific procedures to follow when a particular event. For example, bomb threats are common crisis events that are addressed, and these usually contain a step by step procedure for responding to such a threat. Another example is the evacuation of a building, a procedure which should be carried out in an organized, methodical fashion. However, responding to complex crises will also involve contingency approaches. This line of thinking maintains that there may not be one best approach to every crisis.

Shrivastava noted in the early 1990s that moving from procedures to broader based crisis skills was an emerging trend in the crisis management field (Shrivastava, 1993). Included in this skill set is the need for "decentralized decision making" and "managerial autonomy and flexibility" (Shrivastava, 1993, p. 28). While procedures are important in managing a crisis, this skill set recognizes that contingencies may be required along the way. Bertrand and Lajtha refer to this ability as the "breaking of inflexible mindsets" or "training oneself to deal with the unexpected" (Bertrand & Lajtha, 2002, p. 186).

The implications for management are two-fold. On one hand, the crisis management team needs to address specific potential crises events and how they should be managed if they occur. On the other hand, managers need to maintain flexibility in their responses to more complex situations. Making adjustments along the way is part of contingency thinking, and this in itself, is an art, as well as a science. Crisis response then, requires a set of plans that become the backbone for the management of the event. Crisis response also requires a degree of improvisation, an ability to create new responses in light of new information that the crisis may reveal.

The organization's website will become the chief communications tool during a crisis. Internet technology has expanded the communication tools that are available during a crisis (Vielhaber & Waltman, 2008). At the top of the list is the organization's website. The website can become the key contact point between the organization and its stakeholders during a crisis. Unfortunately, some crises have actually caused the website to "go down", rendering it useless. Union University, a small private college in western Tennessee experienced this in February 2008, when a tornado ran through the campus, damaging buildings and causing the website to become unavailable for several hours. On the other hand, Virginia Tech was able to remain online by loading a simplified "light version" of its website after the April, 2007 shooting rampage by student, Seung-Hui Cho (Joly, 2008). The website became the key communication device with the public during the ordeal. Following the shootings, the website received up to 150,000 visits per hour. Its normally transfers 15 gigabytes a day, but on the day of the shooting, the web server transferred 432 gigabytes (Carlson, 2007).

There are several implications for crisis managers. First, the organization's emergency website arrangements should not be compiled in a vacuum by the IT department. The crisis management team must be available to share information and also receive advice on how the website should be maintained during a crisis. One thing is certain; the website will need to be scaled down considerably so that it can absorb the high amount of traffic that will descend on it by users wanting an update on the crisis. A second implication is to consider partnering with another organization in a "co-location arrangement" for operating the website (Joly, 2008: 62). This means that one organization can piggyback off the other if their website goes down, and vice versa. Among institutions of higher education, Duke and Sanford have such an arrangement (Joly, 2008). If a major emergency renders one of the school's websites inoperable, the other school will host and maintain the website until the crisis is over.

The External Landscape

The Internet will become more powerful in its ability to influence the outcome of a crisis. The Internet began to influence crisis planning shortly after its use became widespread in the early 1990s. One of the first companies directly affected by an Internet-related crisis was Intel, when its flawed Pentium chip surfaced in 1994. The crisis began rather innocently when math professor Thomas Nicely at Lynchburg College in Virginia found a computer error when he was working with a math problem and e-mailed a colleague on the matter (Weiss, 1998). Soon, his spreadsheet problem showing how the Intel chip could incorrectly calculate certain problems was on the Internet. Intel had thus become one of the first victims of substantial negative Internet publicity, a phenomenon known as flaming.

As the Intel example illustrates, the Internet can *be* the crisis. At least three illustrations of this type of crisis are evident: (1) when an organization's website is compromised due to a hacker intrusion or virus, (2) when negative websites or blogs surface which criticize an organization, and (3) when evidence from the Internet incriminates a party.

The general public will play a more active role in crisis communication through the use of social networking tools.   One of the more interesting outgrowths of social networking tools is their use in crisis communication. Such tools consist of blogs, instant messaging services, photo sites, and interactive maps. Social networking tools were used recently during the October 2007 wildfires in Southern California. The advantage they offered was the ability to communicate news that was not available on national or even local news outlets.   News such as the progression of the fires, the availability and location of emergency shelters, and the opening or closing of businesses and schools were available in almost real time through social networking outlets (Palmer, 2008).

Social networking offers the advantage of being able to disseminate information, even if the organization's website becomes inoperable. Such was the case after the Union University tornado mentioned previously. However, despite a lack of a website, a blog was set up at blogspot.com to provide updates on the damage and recovery. In addition, the university was able to use its Facebook page to share updates, photos, and videos (Joly, 2008).

The implication for crisis managers is to educate themselves on the various social networking

tools available. Unlike websites, which often need people with specialized skills to set up and operate, social networking tools are easy to use and manage.

ORGANIZATIONAL LEARNING

The Internal Landscape

Organizational learning will increase in importance because of its role in providing the important feedback loop back to strategic planning. The traditional approach to crisis management has been to focus on planning for potential crises and mitigating the impact of the ones that do occur. Much has been written on the need for effective crisis detection interventions (Elsubbaugh, Fildes, Rose, 2004; Mitroff & Anagnos, 2001; Pearson & Clair, 1998). Preventing crises before they occur makes economic sense and reduces the possibility of human and physical damage to the organization.

A wealth of literature also exists on the actual management of a crisis. Indeed, some disasters simply cannot be prevented, but they can be mitigated. One can prepare for and manage the impact—to some extent—natural disasters such as hurricanes. Some crises are induced by humans, however, and call for different types of management intervention. Product failures and industrial accidents focus on careful media relations and extensive human resource efforts. The focus during these times is to manage the crisis and move the organization through the ordeal.

Although traditional crisis management acknowledges the need for organizational learning after an event, most research continues to focuses on pre- and mid- crisis planning. This mindset will need to change in the future, and subsequently, we expect to see it as an emerging trend in the near year to come. A number in the crisis management field have made a call for a renewed focus on the post-crisis stage, where learning and evaluation needs to take place (Bertrand & Lajtha, 2002; Chong, 2004; Kovoor-Misra & Nathan, 2000; Pearson & Clair, 1998). What is significant about organizational learning is that it initiates the feedback loop that is necessary in the strategic management framework. Figure 4 illustrates this feedback loop as it moves back to the landscape survey, strategic planning, and crisis management stages. In each stage, feedback can be useful as the organization prepares for the next round of crises. The external landscape link is also depicted, showing that organizations and industries also utilize feedback to protect from crises.

Insert Figure 4 Here

The implication of this emerging trend is significant, and remains a central theme of this paper – the crisis management process, from landscape survey to organizational learning, needs to be an integral part of the organization's strategic planning process. The days where crisis management consisted of a small select group of managers who wrote the crisis plan and met occasionally are gone. Crisis events impact strategy in the long-run, and as such, the planning, managing, and learning from these events, must be carried out within the strategic management framework.

Organizational learning after a crisis will lead to the abolishment of the existing status quo. Preserving the status quo of an organization and returning to "business as usual" has been the

traditional mindset of many organizations following a crisis. The emerging viewpoint is that crises offer a manner to change or even abolish the status quo. "Crises are, by their very nature, an invitation to abandon standard ways of doing things. They offer an opportunity to think and work laterally and to de-compartmentalized/break down encrusted silos in the company" (Bertrand & Lajtha, 2002: 186). Inherent in this mindset is the notion that a crisis can trigger the forces of renewal in an organization (Dynes, 2003; Olshansky, 2006). Chaos theorists who study organizational crises call this process emergence. Emergence occurs when an organization passes through a crisis and becomes a different and more adaptable organization (Murphy, 1996). For example, the Red River Flood of 1997 was analyzed through the lens of chaos theory and the subsequent organizational renewal that took place (Sellnow, Seeger, Ulmer, 2002). The observation of Sellnow and colleagues was that the local government of Fargo, North Dakota, emerged as a new leader in that geographic area, taking over the lead in emergency response management from the county, which formerly carried out this function. In other words, the status quo of how emergencies had been managed in the past, was not broken, and replaced with a better system.

The implication for crisis managers/strategic planners is one of hope. Crises, although they are negative events, can bring on positive change. However, for this positive change to occur, the learning process must be tied back with the strategic planning process, otherwise, no substantial change will occur in the long-run.

The External Landscape

In the external landscape, learning extends into areas outside of the organization. In addition, researchers outside the organization take an active role in the study of crises. The following are emerging trends that will occur in the field of crisis management research.

Crisis management frameworks and models will become more complex and sophisticated. Frameworks of crisis management have traditionally been simple, with most depicting a sequential format for understanding the evolution and resolution of a crisis. The most basic framework consists of a pre-crisis, crisis, and post crisis sequence as overviewed in chapter 1. Smith (1990) and Richardson (1994) utilized this approach in their studies. Four- and five-stage frameworks have also been proposed (see Fink, 1996; Hosie & Smith, 2004; Meyers, 1993; Pearson & Mitroff, 1993). This paper utilized a four-stage approach. Frameworks have also been offered in the types of crisis categories as well as crisis management communication strategies.

In the future, frameworks will examine new areas that have been previously un-researched. For example, an area that has been mostly untouched is the relationship between crisis management and sustainable development (Crandall & Mensah, 2008).   These two areas are actually closely related since an environmental crisis triggered by an organizational decision, can quickly consume sustainable resources. Framework development in this area is needed.

Although frameworks offer a general approach to understanding the components of crisis phenomena, models are designed to look at the different variables that interact with each other before and during a crisis. Some progress has been made in the area of organizational crisis

model building. Shrivastava, Mitroff, Miller, & Miglani (1988) offered one of the first industrial crisis models. Sheaffer, Richardson, & Rosenblatt (1998) studied the 1995 collapse of Barings, a conservative, once solid, British Bank, and proposed a crisis-causal antecedents and an early-warning-signals model. Pearson & Clair (1998) looked at the crisis management process and proposed a success failure outcomes model. More recently, a crisis preparedness model has been proposed by Elsubbaugh, Fildes, & Rose (2004). In the future, continued progress in model building can be expected.

Another emerging trend in the area of frameworks and models is the inclusion of complexity and chaos theory as a means of offering enriched understanding of the complexity of crisis events. Sellnow, Seeger, & Ulmer (2002) examined the 1997 Red River Valley flood using the framework of chaos theory. Smith (2005) looked at the phases of a crisis event utilizing concepts from chaos theory. Paraskevas (2006) offered a complexity science approach to organizational crises. More recently, Crandall (2007) utilized chaos theory to examine the Union Carbide Bhopal gas leak and the 1995 Malden Mills textile fire in Massachusetts. We anticipate that complexity models such as chaos theory will continue to be used in the study of crises.

Crisis research will become more empirically rigorous. Crisis management research has been dominated by the case approach. Indeed, case studies of a single event can be valuable learning tools for students and practitioners. In the 1980s, Union Carbide's Bhopal disaster, Johnson & Johnson's Tylenol cyanide sabotage, and the Exxon oil spill were well documented. A number of high profile events made valuable case studies in the 1990s, including the bombing of the Murrah Federal Building in Oklahoma City, the crash of ValuJet Flight 592 into the Everglades, and the Luby's Cafeteria massacre in Killeen, Texas. Since the beginning of the millennium, the September 11th toppling of the World Trade Center Towers, Hurricane Katrina, the Asian Tsunami of December 2004 and the 2008 China earthquake, also known as the Great Sichuan Earthquake have been subjects for case studies.

Some multivariate empirical work has also occurred in crisis management research since its inception in the 1980s. In one of the earlier empirical studies, Marcus and Goodman (1991) looked at the impact on the stock market with corporate announcements pertaining to crises. Greening and Johnson (1996) used regression analysis to discover how management teams and strategies correspond with catastrophic events. More recently, Sheaffer and Mano-Negrin (2003) have used factor analysis to examine executive orientations towards crisis management policies and practices. More rigorous empirical models are emerging. One of the dilemmas facing crisis management researchers, however, is the lack of a clear dependent variable. This problem originates from the lack of constructs and scales that are void in the crisis management field at present. A wealth of research opportunity is available to develop these constructs and scales, and furthermore, to test them in multivariate studies.

Crisis research will take on a long-range perspective. The traditional approach in crisis management research was to analyze short-term events, typically single event crises. The study of these events included an analysis of the various phases of the crisis from its pre-crisis stage to the learning stage. However, the long-term effects of these crises have not been widely researched. Revisiting the sites and stakeholders involved in a crisis to determine what learning and policy changes have been implemented is often appropriate (Hart, Heyse, & Boin 2001). A

long term view of crisis also looks at the precursors to these events. Analyzing variables such as the organizational culture and other mini-steps that lead to the crisis can yield useful information to both researchers and managers.

CONCLUSION

This paper has examined emerging trends in the new crisis management landscape. A four-stage framework was utilized that follows the progression of a modern crisis management approach. The first stage, landscape survey, looks at the crises threats that exist inside and outside the organization. This analysis becomes the input for the next stage, strategic planning, the process where crisis events are anticipated and planned for. Crisis management, the third stage, is the reactive phase where management addresses the crisis at hand. Organizational learning, the last stage, seeks to derive lessons that can be learned from the crisis.

REFERENCES

Barton, L. (2001). *Crisis in organizations II*. Cincinnati, Ohio: South-Western College Publishing.

Bertrand, R., & Lajtha, C. (2002). A new approach to crisis management. *Journal of Contingencies and Crisis Management*, 10(4), 181-191.

Carlson, S. (2007, August 3). Emergency at Virginia Tech shows the power of the web, says campus official. *The Chronicle of Higher Education*, 53(48).

Carson, Paula Phillips, Lanier, Patricia A., Carson, Kerry David, and Guidry, Brandi N. (2000), Clearing a path through the management fashion jungle: Some preliminary trailblazing. *Academy of Management Journal*, 43(6), 1143-1158.

Carroll, A., & Buchholtz, A. (2003). *Business & society: Ethics and stakeholder management.* Mason, Ohio: Thomson South-Western.

Chong, J. (2004). Six steps to better crisis management. *The Journal of Business Strategy*, 25(2), 43-46.

Coombs, W. (2006). *Code Red in the Boardroom: Crisis management as organizational DNA*. Westport, Connecticut: Praeger.

Crandall, W. R. (2007). Crisis, chaos, and creative destruction: Getting better from bad. In *Re-discovering Schumpeter four score years later: Creative destruction evolving into "Mode 3" (E.G. Carayannis & C. Ziemnowicz, eds.)*. Hampshire, England: MacMillan Palgrave Press.

Crandall, W. R., Mensah, E. C. (2008). Crisis management and sustainable development: A framework and proposed research agenda. *International Journal of Sustainable Strategic Management*, 1(1), 16-34.

Denning, P. (2006). Hastily formed networks: Collaboration in the absence of authority. *Communications of ACM*, 49(4), 15-20.

Dynes, R. (2003). Noah and disaster planning: The cultural significance of the flood story. *Journal of Contingencies and Crisis Management*, 11(4), 170-177.

Elsubbaugh, S., Fildes, R., & Rose, M. (2004). Preparation for crisis management: A proposed model and empirical evidence. *Journal of Contingencies and Crisis Management, 12(3)*, 112 – 127.

Fink, S. (1996). *Crisis management: Planning for the inevitable*. New York: American Management Association.

Greening, D., and Johnson, R. (1996). Do managers and strategies matter? A study in crisis. *Journal of Management Studies*, 33(1), 25-51.

Hart, 't P., Heyse, L., & Boin, R. (2001). New trends in crisis management practice and crisis management research: Setting the agenda. *Journal of Contingencies & Crisis Management,* 9(4), 181–188.

Hosie, P., & Smith, C. (2004). Preparing for crisis: Online security management education. *Research and Practice in Human Resource Management*, 12(2), 90-127.

Joly, K. (2008). It's 2008: Is your 911 website ready? *universitybusiness.com*, April, 61-62.

Kovoor-Misra, S., & Nathan, M. (2000). Timing is everything: The optimal time to learn from crises. *Review of Business*, Fall, 31-36.

Lagadec, P. (2004). Understanding the French 2003 heat wave experience: Beyond the heat, a multi-layered challenge. *Journal of Contingencies and Crisis Management*, 12(4), 160-169.

Lockwood, N. (2005). Crisis management in today's business environment: HR's strategic role. *SHRM Research Quarterly*, 4, 1-9.

Marra, F. (1998). Crisis communication plans: Poor predictors of excellent public relations. *Public Relations Review,* 24(4), 461-474.

Millar, D. (2003). News Coverage of Business Crises during 2002, *ICM Crisis Report*. The Institute for Crisis Management. Retrieved 9/3/04, http://www.crisisexperts.com

Mitroff, I., & Anagnos, G. (2001). Crisis in crisis management. *Corporate Counsel*, 8(2), 58-61.

Murphy, P. (1996). Chaos theory as a model for managing issues and crises. *Public Relations Review*, 22(2), 95-113.

Nathan, M. (2000). The paradoxical nature of crisis. *Review of Business*, Fall, 12-16.

Olasky, M. (2006). *The politics of disaster: Katrina, big government, and a new strategy for future crisis*. Nashville, TN: W Publishing Group.

Olshansky, R. (2006). Planning after Hurricane Katrina. *Journal of the American Planning Association*, 72(2), 147-153.

Palmer, J. (2008, May 3). Emergency 2.0 is coming to a website near you: The web spells a sea change for crisis management. How should emergency services respond? *New Scientist*, 24-25.

Paraskevas, A. (2006). Crisis management or crisis response system? A complexity science approach to organizational crises. *Management Decision*, 44(7), 892-907.

Pearson, C., & Clair, J. (1998). Reframing crisis management. *Academy of Management Review*, 23(1), 59-76.

Pearson, C., & Mitroff, I. (1993). From crisis prone to crisis prepared: A framework for crisis management. *Academy of Management Executive*, 7(1), 48-59.

Penrose, J. (2000). The role of perception in crisis planning. *Public Relations Review,* 26(2), 155-171.

Preble, J. (1997). Integrating the crisis management perspective into the strategic management process. *Journal of Management Studies*, 34(5), 769-791.

Richardson, B. (1994). Socio-technical disasters: Profile and prevalence. *Disaster Prevention & Management*, 3(4), 41-69.

Sellnow, T., Seeger, M., & Ulmer, R. (2002). Chaos theory, informational needs, and natural disasters. *Journal of Applied Communication Research*, 30(4), 269-292.

Sheaffer, Z., & Mano-Negrin, R. (2003). Executives' orientations as indicators of crisis management policies and practices. *Journal of Management Studies*, 40(2), 573-606.

Sheaffer, Z., Richardson, B. & Rosenblatt, Z. (1998). Early-warning-signals management: A lesson from the Barings crisis. *Journal of Contingencies and Crisis Management,* 6(1), 1-22.

Shrivastava, P. (1993). Crisis theory/practice: Towards a sustainable future. *Industrial & Environmental Crisis Quarterly*, 7(1), 23-42.

Shrivastava, P. Mitroff, I.I., Miller, D., & Miglani, A. (1988). Understanding industrial crises. *Journal of Management Studies*, 25(4), 285-304.

Smith, D. (1990). Beyond contingency planning: Towards a model of crisis management. *Industrial Crisis Quarterly*, 4(4), 263-275.

Smith, D. (2005). Dancing around the mysterious forces of chaos: Exploring complexity, knowledge, and the management of uncertainty. *Clinician in Management,* 13, 115-123.

Vielhaber, M.E., & Waltman, J.L. (2008). Changing uses of technology: Crisis communication responses in a faculty strike. *The Journal of Business Communication*, 45(3), 308-330.

Wang, W., & Belardo, S. (2005). Strategic integration: A knowledge management approach to crisis management. *Proceedings of the 38th Hawaii Conference on System Sciences.*

Weiss, J. (1998). *Business ethics: A stakeholder and issues management approach*, Fort Worth, TX: The Dryden Press.

Figure 1 – A Framework for Crisis Management

	Landscape Survey	Strategic Planning	Crisis Management	Organizational Learning
The Internal Landscape	What crisis threats exist inside of the organization? (This process involves looking at strengths and weaknesses of the organization)	How can we plan for crisis events? (This process includes forming the crisis management team and writing the crisis plan)	How can the organization manage its internal stakeholders when a crisis occurs? (These include the organization's employees and owners)	What did the organization learn from this crisis?
The External Landscape	What crisis threats exist OUTSIDE of the organization? (This process involves looking at opportunities and threats)	What planning has been done OUTSIDE of the organization that can help us prepare for these crisis events? (This process involves looking at what industry associations and government agencies have done)	How can the organization manage its EXTERNAL stakeholders when a crisis occurs? (These include customers, suppliers, the media, the local community, and the general public)	What was learned OUTSIDE of our organization from this crisis? (How will industry associations and government agencies change their policies)

Figure 2 - Emerging Trends in Crisis Management

	Landscape Survey	Strategic Planning	Crisis Management	Organizational Learning
The Internal Landscape	• Enthusiasm for crisis management planning will increase in organizations. • Crises will increasingly be seen as a moral failure on the part of the organization.	• Crisis management plans will move from bound, static notebooks, to dynamic electronic documents. • Crisis management planning will become part of the organization's regular strategic planning process.	• Contingency responses to specific crisis events will become more common. • The organization's website will become the chief communications tool during a crisis. **Crisis**	• Organizational learning will increase in importance because of its role in providing the important feedback loop back to strategic planning. • Organizational learning after a crisis will lead to the abolishment of the existing status quo.
The External Landscape	• Victims of crises will become more visible and powerful as stakeholders. • An organizational crisis will be increasingly seen as a trust issue.	• Crisis management teams will be interacting more with crisis teams from outside their organization. • The focus efforts of crisis management will expand to include a wider range of stakeholders.	• The Internet will become more powerful in its ability to influence the outcome of a crisis. • The general public will play a more active role in crisis communication through the use of social networking tools.	• Crisis management frameworks and models will become more complex and sophisticated. • Crisis research will become more empirically rigorous. • Crisis research will take on a long-range perspective.

Figure 3 - Crisis Management Article Counts 1980 to 2007

Search Parameters:
Date - July 21, 2008
Key Words - crisis management
Source - Business Source Complete (EBSCO)
Search Type - Boolean
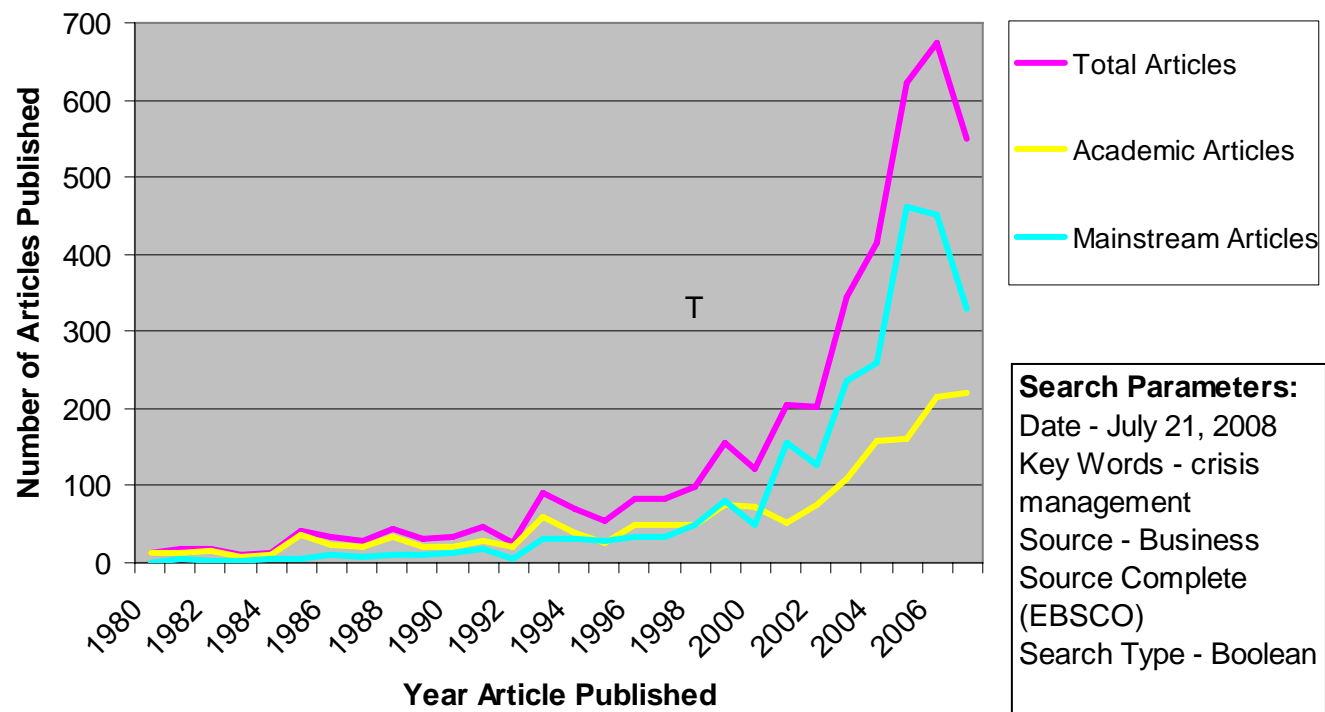
Figure 4 - Activities of the Crisis Management Team (CMT)/External Landscape Entities, and the Subsequent Learning Feedback Loop

	Landscape Survey	Strategic Planning	Crisis Management	Organizational Learning
The Internal Landscape	The CMT identifies the crisis threats the organization is facing.	The CMT develops the crisis management plan and leads training in crisis management.	The CMT actively manages the crisis when one occurs.	The CMT leads the post crisis evaluation so that learning can occur.
The External Landscape	Industries & other external organizations identify their own crisis threats.	Industries & other external organizations engage in crisis management planning.	External organization(s) respond to a specific crisis.	The organization & other relevant stakeholders engage in learning activities.

Indicates feedback loop

Indicates sequence path

USING SYSTEM DYNAMICS TO IMPROVE COORDINATION BETWEEN HOSPITAL UNITS

John E. Spillan
The University of North Carolina at Pembroke
john.spillan@uncp.edu

Christopher Ziemnowicz
University of North Carolina at Pembroke
ziemnow@uncp.edu

ABSTRACT

Hospitals are complex systems that can be represented as networks of interacting units called "services". A model of hospital emergency room patients is used to analyze bed utilization and the backlog in emergencies using a system dynamics tool. It shows how the organizational boundary creates a lack of coordination among services. The simulation model presented uses a gaming interface to compare policies and their effects. The results show that medical service decision makers indirectly control emergency backlog problems. The study shows that solutions that do not require organizational change are often ineffective.

Keywords: hospital management, system dynamics, organizational learning, emergency room service.

INTRODUCTION

Hospitals are complex organizations made up of interdependent subsystems for receiving patients, examining, retaining, and treating them. There are numerous pathways along which patients flow through a hospital according to their specific health problem, as well as the current constraints within the subsystems that patients have to pass through (for example, a patient may mean they need an EEG, but the current backlog for EEG implies waiting for three days). This interdependency of services along the patients' pathways is what system dynamics professionals call dynamic complexity: each medical decision affects the context in which many other medical decisions are taken, and the overall implications of a decision are hardly taken into account.

Effectiveness and cost of treating a patient will depend on the availability among the different subsystems at the time of particular need. The total amount of time of treatment will increase when intense use of subsystems results in increased waiting times. Moreover, the structure of responsibilities and incentives may create situations where a physician makes decisions that are locally rational, but they generate adverse consequences in other services. These are often not fully perceived by the physician.

There are organizational frontiers that blind decision makers to the "side effects" that appear in other subsystems (Wolstenholme, 1990). At the same time, decision makers in other subsystems will make choices that are locally rational for them, in order to avoid

or overcome these "side effects". This pattern of decisions takes the form of closed loops that lock in both decision makers. Since these loop structures are extremely common, they be considered as systemic archetypes (Senge et al., 1994). An extended collection of such archetypes has been reduced to four generic archetypes (Wolstenholme, 2003). Many of these have been found in health system and hospitals (Wolstenholme, 2004).

This paper examines how one such structure operates in a hospital environment between the emergency subsystem and one inner medical service, and how system dynamics modeling has been used to improve the situation. This is a typical case where a hospital's medical service uses beds in ways that are coherent in terms of the service's inner logic, but create a problem in the emergency service. There are several reasons why the service wishes to use the greatest possible number of its beds at all times. However, there must be "idle" beds in order to receive patients who have been stabilized in the emergency service. If there are no "idle" beds, these patients cannot leave the emergency room to make room for new patients. In terms of decision taking, there is an organizational border (Wolstenholme, 2003) between the "emergency" and the "medical service" although the patient flow cuts across it. System dynamics can be used to negotiate a mutually satisfactory solution.

To develop this model, the essential concepts of system dynamics modeling have to be defined. These include notions of feedback loops, of time delays, and the basic characteristics of stock and flow variables. A system dynamics model to allow physicians to explore different strategies to avoid the emergency service problems without creating one for the medical service was designed. This model allows decision makers to formulate different policies concerning the admission and release of patients in the emergency and the medical service. The number of beds that the medical service keeps "idle" is adjustable to evaluate the effect on total waiting for new emergency patients. This model allows the medical service decision maker to examine the effects of their decisions on the emergency service. This presents a typical situation, thus all hospitals can adopt a similar approach to achieve optimal service performance.
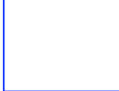
INTERVENING IN COMPLEX SITUATIONS WITH SYSTEM DYNAMICS

In their simplest form all systems consist of inputs, processes, and outputs. These are fundamental to operate a productive, goal achieving organization. To comprehend an organization's system it is necessary to examine the interactions, relationships, and transactions that comprise the substance of the organization's day-to-day business. These dependent variables are influenced by the behavior of internal and external environmental as well as cultural factors. The structure of the relationships affects the feedback loops and direction of each variable's interaction. This transforms the composition of other variables and ultimately influences decision-making and policy directions.

The feedback loops and their direction are capable of producing factors that determine growth, stagnation, or decline in an organization's development. How the feedback is balanced and driven will determine the productivity of the organization. The system dynamics approach focuses on helping decision makers understand how structure drives behavior; it does so using the rigor of simulation and the power of visualization. The

system dynamics model is comprised of four components represented by symbols shown in Table 1.

Table 1: Systems dynamics component parts

Available boxes	"Stocks" are accumulators; they represent an amount of something at a given point in time, for example: available emergency room beds. The entities counted in these stocks are often called "resources".
hospitalized	"Flows" are what changes stocks during a period of time. For example, hospitalized patients will diminish the number of patients in the emergency room and at the same time increase the number of hospitalized patients.
admission probability	"Converters" or "auxiliary variables" allow for indicators and ratios, for example the number of available beds divided by the total number of beds or the admission probability.
	"Information flows" enable us to describe decisions that take into account the values of certain variables.

Decisions are made and enacted to achieve organizational goals and objectives. This process is driven on one level by information feedback. Choices are made with the available information. The actions that come from these changes will modify the situation, which in turn provides new information. On a second level, there are strategies, structures, and decision rules that are applied to available information. These, in turn, are expressions of our experience and knowledge. The formation and transformation of these models is also influenced by available information. However, it is often difficult to learn from experiences in real-time because there are many singular instances of particular cases and long delays, as well as multiple influences, make it difficult to analyze experience.

The underlying cycle of action learning is depicted in Figure 1. It also illustrates the complexity of mental models and virtual models. It depicts the interactions between the components of the system. Examining the interrelationships and response loops that are developed, a decision-maker can highlight the critical areas where management intervention is needed. Understanding how each component interfaces with each other enhances the manager's ability to make more informed and appropriate decisions that fit the problem. The availability of a virtual world to interact is an opportunity to compress time and space and to perform policy experiments. This helps to transform mental models and ultimately allows for better decisions.

Figure 1: modeling and simulating to learn in complex systems
(adapted from Sterman, 2000, p. 45)
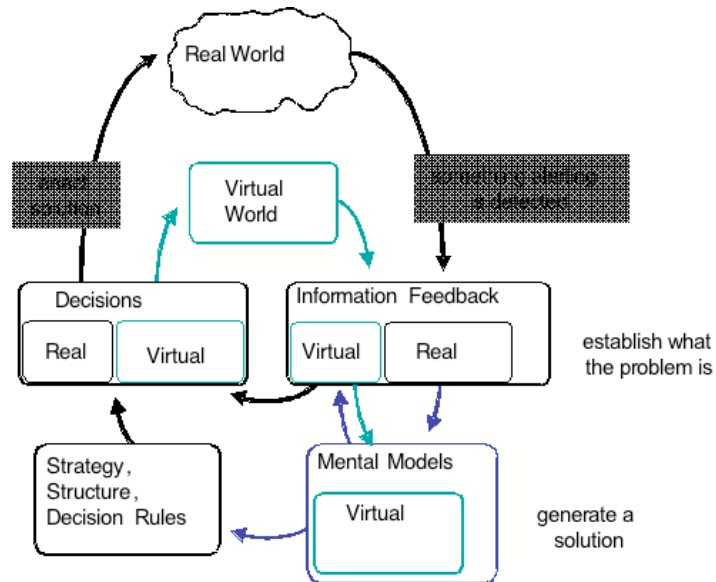
Organizations constantly interact with the internal and external environments. There is a need to identify problem areas and develop appropriate strategies to resolve problems that are detected, or strengthen the areas that are identified as weak. (iThink Manual, p. 1-10)

Managing any type of organization requires a multi-dimensional perspective. It is valuable to have a visual description of the soft variable elements and their relationships, as well as a portrayal of how these relationships affect other elements within the whole organization. This study used the iThink mapping, simulation, and modeling tool. It provides the capability of designing a model with visual images through a mapping process. Simulations can be executed on the model that will show how the elements of the system interact. The model shows not only the effect a change in one or more variables can have on each other, but also on the whole system itself. It shows how interrelationships can affect organizational learning and ultimately productivity. The essence of the system dynamics modeling approach is finding the feedback loops and relationships that are dependent on each other and have the most influence on the output of the system.

Figure 2 shows the relationship between the hospital's capacities to meet the increasing demand of the community. This archetype illustrates the major policy connection between health care management systems and their communities. The essence of this idea is to facilitate more hospital admissions and meet the demands of the community. In this example the unintended result of the hospital policies is to increase more need for post-hospital services. In both cases, there is limited capacity and thus the consequence is the underachievement of the objective which the community's demand.

Figure 2: Example of a systemic archetype.
Adapted from Eric Wolstenholme, Using Generic Archetypes to support thinking and modeling. Systems Dynamics Review, 20(4), 2004, pp. 346-347.
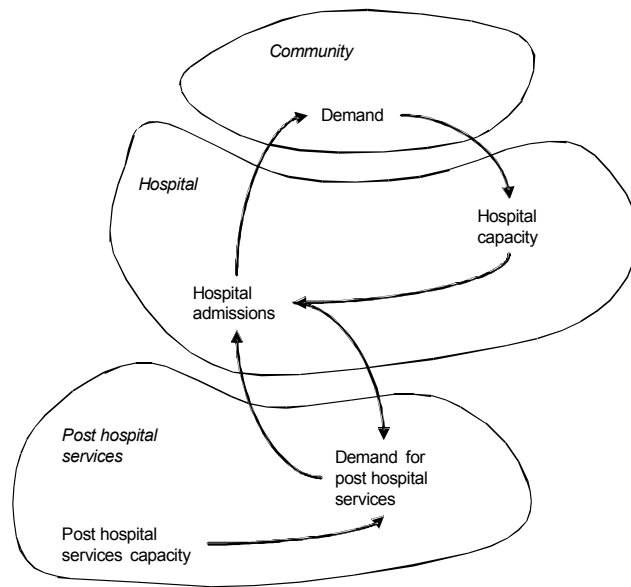
Hospitals struggle to provide the services that are essential for each patient, yet resource constraints and inflexible service pathways cause congestion and frustration among the service consumers and the service providers. In the following sections we present an alternative perspective and solution that considers the interrelationship of the hospital systems components that can create the constraints and cause the frustrations.

ANALYTICAL MODEL

To evaluate this simple yet complex delivery system, a simulation model can be used with a gaming interface that has been designed to represent a particular organization. The purpose of designing such an interface is to allow for experiments or the iteration of "what If" scenarios. The in a hypothetical hospital modeled contains one medical service and one emergency service. Its focus is on the flow of patients through the emergency service and – sometimes- towards the medical hospital bed stay. The analytical model helps promote alternative thinking and different perspectives regarding problems managers encounter in day-to-day operations.

The use of modeling and simulating is a means to reflect upon problems and to get a feel for changes that may prove helpful. This does not present a specific solution; thus, the parameters used and the scenarios simulated are generic. Rather than deriving specific recommendations for a hospital, conclusions can be drawn concerning the decision-making approach. To demonstrate the value and power of this systems dynamic modeling schema, a simulated five days (by hours) configuration of a hospital with six emergency beds and 100 medical beds that encounters a hypothetical daily flow of new emergency patients. A portion of the model is shown in Figure 3.

Figure 3: patients' flow through the two units
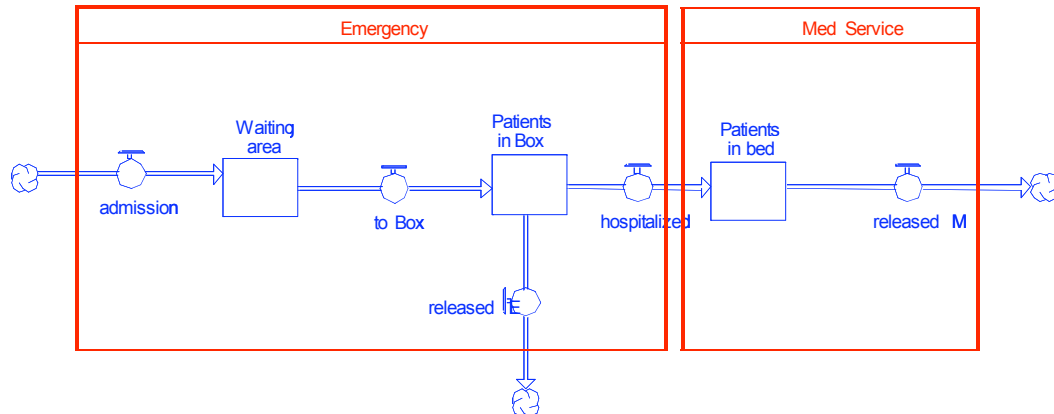
The emergency service receives patients that have to be stabilized in order to stay alive. The basic unit of treatment shown is the "box", where each patient receives treatment by a physician. From there on, the patient may be released or hospitalized. If the patient has to be hospitalized, they will be transferred to the medical service, which has to have a bed available at that precise moment. If there is no bed available, the patient has to remain inside the box and wait in order to receive a bed in the medical service they will be transferred to. During the "waiting period" in the box, the following patient cannot enter into treatment, and a backlog of critical patients builds up in the emergency service.

The model of the hospital has a medical service that receives patients from other areas, gives them treatment, and then releases them home or transfers them to other service areas. The physician manages several resources in order to attend to their patients. One of the critical factors in this services delivery situation is the bed availability. Without free beds, a physician cannot hospitalize patients. Physicians also consider the patient's opinion concerning service. If the patient feels badly served, they may switch to another physician or hospital. On the other hand, the hospital's interaction leads to a policy that aims at keeping free beds at a minimum.

When the physician receives a patient that needs to be in hospital, there may be reasons why an immediate hospitalization is not possible. After all, there are many patients demanding attention, and some are in a more pressing situation that others. Also, there may be resource constraints that preclude immediate attention. However, a particular patient may not understand that they have to wait if at the same time they see beds available (resources). So in the physician's logic, if it is important to make the patient feel well attended, then it makes sense not to have too many free beds.

Figure 4: Two local systems and one organizational frontier
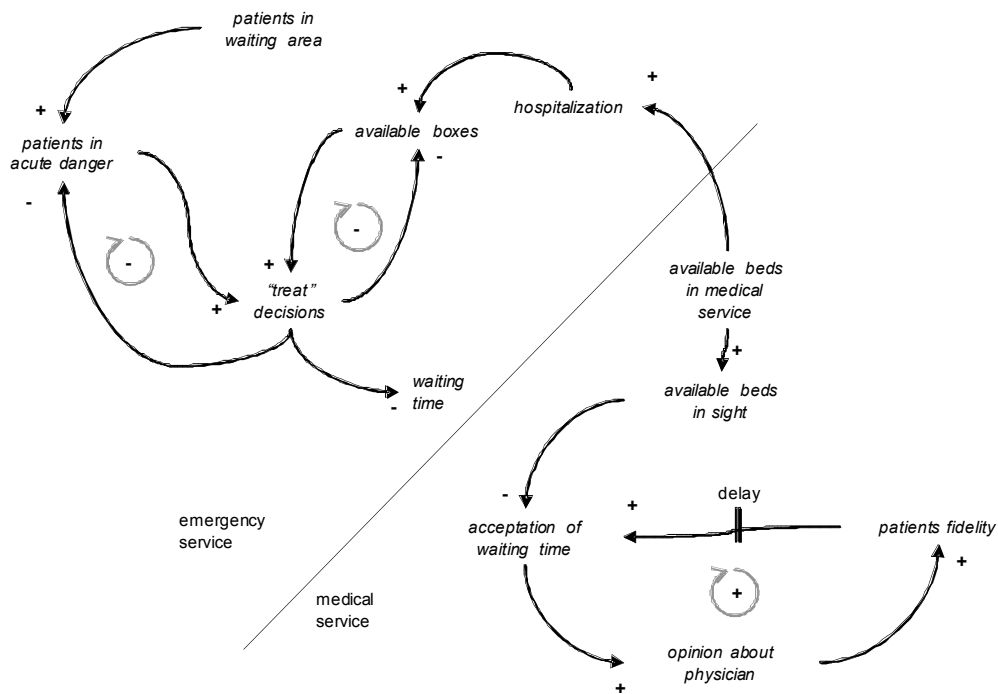
Physicians and hospital administrators reviewed the complete model and simulations. They quickly grasped the structure of the model and accepted is as valid representation of their situation. After inspection of the model's behavior, they concluded that this approach could help them and shape their ideas. They have many ideas about how to improve their hospital, but they felt that without a rigorous way to articulate them, their proposals remained only speculations. The model also illustrated that effective solutions require organizational change to be effective.

The scenario chain of events, together with the involved variables and results of the model, are available from the authors. This model is currently being expanded to cover other specific hospital conditions and issues. One scenario under development will attempt to resolve the question of how many beds have to be available for emergencies that may be encountered by a hospital over a period of one year.

DISCUSSION

The hospital situation is similar to that frequently encountered in *logistics (supply chain management)*, and helpful contributions may come from this field. It is also essential to recognize that some of the variables implied in this situation behave as *accumulators*, while others behave as *flows*. An accumulator is passive: unless new material arrives or some is evacuated, the quantity inside the accumulator remains constant. A flow is what changes the quantity of an accumulator, adding to it or taking from it. For example, waiting areas, the emergency beds, and hospital beds are accumulators with their characteristic inertia. New admissions and other movements of patients or changes of state (beds and boxes) are flows, and only they can change the accumulators. In turn, the

situation of accumulators determines the flows. The differences and relationship between accumulators and flows have been theorized and systematically used in *system dynamics* to design effective interventions in complex systems, and helpful analysis may come from this discipline.

There are several lessons that can be derived from this model and multiple simulations. First, the emergency service cannot solve the congestion problem coming towards it from the medical service, since all possible decisions are made in the medical service. In fact, the decision variables that can be affected by the simulation user are part of the "medical service" sector. Next, changing patient release times to coincide with daily emergency peaks will only bring a one-shot relief and not affect the performance significantly. A constant checkout of patients is able to repeat this impulse every day and thus allows improving performance (patient throughput). Third, developing a simulation model allows a comparison of alternatives and to understand important differences between them.

CONCLUSIONS

A hospital can be analyzed as a net of interacting "services" and focused on what happens between two of these services: "emergency" and a prototypical "medical service". It became clear that the medical service uses bed assignment policies according to its inner logic, and that the side effects this causes in emergency are not taken into account. For example, if the emergency unit perceives a bottleneck because they cannot transfer stabilized patients to the medical service; being unable to treat new emergency patients, they can send home patients who may not be at vital risk, but there is no substantial policy available to solve the problem.

The simulation has shown that unless the underlying "physical" relations are balanced, "firefighting" decision policies will only have superficial effects. The simulation model in this representation shows managers that the policy levers are not in the emergency unit, but are actually found within the medical service. This approach allows decision makers to test and compare decisions as well as policies to determine the proper mix of hospital resources combining sensible effects with affordable efforts.

The model presented in this paper is a generic, as are the findings. Because this model is flexible, it offers adaptation and applicability to most hospitals. The model's mapping feature also provides a compelling visual representation of the various interrelations between and among the variables in any organization. While the mapping feature gives decision makers a visual perspective, the dynamic modeling that is embedded in the software provides a better understanding of the impact of decisions that are made or not made in an organization. This facilitates a novel simulation method for decision makers to learn and test ideas that were previously not available. A hospital can also use this tool as a means to maintain a learning organization. However, this model is just one approach to help managers in an organization sustain its competitive edge in a rapidly changing environment.

REFERENCES

Caceres, P.A. and Rodriques-Ulloa, R., (2007), An application of soft systems dynamics methodology (SSDM), 58(6), pp. 701-713.

Coyle, G., Road, C., and Shivenham, S., (2007). Qualitative and Quantitative Modelling in Stystems dynamics: Some Research questions, System Dynamics Review, 16(3), pp. 225-244.

Forrester, Y. (1961), *Industrial dynamics*. (MIT Press, Cambridge).

Grobler, A. (2007), Systems dynamics project that failed to make an impact, System Dynamic Review, 23(4), pp. 437-452.

iThink Systems Thinking Manual (1992), iThink: The Visual Thinking Tool For the 90s, High Performance Systems Incorporated, (Hanover, New Hampshire).

Lane, D. (2007). The power of the bond between cause and effect. Jay Wright Forrester and the field of systems dynamics, System Dynamics Review, 23(2/3), pp. 95-118.

Lane, D.C. and Husemann, E. (2008). Systems Dynamics mapping of acute patient flow, Journal of Operations Research Society, 59, pp. 213-224.

Roberts, E.B. (2007) Making System Dynamics useful: a personal memoir, System Dynamics Review, 23(2/3/), pp. 119-136.

Senge, P., Ross, R., Smith, B., Roberts, Ch. and Kleiner, Ar. (1994): *The fifth discipline fieldbook*, (New York: Doubleday).

Sterman, J. (2000). *Busyness dynamics: systems thinking and modeling for a complex world*, (Wiley-New York).

Sterman, J. (2007). Exploring the next great frontier: System dynamics at fifty, 23(2/3), pp. 89-93.

Visser, M. (2007). System Dynamics and group facilitation: Contributions from communication theory, System Dynamics Review, 23(4), pp. 453-463.

Weil, H.B. (2007). Application of System dynamics to corporate strategy: An evolution of issues and frameworks, System Dynamics Review, 23(2/3), pp. 137-156.

Wolstenholme, E. (1990), *Systems enquiry*, (Wiley, Chicester).

Wolstenholme, E. (2003), Towards the definition and use of a core set of archetypal structures in system dynamics, *System Dynamics Review* 19(1), pp. 7-26.

Wolstenholme, E. (2004), Using generic system archetypes to support thinking and modeling, *System Dynamics Review,* 20(4), pp. 341-356.

HRM's TRENDS AND SHIFTING PRACTITIONER ROLES AND COMPETENCIES: PRELIMINARY EVIDENCE FROM NOVA SCOTIA

Paula Crouse, Department of Information Technology, Mount Saint Vincent University
Halifax, Nova Scotia, B3M 2J6, (902)-457-6667, Paula.crouse@msvu.ca

Wendy Doyle, Department of Business and Tourism, Mount Saint Vincent University
Halifax, Nova Scotia, B3M 2J6, (902)-457-6667, Wendy.doyle@msvu.ca

Jeffrey D. Young, Department of Business and Tourism, Mount Saint Vincent University
Halifax, Nova Scotia, B3M 2J6, (902)-457-6361, Jeff.young@msvu.ca

ABSTRACT

This paper examines the impact of environmental trends on roles and competencies of professionals in human resource management (HRM). Results of in-depth interviews with six human resources managers from a variety of organizations in Halifax, Nova Scotia are presented. Environmental trends include a shift to a strategic view of HRM's role, changing demographics, and changes in technology. Findings suggest that HRM roles and their associated competencies are changing; for example, there is a shift to a strategic and business partner role from more traditional HRM roles. Implications for HRM professionals and future directions for research are discussed.

INTRODUCTION

Organizations have long operated in environments that have changed quickly, dramatically and frequently. There are numerous, often-cited, broad-brush trends that require organizational responses. For example, globalization [5] [19] [33] can provide opportunities, but it also tends to increase competition. Technology change, another trend [5], can facilitate communication [33] as well as increase organizational efficiency [19]. Workforce demographics are changing [5] and employees are aging [19] [33]. Further, employee diversity is increasing [19] [33] and employee expectations are changing [5] [19] and increasing [33].

In addition, customer relationships are changing [5] and customers are more demanding than they have been in the past [22]. The financial performance of firms has also become a focal point for many [5] [24] [33] and others are paying attention to intangibles [33]. Social change, for example, is resulting in employment laws that are more restrictive than in the past in many countries [19] and ethical issues also remain prominent [24] [34].

Within these changing broader environments and organizations, the human resource management (HRM) function has evolved from a narrow personnel orientation to a broader HRM perspective [20] and has further developed by becoming more strategic in orientation.

1

This strategic human resource management (SHRM) orientation is emphasized by a number of writers across various components of the HRM field, for example, recruitment and selection [9], training and development [29], and compensation [23].

Further, during these shifts many have been critical of the role of HRM and suggested among other things that it does not add value to the firm [13]. However, others have shown that HRM does indeed add value to the firm [20]. In addition, some have indicated that human resource development (HRD), historically a part of the broader field of HRM, has begun to emerge as it own field of enquiry [32].

Clearly, the field of HRM is changing and growing as a profession—new knowledge is being created, the standards of performance will increase in level and type [22], and it is under pressure from various quarters. The following paper examines the HRM function and HRM practitioners in Nova Scotia in terms of trends that the HRM profession currently faces and might face in the future. It also considers the resulting changing roles and competencies required of HRM practitioners.

Initially this paper reviews the literature relevant to trends facing the HRM profession and resulting changing roles and competencies. It then provides a description of the study's methodology, presents results and discussion, and concludes with implications for the profession and directions for future research.

HRM – TRENDS, ROLES AND COMPETENCIES

There are numerous trends that have had impact directly on the practice of HRM; for example, globalization has resulted in specific challenges to HRM including how to enhance global business strategy, how to align HRM with business strategy, how to design and lead change, how to build global corporate culture, and how to develop global leaders [25]. Further, organizations must compete for talent globally [22].

In addition, changes in technology have resulted in changes to how traditional HRM activities are managed. For example, payroll and information systems can be more effectively and efficiently handled through better technology [1]. As well, web recruiting has increased dramatically since the turn of the century [11] and e-learning as a way to train and develop talent has also grown tremendously [11]. This increased use of technology and speed is evidenced by the greater usage of technological learning opportunities such as online journaling [8], podcasts [12], blogs [12] [17], wikis [18], as well as web discussions [14] and on-line simulations [31].

Changing demographic trends, for example, worker retirement and reduced population growth are causing labour shortages for firms [3], and they might well face difficulty in recruiting, retaining and engaging employees [11] [15] [16]. Talent management is thus a very important process [11]. For example, various generational groups in the workforce have different preferences for benefits and tailored benefit plans can be used to attract and retain talent [6]. Further, succession management has become a crucial issue because proper succession management can help to develop and retain good people [5]. This is particularly so for organizational leaders; however, only about 55% of organizations have a succession plan in

2

place and of these about one-third have not been particularly effective in their succession management activities [2].

Further, being able to deal with many diverse groups as employees and customers is required [3]. HRM managers must be able to source and recognize "diverse and nontraditional talent" especially in a global and increasingly diverse environment. Indeed, managing takeovers and acquisitions and the required integration of people and systems is a major challenge [1, p. 29].

HRM practitioners are under pressure to show how they add value to the firm [1]. Some suggest that this can occur through increased employee abilities and increased organizational capabilities [22]. However, traditional HRM activities such as recruiting and career planning are devolving to line managers [27], and the impact of HRM is increased for those HRM managers who collaborate with line managers [22]. Further, outsourcing of HRM activities has become a major trend in businesses [1] [7], and it has also increased in the public sector [10].

Ethical issues have increased for managers and organizations, and reputation can help or hurt a firm's recruitment and retention [34]. Changes in laws mean that HRM practitioners must work to keep up [1] and talent must be treated fairly [11].

Have trends from the 1990s to the early 2000s affected the practice of HRM? What are these trends? How have they affected professional practice? Are there any new trends in HRM practice that are emerging? If so, what are these? How will they affect HRM practice?

As trends have emerged HRM professionals have been expected to occupy new roles and some have suggested that the former functional HRM role has been supplanted by a more strategic role, and new roles require new competencies [19] [33]. Many new or enhanced roles for HRM practitioners have been described by numerous writers, and although many of these roles overlap, there are some that do stand out. For example, one key role for practitioners seems to be that of "change manager," learning to better assist organizational managers to deal with change [16] [28] [33]. Also, HRM practitioners must begin to act as a "business ally" [33] by taking roles as "strategist" and continuing to show how HRM adds value to the organization [16] [22] [24]. Thus HRM practitioners must become competent in the use of ROI tools, develop skills in influencing others (especially key decisions makers), show how meeting the needs of diverse firm stakeholders adds value, and create an action plan that prioritizes those needs [24].

HRM has a role to play as "talent and succession managers" by providing professional and technical expertise [5] [16] [33], but they must also ensure that senior managers are active in managing this process [5]. Again their roles and competencies as influencers come to the fore.

HRM has also seen a shift in roles from "training suppliers" to "learning managers" [26] [30]. For example, some have discussed the demand for the increased speed of learning and the associated increased demand for just-in-time (JIT) learning and its associated implications for HRM [4]. These include using available technology while maintaining a social touch in learning. Practitioners must become more proactive and adopt roles that are facilitative and supportive, and they must use JIT learning to get knowledge to the right people at the right time.

HRM practitioners must also act as "ethics champions" [22] by showing employees that, if ethical issues arise, they have options through open-door policies or 1-800 support lines and

3

helping to develop the right ethical culture [34]. In addition, HRM practitioners must be "integrators"—bringing other people and processes together—and "collaborators"—working closely with others [22]. They must also act as "employee champions" [22] in part by serving as managers of diversity as well as creating cultures that facilitate employee loyalty and engagement [16].

Clearly, HRM practitioners have, or should have, come a long way from keeping records and managing payroll systems. Their jobs now require serving many new and different roles than in the past, and these roles require development of current competencies or the acquisition of new ones. Many of these competencies revolve around hard-core business competencies, but others also require a firm ground in areas such as communication, coaching, influencing, and understanding others among other competencies.

What are the key roles that HRM practitioners occupy in 2008? What are the key competencies that are required to operate within these roles? Are there any shifts in roles and competencies anticipated?

METHODOLOGY

The methodology used in this study was qualitative and exploratory in nature and was intended to examine a number of case studies [21]. For example, there is an opportunity for direct, face-to-face encounters which will provide a richness of detail, and there is also an opportunity to engage in analysis during the data collection phase. The case study is the preferred strategy in this research for several reasons: 1) questions of "what," "how," and "why" regarding informal workplace learning are being examined, 2) the investigators have little or no control over events within the sites to be studied, and 3) events in a real-life context are the study's focal point [36].

The study's findings are based on in-depth interviews with six HRM managers in a variety of organizational contexts in the Halifax Regional Municipality (a major financial, government, retail, industrial, military, university and health-care center in the Atlantic Provinces of Canada).

Organizations were selected from several sources: the Halifax Chamber of Commerce Business Directory, the local telephone directory, various websites, and assorted media reports. The intent of the authors was to increase the variation of the sample and thus participation was sought from HRM managers in organizations from various sectors such as government, military, health care, and business to name a few.

In total 20 letters were sent between July 2008 and August 2008 to human resource managers at these organizations explaining the study and inviting them to participate. Ultimately these managers were contacted by telephone by the researchers to determine their willingness to participate. At that point, an interview was arranged for a mutually convenient time and place for those who agreed to participate in the study.

A pre-test of the interview guide resulted in minor revisions to improve clarity. Interviews were then completed using an interview guide consisting of open-ended and closed-ended questions to determine selected demographic and organization information as well as issues related to trends

4

impacting the profession and shifts in professional roles and competencies. Interviews took approximately 60 minutes, were tape-recorded and were transcribed. The interviews were then coded and analyzed on a qualitative basis.

RESULTS

Participants and Their Organizations

The results presented here are very preliminary given that interviews are still being conducted. However, the managers who participated in this study represented a diverse group across several quite different organizations. Participants are identified by number to protect their identities, and they and their organizations are briefly described below:

Participant 1 is a female Director of Human Resources at a post-secondary educational institution with approximately 500 full-time employees. This Director is a generalist with 20 years of full-time work experience in the field of HRM. She holds a BA, BEd, MBA, and CHRP.

Participant 2 is a female Human Resource Manager at a health-care facility with approximately 1000 full-time and part-time employees. This Manager is a combined generalist and specialist (recruitment and labour issues) with six years of full-time work experience in the field of HRM. She holds a Certificate in Adult Education and several professional credentials including Professional Recruiter, IPM and Psychometrics Professional Assessor.

Participant 3 is a female Human Resource Director in a federal government department with 44,000 full-time employees. This Director is a combined generalist and specialist (advising senior managers on all HRM areas) with four years of full-time work experience in the field of HRM. She holds an undergraduate degree and professional accounting designation.

Participant 4 is a female Senior Vice-President of Human Resources in a diversified group of companies with 3500 employees. This Vice president has a BA and an MBA and a combined 25 years' experience in her firm and the HRM field.

Participant 5 is a female Director of Employee Services in a post-secondary educational institution with 1700 employees. This Director has a BA, a Certificate in Personnel Management and a Certificate in Human Resources Management and 20 years' experience in HRM.

Participant 6 is a female Senior Director, Human Resources in a high-tech consulting firm with 600 employees in Canada and 1400 worldwide. This Director is a generalist, has a CHRP and has 15 years' experience in HRM.

The first set of questions considered trends from the 1990s to the early 2000s and how they affected the practice of HRM. Strategic roles, demographics and changes in technology have been important trends.

5

The shifting role of human resources from processing human resource transactions to being a strategic member of senior management was a common finding. Participant 1 indicated that the biggest trend has been the positioning of HRM as a strategic partner: "…others have realized HR is not just paper clearing, record-keeping …" Participant 2 held a similar view, suggesting "at one time Human Resources was probably more of a processing department; it wasn't part of the whole business of the organization. I think it's becoming much more part of the business of the organization … we're part of that whole senior management group and making decisions for the organization." HRM is now much more strategic in orientation, and as a result, Participant 2 suggested that broader knowledge and need for specialists is required of practitioners; for example, in labour issues, "When I hear about organizations hiring lawyers to be HR professionals, I can appreciate why." Participant 3 said that her organization had shifted from a transactional role for HRM to one that is based on providing advice and consulting to managers. This has then required HRM to develop its own expertise within certain areas to be more efficient and competitive (e.g. hiring and compensation). This strategic shift resulted in Participant 5 stating that, "Everything we do is built on, dependent on, and linked to our strategy… I can remember when HR used to be the personnel police and … it is now being a strategic partner … we need to enable employees to be more independent and self-sufficient …running reports that enable decision making."

The new strategic role seemed to arise from changing demographics as well as other factors. However, demographics such as the aging population impact benefits (very costly) and also make recruitment/retention more difficult. As the older employees leave, new ones must be recruited. Participant 2 indicated that demographics were less of an issue for her organization because turnover was very low. However, in the changing labour market, younger hires are more demanding than their predecessors, they want more money when they start, and they are not afraid to ask for time off. However, responses to different demands from different groups are limited because of a high rate of unionization and associated collective agreements, which clearly delineate pay rates and other benefits. For Participant 3 the aging workforce was a factor, and it resulted in the development of various programs such as those related to disability management, mental health and wellness issues in the workplace, as well as a focus on succession planning. The aging workforce (and associated early and normal retirements) has resulted in managers moving through the ranks more quickly than in years previous. Consequently, HRM must help provide more coaching and mentoring for these managers. Participant 4 felt that changing demographics was the most important trend and has resulted in a plan to combat her firm's labour shortage. For Participant 5 this shift in workforce demographics has led to different ways of recruiting and retaining and a tendency to focus more on engagement than previously. Likewise Participant 6 believed that fewer graduates were available for her firm to recruit and "groom" and that demographics had changed, which affected recruitment: "How do we stay on top of what's driving the people who want to work for us?"

Technology changes have also had an impact on human resource practice. For Participant 1 technology has changed what is required of people in their jobs and then creates a need for more and more training as technology continues to develop. It is difficult to recruit and retain IT people because the organization has difficulty matching the salaries, benefits and perks of the private sector. On the other hand, Participant 3 suggested that HRM had driven changes in technology because these changes helped HRM achieve its goals of providing consulting and coaching to managers through having technology handle more of the transactions processing.

6

These changes were echoed by Participant 4 and Participant 5 who indicated that enhanced technology had been brought in to make the organization more competitive with its recruiting. Participant 5 saw technology being leveraged to help her organization shift to a self-service model.

The second set of questions focused on new trends in HRM practice that are emerging and how they are affecting HRM practice. Clearly, the issue of demographics and dealing with younger workers was a key issue.

Participant 1 identified generational differences as a current trend because the different groups, such as Boomers, Xs, and Ys, all want different things. "People don't stay forever," and her organization is experiencing more turnover recently. Exit interviews suggest that some people, many younger people, leave their jobs for no particular reason (e.g., not going elsewhere for higher salary). Many younger people are leaving simply because they don't see themselves committing for 20 years. How do we keep them satisfied?

Participant 2 felt that changing demographics would require her organization to adapt to recruit people from new demographic groups. HRM and others must change their attitudes toward the workforce coming in. However, she also felt that this would have to be done with the collaboration of the unions, a job that is made more difficult by a lack of money. However, she felt that incentives for young people and much more flexibility in taking time off were appropriate responses to different generational wants. Participant 3 also felt the impact of changing demographics. She indicated that preparing younger workers, who lack the experience of their predecessors, to deal with difficult situations was an issue: "They haven't been through the school of hard knocks kind of thing where you sort of learn things just by doing over time, so it's how we prepare those people so that, you know, when they are dealing with their difficult circumstance … those kinds of skills in the organization." Participant 4 identified three broad groups of people in her firm: older senior managers, middle-aged managers, and young, new entrants. She has seen an extreme difference in attitude across the groups, largely in terms of work ethic. For example, "I mean if they decide (younger workers) that they want to stay at home for whatever reason, that should be acceptable, and then if you convey that reason the person stated on to the senior management, they can't comprehend it at all." Participant 5 felt that the emergence of many different types of generations in the workplace at one time was forcing her organization to change its definition of diversity and how that impacts on recruitment, retention, and engagement.

In addition, Participant 2 felt that acquisition of broader knowledge was still an emerging issue because things, for example, will continue to change and develop. Participant 3 also believed that issues such as disability, mental health and wellness programs, and succession planning were emerging. Participant 6 also identified work-life balance, wellness initiatives, succession planning and technology changes as trends. There was also a trend toward increased demand for HRM reports in her firm. These emerging trends are now requiring HRM people to focus on issues of performance management and developing well-rounded IT consultants and to develop new recruiting strategies to identify those who possess the "hot" skills.

7

The third set of questions explored key roles that HRM practitioners occupy in 2008, key competencies that are required to operate within these roles, and shifts in roles and competencies anticipated.

All six participants occupied a variety of roles and were engaged in dealing with standard types of issues such as performance management issues, discipline, HRM planning, recruiting and training and development. However, the one role that emerged very clearly was that of internal consultant. These HRM practitioners provided advice and guidance on a range of issues to managers for decision making. They all saw their role as strategic, and as Participant 1 indicated, their job is to "feed into the executive management group … being a business partner." Participant 5 echoed this sentiment and said, "… serving on different committees, working with executives and senior leaders around their strategies and what we can do to help support them."

Competencies that were identified by all six participants were numerous but can be categorized as follows:

Technical HR skills – being technically competent and well rounded—that is, knowledgeable about a broad array of issues such as labour relations, wrongful dismissal, succession planning, competency assessment, reward and recognition programs, benefits and pension issues—were seen as being important by all six. Indeed, Participant 2 summed up the need for technical skills quite well by saying, "… being able to interpret collective agreements, always be prepared to go to court … How's that going to be perceived in court?"

Strategic skills – knowing the business and industry in which they operated was important as were analytical skills, and as Participant 3 said, being able to "translate the vision into operational activity." In a related vein was the notion of managing change. Participant 6 said a key competency is the ability to "move through changing landscape quickly."

Organizational/management skills – being able to work under pressure, having strong leadership skills, establishing priorities, having project management skills, and possessing strong investigation skills.

Personal skills – having good judgment, common sense, self-awareness, for example, knowing your limitations.

Interpersonal skills – being able to deal with diverse individuals and teams, facilitating, negotiating, influencing, knowing who to ask, coaching.

One issue that emerged was that of the overall HRM role, which is to some extent dependent on organizational size and resource availability. Two participants in smaller, publicly funded organizations seemed to be "in the trenches" and seemed to be involved in the day-to-day HRM operations to a greater extent than some participants who were in larger, more fully resourced organizations. Consequently, those in smaller organizations felt that they had to develop strategically, but they also had to know about a broad range of technical issues because they had to deal with the day-to-day issues to a greater extent than did those in larger organizations.

8

However, those in the larger, better resourced organizations felt that their role was more one of team and strategic leadership and the technical issues were left to specialists. For example, Participant 4 said that she had oversight of the HRM area; however, she had professionals in place to handle the technical aspects. Her role is to provide leadership for the HRM strategic plan. Further, Participant 5 said,"…do I have all the strengths necessary to be successful? Probably not. But it's more about the outcomes by using the strengths that exist throughout teams of people …What I care more about is that collectively we have what it takes to achieve those outcomes …" Thus participants in the larger organizations focused on being strategic but also on developing their own leadership and team-building capabilities.

Participants did detect some shifts in roles and competencies. For example, both Participant 1 and Participant 6 felt that HRM practitioners, at least in their organizations and industries, must be better generalists and they must have well-rounded HRM and business knowledge because their organizations are relying on them. This is in part a function of the size of their organizations and the economic and other resource constraints faced. Participant 2 believed there would be greater emphasis on succession planning, which is "something that we have not done a lot here." Other areas that were on the upswing included promoting organizational development, adult learning, conducting more professional assessments for leadership competencies, and focusing on organizational health and work/life balance issues. Participant 3 spoke of the benefits of operational experience and how her organization has moved from a generalist to a specialist approach, which develops a depth of expertise. This is counter to what Participant 1 suggested, but Participant 3 is in a very large, well-resourced organization and these specialists cannot only be afforded, but they are also needed.

Participant 4 indicated that workforce demographics would tend to remain an issue and other factors such as mental-health issues and employee assistance programs would increase in importance. Participant 6 also mentioned demographics and being able to meet the changing needs of employees as well as focusing on work-life balance issues. Participant 5 indicated that HRM's roles such as recruitment/retention, stewardship, building leadership capacity, building employee self-sufficiency, assisting people with their learning and growth, and developing a "top-notch services model" have and are aligned with the broader strategy of her organization.

All participants seemed to agree that HRM practitioners needed to understand the business of the organization, but Participant 3 also raised the issue of understanding the financial impact of HRM work – "when we are proposing HR strategies we have to really add some value."

Discussion

The interviews to date reinforce the trends noted in the literature. Changing demographics appear to be the driving force behind the trends in the changing role of human resources practitioner. As skilled people become more of a scarce resource, HRM becomes more of a critical area for organizations. The participants reported that human resources is moving to more of a strategic role, and this trend has also been reported by [9] [29] [23] [20]. How is this trend evidenced in the day-to-day activities of a human resource manager? The HRM manager may be sitting on top-level management teams and be expected to contribute to the strategic decision-

making of the organization. Some suggest that this means that the HRM manager has to be familiar with tools used to make strategic decisions, for example, ROI and the skills to influence others [24]. HRM managers are also taking a strategic approach to HRM decision making and planning as well as participating on organization-wide teams.

Technology has allowed HRM to free up resources to deal with the new roles that result from changing demographics. Clearly the participants found that HRM was changing from a transactional approach to a coaching/advising role as transaction activities such as hiring, performance appraisal, and payroll activities were transferred to line managers. This is consistent with the findings of a number of researchers [27] [22]. The change in role of HRM from transactions to coaching/advising has been facilitated by technology. Whether technology has driven the change or HRM managers whose role is changing have driven technology to develop the necessary tools can be debated. However, without the technology improvements, the delegating of payroll and other "traditional" HRM functions would not have been possible. The new role of coaching and advising requires different skills and competencies.

The participants also discussed another trend that is affecting their role, and that trend is the changing demographics of the workplace. Again, this trend is documented in the literature by numerous researchers [2] [3] [5] [6] [11] [15] [16]. The implications of this trend are far-ranging. The participants mentioned mental health, wellness, benefits, succession planning, recruitment, retention, disability management, different needs and work values of various age groups as well as managers moving up in the ranks more quickly. The last implication results in what some refer to as talent management [11]. This results in HRM managers providing coaching and advice to the young managers receiving promotions quickly as well as planning ways for various generational groups to work together. In other words, HRM managers must act as change managers [16] [28] [33].

Some research indicates that technology changes are affecting the role of HRM managers [1] [11], and one interviewee felt that HRM needs were driving technology. Another interviewee felt that technology changes were affecting learning needs, and it was especially difficult to attract and retain IT people.

There is a sense from these few interviews that practitioners are developing HRM as an internal consulting organization [35]. Certainly the results of this paper show that although the transactional issues are still being managed, HRM practitioners are making the shift to providing transformational services as well, tying their work to that of the organization, and they are trying to be relevant to their organizations.

The results also show that these practitioners occupy a variety of roles and have developed and continue to develop a variety of skills and knowledge. Further, these roles and knowledge and skill requirements appear to be shifting somewhat for each practitioner. Although there are shared trends, there is also an element of individuality in roles and competencies. This individuality is based on individual HRM practitioners' own roles and competencies (possessed and required) and the different organizational/environmental contexts in which they operate. This situation puts tremendous pressure on practitioners as they not only manage the shift from transactional to transformational practice, but they must continue to keep learning.

10

How are future trends going to affect the role of HRM professionals? All six participants discussed again the impact of changing demographics. Again this included dealing with younger workers who have different needs and values, assisting young managers who are quickly being promoted without as much experience, succession planning, disability, mental health and wellness programs. In other words, there were no significant new trends forecasted that were not already affecting their roles.

Changing demographics have resulted in a much more strategic role for human resource directors or vice-presidents. The competency needs for this role centre on breadth of knowledge of how the business or organization works. Yet, more complexities are being added to human resources, which increases the need for specialists. In large organizations, specialists support the generalist at the head of the human resource area. These generalists at times are brought in from other functional areas and have MBAs or professional accounting designations as they have to bring value to the senior management team and need that broad perspective. Future research is needed in this area to answer questions such as: How do smaller organizations with a limited staff handle the two roles, that is, a generalist with broad business knowledge and a specialist who can handle labour relations, conflict management, coaching, benefit plans, disability issues, etc.? In larger organizations, what types of succession plans exist for human resource directors? If human resource practitioners are becoming more specialized, where will future heads of the human resource area come from as they need broad general skills?

Another area of future research could be how companies are dealing with a new version of diversity, that is, one based on different ages and resulting values in the workplace as opposed to different genders, language, culture or religion. Yet another area of future research could look at the ways that human resources departments are measuring the value that they add to organizations which would include how the human resource area is contributing to strategic decision-making.

REFERENCES

[1] Adler, P. S. Making the HR outsourcing decision. *MIT Sloan Management Review*, 2003, 45(1), 53-60.

[2] Bernthal, P., & Wellins, R. Trends in leader development and succession. *Human Resource Planning*, 2006, 29(2), 31-40.

[3] Bohara, A. M. Managing talent in a global work environment. *Employment Relations Today*, 2007, 34(3), 27-35. www.interscience.wiley.com DOI 10.1002/ert.20162 retrieved July 18, 2008.

[4] Brandenburg, D. C., & Ellinger, A. D. The future: Just-in time learning expectations and potential implications for human resources development. *Advances in Developing Human Resources*, 2003, 5(3), 308-320.

[5] Busine, M., & Watt, B. Succession management: Trends and current practice. *Asia Pacific Journal*, 2005, 43(2), 225-237.

11

[6] Clark, A. D. The new reality: Using benefits to attract and retain talent. *Employment Relations Today*, 2007, 34(3), 27-35. www.interscience.wiley.com DOI 10.1002/ert.20162 retrieved July 18, 2008.

[7] Cooke, F. L., Shen, J., & McBride, A. Outsourcing HR as a competitive strategy? A literature review and an assessment of implications. *Human Resource Management*, 2005, 44(4), 413-432.

[8] Cyboran, V. L. Fostering workplace learning through online journaling. *Performance Improvement*, 2005, 44(7), 34-39.

[9] Das, H. *Recruitment, selection and deployment of human resources.* Toronto, ON: Pearson Prentice Hall, 2007.

[10] Davidson, G. K. Emerging trends and early lessons in public-sector HR outsourcing. *Employment Relations Today*, 2005, 31(4), 31-37. www.interscience.wiley.com DOI 10.1002/ert.20039 retrieved July 18, 2008.

[11] Frank, F. D., & Taylor, C. R. Talent management: Trends that will shape the future. *Human Resource Planning*, 2004, 27(1), 33-41.

[12] Gronstedt, A. The changing face of workplace learning. *T+D*, 2007, 61(1), 20-24.

[13] Hammonds, K. H. Why we hate HR. *Fast Company*, 2005, 97, 40-47.

[14] Hulkari, K., & Mahlamäki-Kultan, S. Reflection through web discussions: Assessing nursing students' work-based learning. *Journal of Workplace Learning*, 2008, 20(3), 157-164.

[15] Jamrog, J. The perfect storm: The future of retention and engagement. *Human Resource Planning*, 2004, 27(3), 26-33.

[16] Jensen, E. HR's role in helping companies achieve high performance. *Employment Relations Today*, 2005, 32(2), 39-52. www.interscience.wiley.com DOI 10.1002/ert.20062 retrieved July 18, 2008.

[17] Karrer, T. Learning and networking with a blog. *T+D*, 2007, 61(9), 20-22.

[18] Laff, M. The world according to WIKI. *T+D*, 2007, 61(5), 28-31.

[19] Lipiec, J. Human resources management perspective at the turn of the century. *Public Personnel Management*, 2001, 30(2), 137-146.

[20] Liu, Y., Combs, J. G., Ketchen, D. J., Jr., Ireland, R. D. The value of human resource management for organizational performance. *Business Horizons*, 2007, 50, 503-511.

[21] Lofland, J., & Lofland, L. *Analyzing social settings: A guide to qualitative observation and analysis.* Belmont, CA: Wadsworth Publishing Company, 1984.

12

[22] Losey, M., Meisinger, S. R., & Ulrich, D. Conclusion: Reality, impact, and professionalism. *Human Resource Management*, 2005, 44(2), 201-206.

[23] Martocchio: J. J. *Strategic compensation: A human resource management approach* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall, 2006.

[24] May, G. L., Sherlock, J. J., & Mabry, C. K. The future: The drive for shareholder value and implications for HRD. *Advances in Developing Human Resources*, 2003, 5(3), 321-331.

[25] Mendenhall, M. E., Black, J. S., Jensen, R. J., & Gregersen, H. B. Seeing the elephant: Human resource management challenges in the age of globalization. *Organizational Dynamics*, 2003, 32(3), 261-274.

[26] Nijof, W. J. Is the HRD profession in the Netherlands changing? *Human Resource Development International*, 2004, 7(1), 57-72.

[27] Perry, E. L., & Kulik, C. T. The devolution of HR to the line: Implications for the perceptions of people management effectiveness. *The International Journal of Human Resource Management*, 2008, 19(2), 262-273.

[28] Rynes, S. L. Where do we go from here?: Imagining new roles for human resources. *Journal of Management Inquiry*, 2004, 13(3), 203-213.

[29] Saks, A., & Haccoun, R. *Managing performance through training and development* (4th ed.). Toronto: Thomson Nelson, 2007.

[30] Sambrook, S., & Stewart, J. Factors influencing learning in European learning oriented organisations: Issues for management. *Journal of European Industrial Training*, 2000, 24(2), 209-219.

[31] Slotte, V., & Herbert, A. *Journal of Workplace Learning*, 2008, 20(3), 165-180.

[32] Smith, A. Engagement or irrelevance? HRD and the world of policy and practice. *Human Resource Development Review*, 2006, 5(4), 395-399.

[33] Ulrich, D., Brockbank, W., Johnson, D., & Younger, J. Human resource competencies: Responding to increased expectations. *Employment Relations Today,* 2007, 1-12.

[34] Vickers, M. R. Business ethics and the HR role: Past, present, and future. *Human Resource Planning*, 2005, 28(1), 26-32.

[35] Vosbergh, R. M. The evolution of HR: Developing HR as an internal consulting organization. *Human Resource Planning*, 2007, 30(3), 11-23.

[36] Yin, R. *Case Study Research: Design and Methods*. Beverly Hills, Calif.: Sage Publications, 1984.

13

TELECOMMUTING'S EFFECTS ON THE EMPLOYEE, THE WORK GROUP, THE ORGANIZATION, AND SOCIETY

Samir Y. Khoury
Department of Technology Systems
East Carolina University
Suite 406 Science and Technology Building
Greenville NC 27858
252-328-9644
khourys@ecu.edu

ABSTRACT

Telecommuting is an option that many workers and organizations are considering or have already embraced for various reasons. Some of these reasons include an effort to improve job satisfaction or to reduce organizational costs. Individual workers, work groups, organizations, and society are affected by telecommuting in different ways. In an effort to gain a broader understanding of telecommuting's effects and to generate ideas for further research, this paper will explore telecommuting's effects on these different entities through an analysis of the available literature.

INTRODUCTION

A commonly held belief in the business world is that organizations can improve workers' performance, if they can increase workers' job satisfaction. A review of the job satisfaction literature identified numerous studies where increased job satisfaction resulted in higher productivity. As a result, organizations have made attempts to improve job satisfaction using a variety of options in an effort to improve performance. Nearly every option available to organizations comes with advantages and disadvantages. If organizations plan to improve job satisfaction within their organization, they first need to understand the advantages and disadvantages of each option.

One of the options organizations have tried using to improve job satisfaction is to allow workers to telecommute. "Telecommuting—the much anticipated ability to work at home in a virtual office, separated from but electronically connected to the workplace—promises many social and economic benefits" [11, p.17]. Research has repeatedly shown that telecommuting increases job satisfaction and increases productivity [8]. Despite this substantial benefit, not all organizations that have allowed telecommuting were attempting to improve job satisfaction. Instead, many organizations were trying to reduce costs associated with office space, parking lots, and utilities when they adopted telecommuting practices [8] [10]. Their desire to reduce costs prompted further research on telecommuting. Most of this research concluded telecommuting reduces an organization's operating cost. On the other hand, many studies have shown that telecommuting did not provide the benefits organizations expected [1]. Regardless of these differences in findings, telecommuting has changed the work environment in many ways.

This paper will explore how telecommuting has modified the way many workers perform their jobs. The advantages and disadvantages of telecommuting will also be explored. The aim is to explore these advantages and disadvantages in relation to the individual worker, the work group, and the whole organization, since telecommuting influences these organizational entities differently. The paper will culminate with a look at telecommuting's effects on society.

CHANGES INTRODUCED BY TELECOMMUTING

An analysis of the telecommuting literature identified numerous studies that have concluded that telecommuting has changed the way workers perform their jobs. Fortunately, many of these changes were positive changes. One of these changes is the way workers are supervised. For example, telecommuting removes the worker from the supervisor's viewing area and keeps the supervisor from being able to directly observe the worker's performance. As Thatcher and Zhu [12, p.1079] point out, telecommuting "reduces direct supervision, coordination, and feedback". Supervisors are forced to find other ways to monitor workers, coordinate with them, and to provide them with feedback. Also, supervisors have to schedule regular meetings with workers, conduct phone conferences, and develop formal work plans in order to ensure telecommuting workers are still managed effectively. Furthermore, supervisors have to measure productivity differently than they would have in a traditional work environment, since direct observation is no longer an option.

Telecommuting also changes workers' dependence on supervision. Workers will have to exercise more initiative and may have to make more decisions on their own, since a supervisor will not be there to guide them step-by-step. Workers that are afraid to make their own decisions may encounter difficulties in a telecommuting environment. Organizations should select workers that are independent and self-motivated for telecommuting positions. Workers that do not have those traits could still perform some telecommuting tasks, such as routine data entry, where complex decisions and problem solving are not required.

Another change brought on by telecommuting is that it forces workers and supervisors to embrace technology. Effective telecommuting is not possible without technology. Workers will have to know how to use fax machines, computers, and communication software in order to do their job [13]. Workers will also have to know how to secure and protect their computer resources from hackers, viruses, and other malicious software. Workers and supervisors will also have to understand networking technology enough to be able to resolve minor connection issues. In addition, workers and supervisors may need technical training to prepare them for the complexities of telecommuting [13].

Human resource and other support functions will need to change in order to provide workers with the support they need [13]. These departments will have to automate many of their services, since they will not be within walking distance of workers. For example, the human resource department may have to post forms on Web pages, so workers can access them from home. The computer support department will also have to change how it handles workers' problems, since workers will be located away from the office [13]. If computer support technicians cannot resolve problems over the phone or through networking technology, they will

have to dispatch a technician to fix the problem. The same level of support provided to traditional workers should be provided to telecommuters.

The most significant change telecommuting brings to the job is that it allows works to work form home. The traditional work day is no longer the norm in a telecommuting environment. Instead, telecommuters are given the freedom to balance work and "personal demands, such as taking care of children, handling personal matters, working on hobbies, participating in sports, attending events important in the lives of significant others, and dealing with day-to-day chores" [8, p.116].

ADVANTAGES AND DISADVANTAGES OF TELECOMMUTING

As discussed above, telecommuting brings about many changes within the work environment. Supervisors, workers, and support departments will have to change their procedures, improve their technical skills, and coordinate task completion in a more structured manner. The changes brought about by telecommuting introduce a number of advantages and disadvantages for individual workers, work groups, the organization, and society.

Effects on Individual Workers

One advantage of telecommuting is that individual workers will be able to save on the cost of travel and on the time it takes to travel back and forth [8]. Another advantage of telecommuting is that individual workers will be able to have a better balance between work and home life, for the reasons identified above. Also, workers are more motivated, because their job satisfaction is improved [8]. Other advantages provided to individual workers by telecommuting include less pressure on workers, better social life, flexible working hours, improved ability to think clearly because of reduced interruptions, improved time management, and the ability to employ homebound individuals [3].

Just as there are advantages to telecommuting for individual workers, there are disadvantages for workers, as well. These disadvantages have prompted some workers to resist telecommuting [13]. For example, studies conducted in Portugal identified that workers feared that supervisors will become more distant to workers when they telecommute [10]. Another resistance issue identified by Nunes [10] is the potential isolation that may occur in a telecommuting environment. Nunes argues that workers prefer to build their status within the organization and then maintain it by remaining visible within the organization. Unfortunately, telecommuting reduces the employee's visibility. What Nunes is saying is that workers feel they would be forgotten and passed up for promotion, if they were not visible within the organization. This fear of being forgotten or being perceived as uncommitted has forced many telecommuters to visit the main office on a regular basis [5] [12].

Telecommuters can also experience more personal conflicts when working at home. For example, Hunton [8] discovered that telecommuters had higher rates of conflict among family and friends when compared to traditional workers. The problem could be attributed to the amount of time spent with family and friends. Hunton also discovered that workers who worked exclusively from home had a higher rate of non-work-related interruptions that lasted an average

of two hours a day as compared to those workers who worked in satellite locations part-time or those that worked in the main office. For these reasons and others, Hunton concluded that telecommuting exclusively from home is not the best option for companies or workers. Instead, Hunton suggests that employers setup satellite locations or require that worker conduct some of their duties from the office.

The increased length of a workday was also identified as a disadvantage in the telecommuting literature. For instance, studies have shown that telecommuters tend to work longer hours, because workdays became blurred [4]. In other words, telecommuters do not clock in and out like traditional workers and often keep working past their normal hours, since they are already at their residence. Also, works tend to start earlier and end later, because they do not have to commute to work like traditional workers [4]. Another significant finding is that workers that telecommute work an average of four hours more than traditional workers [1]. Butler et al. attributed this increase in the number of hours worked to the need to prove that telecommuters are just as valuable to the organization as traditional workers. Butler et al. imply that since workers are out of sight, they may feel they have to prove their worth.

Another disadvantage is that telecommuters may also have to battle state tax rules [11]. Since telecommuters can live in one state and work in another, there may be confusion over which state is allowed to collect income taxes and at what rate. Workers may have to relocate to reduce their tax burden, if the state they live in charges higher rates than the employing state [11]. As Smith and Cristy [11] point out, tax rates can be substantially higher in neighboring states. Unfortunately, new tax rules affecting telecommuters have not caught up with the demand for telecommuters.

Effects on Work Groups

The telecommuting literature provides substantial evidence that individual workers are affected in many ways by the introduction of telecommuting. Some of these ways and their reasons were noted above. A review of the telecommuting literature identified that work groups within organizations are also affected by telecommuting and that telecommuting provides work groups with advantages and disadvantages, as well. Unlike traditional work groups that have the luxury of working face-to-face, telecommuters face a major disadvantage since there is no face-to-face interaction. Face-to-face exchange greatly reduces some of the barriers to communication that are introduced by telecommuting. One of these barriers to communications introduced by telecommuting is information overload. Information overload can occur when more information is received than can be mentally processed by individuals [2]. In a traditional work environment, work group members can read each others' expressions to determine if information overload is taking place. Since telecommuting work groups use a variety of electronic communication media such as chat, e-mail, fax, instant messaging, telephone, and video conferencing, the potential for information overload is likely to occur [2] [14].

Although telecommuting groups may experience information overload, they may also benefit from available communication mediums used in telecommuting. For example, some workers that are afraid to speak in public or face-to-face with work group members will find it much easier to use email or other forms of communication [2]. A work group member with a good

idea may be afraid to present it in a traditional face-to-face meeting, if the member experiences this fear. The availability of other communication mediums used in telecommuting can eliminate this barrier to communication.

A significant advantage to work groups that telecommute is that members can come from many parts of the world at the same time to work on projects, as opposed to having members from the same office or plant form a group [8] [10]. This is a significant advantage, because organizations with many offices all over the world can still form work groups with members from various locations. Organizations will be able to save time and money, because members will not have to travel to meet, as traditional work groups would have to.

Effects on Organizations

Telecommuting not only changes individual work patterns and work group patterns. Telecommuting also changes many work patterns within the organization as a whole. One of these changes briefly described above involved the setup of support functions within organizations. As mentioned above, support functions will have to be flexible enough to support diverse individuals and workgroups located in various locations. Operations may need to be increased to 24 hours to meet the needs of workers in various time zones. Organizations will also need to ensure supporting equipment and supplies are available for telecommuters [13]. Therefore, telecommuting creates disadvantages for organizations that do not have the resources to support telecommuters. Further adding to the problem is that organizations will also need to invest more money in network infrastructure and informational technology hardware and software at the main office and at workers' locations. Another disadvantage is that organizations will also have to develop policies to protect them and their resources.

As previously mentioned, another disadvantage is that organizations will also need to develop comprehensive training programs to ensure workers are aware of these policies and know how to use the available technology to its fullest. Managers and supervisors will also need to be trained on how to effectively manage workers at remote locations. Since supervisors and managers cannot observe workers throughout the day, they will need to find other effective ways to monitor workers' performance [4]. As Dimitrova [4] points out, there is no single right way to supervise telecommuters, since several different approaches were successful in certain situations and not in others. Therefore, organizations should analyze each approach carefully to determine if it is in their best interest.

Another disadvantage of telecommuting involves data security. Data security is a major concern for organizations. As Crandall and Gao [3, p.32] point out, "security issues raise questions as to how much and what type of work should transpire in the home environment". Recent private data breaches that have involved stolen computers have made national headlines and have brought negative attention to organizations. These organizations have incurred customer notification costs, image repair costs, and legal costs as a result of these breaches. Breaches can occur if home owners do not secure their homes as they should or guests in their home gain access to sensitive data. Privacy laws require that sensitive and private data be kept private. Therefore, employers are at risk, if employees maintain sensitive and private data on their home computers, regardless of who owns the computer.

Telecommuting provides a number of advantages for organizations, as well. Numerous studies have shown that telecommuting creates substantial benefits for organizations, which include increasing productivity, increasing company revenues, reducing turnover, reducing absenteeism, reducing costs associated with office space, reducing traffic congestion, conserving fuel, and reducing air pollution [3] [6] [8]. These are substantial benefits, because they allow organizations to operate more efficiently.

Another benefit of telecommuting is it allows organizations to disperse their employees to avoid direct terrorist attacks to a majority of workers [3]. Organizations can also gain access to more candidates by offering telecommuting opportunities to those that were not able to work at the home office due to a disability, caring for young children, or living too far away [3] [6]. Also, organizations that want to distribute their operations throughout the country or world can benefit from telecommuting [3]. These organizations can use the Internet or lease private communication lines to allow their workers to communicate.

Effects on Society

Society can also benefit from telecommuting [3]. One of these benefits is telecommuting reduces the amount of fuel used, since fewer vehicles are traveling on roadways [3] [7] [9]. Other benefits to society include a reduced strain on transportation systems and pollution and more opportunities for handicapped workers [3] [7]. These are substantial benefits that can help all of society by slowing down global warming and other harmful changes caused by human consumption and expansion.

Telecommuting can also have negative consequences on society. As more and more workers telecommute they are less likely to stay active, since they don't have to leave their home. Reduced mobility could lead to obesity, as some studies have shown. Furthermore, as workers become accustomed to working alone, they may find it more difficult to interact with others outside of work. Less worker interaction will likely lead to less organizational involvement and less involvement within the community. If workers lack an opportunity to interact with others on a daily basis, they are less likely to develop professional relationships with coworkers and less likely to take part in their organizations' sponsored functions that benefit society.

CONCLUSION

Telecommuting provides many advantages and disadvantages that need to be carefully considered before an organization incorporates a telecommuting approach. Although there are many advantages to telecommuting that affect individual workers, work groups, the organization, and society, increased job satisfaction is perhaps the greatest advantage to telecommuting. The job satisfaction literature includes substantial evidence that improved job satisfaction results in improved performance among workers. Therefore, organizations should make a concerted effort to develop telecommuting programs and procedures that ultimately lead to increased job satisfaction.

While telecommuting is not a new option available for organizations, it is an option that provides many benefits, as well as potential pitfalls if not properly managed. Many of these benefits and pitfalls to telecommuting were discussed above. From all of the benefits discussed here, perhaps the greatest reason to embrace telecommuting should be to counter the negative effects of rising fuel costs and road congestion. Organizations that provide telecommuting options for workers will most likely contribute to the well being of their workers and ultimately the environment by reducing commuting costs, congestion, and pollution.

Most of all, many advances in technology are making telecommuting more attractive and affordable for organizations. As high speed Internet access becomes available in rural areas, telecommuting becomes possible for more people. Despite these advances, some individuals and organizations still oppose telecommuting, because of telecommuting's perceived and proven negative consequences. More research is needed to determine if telecommuting's negative effects are as serious as some think. Do the benefits truly outweigh the consequences of telecommuting? What are the long term effects of telecommuting on individuals, work groups, organizations, and society? To answer these questions, more extensive studies of telecommuting are needed. These studies should span many organizations and last long enough to measure differences in individual and organizational effectiveness and to determine what the long term effects of telecommuting are.

REFERENCES

[1] Butler, E. S., Aasheim, C., & Williams, S. (2007). Does telecommuting improve productivity? *Communications of the ACM, 50(4),* 101-103.
[2] Capella University (2005). *OM8004: Managing and organizing people* (An Edited Work). Boston: Prentice Hall Custom Publishing.
[3] Crandall, W. & Gao, L. (2005). An update on telecommuting: Review and prospects for emerging issues. *SAM Advanced Management Journal, 70(3),* 30-37.
[4] Dimitrova, D. (2003). Controlling teleworkers: Supervision and flexibility revisited. *New Technology, Work & Employment, 18(3),* 181-198.
[5] Elsbach, K. D. & Bechky, B. A. (2007). It's more than a desk: Working smarter through leveraged office design. *California Management Review, 49(2),* 80-101.
[6] Gibson, J., Blackwell, C., Dominicis, P., & Demerath, N. (2002). Telecommuting in the 21st century: Benefits, issues, and a leadership model which will work. *Journal of Leadership and Organizational Studies, 8(4),* 75-86.
[7] Harpaz, I. (2002). Advantages and disadvantages of telecommuting for the individual, organization, and society. *Work Study, 51(2/3),* 74-80.
[8] Hunton, L. E. (2005). Behavioral self-regulation of telework locations: Interrupting interruptions! *Journal of Information Systems, 19(2),* 111-140.
[9] Mills, J., Wong-Ellison, C., Werner, W., & Clay, J. (2001). Employer liability for telecommuting employees. *Cornell Hotel and Restaurant Quarterly, 42(5)*, 48-59.
[10] Nunes, F. (2005). Most relevant enablers and constraints influencing the spread of telework in Portugal. *New Technology, Work & Employment, 20(2),* 133-149.
[11] Smith, E. K. & Cristy, M. J. (2006). New York's "Convenience-of-the-Employer" rule: From defending the fisc to punishing telecommuters. *Journal of State Taxation, 24(3),* 17-49.

[12] Thatcher, S. M. & Zhu, X. (2006). Changing identities in a changing workplace: Identification, identity enactment, self-verification, and telecommuting. *Academy of Management Review, 31(4),* 1076-1088.

[13] Topi, H. (2004). Supporting telework: Obstacles and solutions. *Information Systems Management, 21(3),* 79-85.

[14] Watson-Manheim, M. B. & Bélanger, R. (2007). Communication media repertoires: Dealing with the multiplicity of media choices. *MIS Quarterly, 31(2),* 267-293.

AN ANALYSIS OF GENDER DIFFERENCES IN PERCEPTIONS OF LEADER MOTIVATING LANGUAGE USE

William Sharbrough
School of Business Administration
The Citadel
Charleston, SC 29409
(843) 953 5164
Email: William.Sharbrough@citadel.edu
Susan A. Simmons
School of Business Administration
The Citadel
Charleston, SC 29409
(843) 953 5165
Email: SimmonsS@Citadel.edu

ABSTRACT

This paper presents an investigation of motivating language theory applied to supervisors and subordinates based on subordinate ratings of their supervisors' use of motivating language. Differences in male and female worker perceptions of motivating language are explored. Questionnaire data collected from a sample of 136 employees in a southeast regional division of a Fortune 500 company forms the basis for the study. The study results assist supervisors in perfecting communication with both male and female subordinates.

INTRODUCTION

The role and importance of language in leader-worker relationships has been analyzed and documented. This research narrows the focus of leader-worker communication by addressing how male and female workers perceive messages from their supervisors. Leader communication has been shown to play a significant role in worker job satisfaction and performance. [21] [16] [23] Further research has documented the impact of leader communication on communication satisfaction [18] [23], worker innovation [12] [13], and worker commitment. [20] [12]

While prior research has shown how leader language affects subordinate job satisfaction and performance, scant research has addressed gender differences in the ways subordinates interpret leader language.

LITERATURE ON GENDER DIFFERENCES IN SUPERVISOR-WORKER COMMUNICATION

Several authors have addressed gender role behaviors during supervision. (e.g., [1] [2] [26] [22]) However, few empirical studies have addressed the role of gender in leader-worker communication.

A study by Nelson and Holloway [19] found that supervisors of both genders encouraged male trainees to send high-power messages more frequently than they encouraged female trainees to do so. They also found female trainees were less likely than male trainees to make a high-power statement following a supervisor's low-power statement. [19]

A study by Sells, et al [22] looked at the effects of supervisor and trainee gender on verbal interactions of participants and on their perceptions of trainee skill levels. This research extended research by Aries [3] [4] Carli [7], and Tannen [25] who found that women's conversations were more likely to address feelings and to emphasize relational concerns. Conversations of men were more likely to focus on external events, to have a competitive tone, and to be task oriented.

Using the platform of prior research on trainee and supervisor gender and its role in evaluation of trainees, Sells et al [22] found that the verbal behavior of supervisors in male-male pairings was more task oriented (and less relationship oriented) than that of female supervisors who were paired with male trainees. They also found that female supervisors paired with male trainees were more relationship oriented (and less assignment oriented) than supervisors in the male-male groups.

Another study addressed the connection between supervisors' performance ratings and subordinates' satisfaction with the manager. The study by Byron [6] examined the role of managers' ability to perceive non-verbal emotion at work. The research asked: Do managers who more accurately perceive others' emotions from non-verbal expressions receive higher satisfaction ratings from their subordinates and higher performance ratings from their supervisor? How might managers use emotional information to increase the satisfaction of their subordinates? Is accuracy in understanding non-verbal emotion more strongly related to these ratings for female managers than for male managers?

Byron's [6] research found that managers' accuracy in perceiving non-verbal emotional expressions and their supervisors' and subordinates' ratings depend on the manager's gender. Female managers, as compared to male managers, who more accurately perceived non-verbal emotional expressions, received higher ratings of performance from their supervisors and higher ratings of satisfaction from their subordinates. However, low accuracy in female managers was associated with lower ratings from both supervisors and subordinates as compared to those received by male managers. Another finding of gender differences in leader-worker communication came from interpretation of the role of being supportive and persuasive. Female managers who were seen as supportive received higher ratings from their subordinates. Male managers who were seen as persuasive received higher ratings from their subordinates. It appears that the ability of female managers to be sensitive to others' emotions and to provide emotional

support to workers is used as the basis for ratings of female managers' job performance. This does not hold true for male managers.

The findings in Byron's [6] study are consistent with research on stereotypes of male and female managers. Male manager stereotypes and men in general, are seen as analytical, logical, and as being a "change agent." Female manager stereotypes and women in general, are seen as being aware of other's feelings, understanding, supportive. (e.g., earlier research by Cejka and Eagly, [8]; Martell, et al, [9])

BACKGROUND AND PURPOSE OF THE STUDY

Prior research documents the interaction of the leader-subordinate communication process. A sophisticated model of leader-subordinate communication comes from Mayfield, Mayfield, and Kopf's [16] development of a motivating language scale. This scale is based on Sullivan's [24] work on motivating language theory (MLT). MLT predicts that communication is an important motivational tool that has positive, significant impacts on employee performance and job satisfaction. Motivating language theory posits that the measurable outcomes shown by employees result from managers' use of three fundamental speech acts when communicating with subordinates.[16] Sullivan [24] classified the three basic speech acts as meaning making, direction giving, and empathetic.

- Meaning –making communication, which explains the rules, structures, and values of the culture of an organization;
- Direction-giving, or uncertainty-reducing communication, which clarifies instructions, clears up confusion, and so forth; and
- Empathetic communication, which expresses the emotions of a leader through shared feelings, praise, criticisms, and so forth.

MLT builds on several assumptions. MLT only explains subordinate responses to leader-initiated communication and not the opposite. Another assumption is that language is assumed to cover most verbal expressions that can occur in leader to worker talk. Next, the effect of motivating language on worker outcomes will be moderated by leader behavior. Research suggests that leader behavior tends to dominate when actions and language are conflicting. The last assumption is that leaders are most effective through the "powerful use" of all types of ML. [16]

Mayfield, Mayfield, and Kopf [16] [17] developed a Motivating Language scale that focused on the three communication acts of meaning making, decision making and empathetic language. Their study was based on questionnaire data collected from supervisors and their subordinates in a nursing department of a large public hospital. Subordinates were asked to fill out a questionnaire rating their supervisors' skill in using motivating language (the ML scale). A sample of 151 usable questionnaires formed the basis for the analysis. The questionnaire data was subjected to factor analysis, and three factors were extracted. The three factors contained significant, stable factor loadings. The questionnaire items cleanly loaded on the expected factors of meaning making, decision making, and empathetic language. The researchers tested scale reliability and found a high degree of stability for ML. Each of the subscales had a significant degree of reliability. As a follow-up study on MLT, Sharbrough, et al [23] developed similar ML

scales by using data collected from employees of a southeast regional division of a Fortune 500 company.

As seen in the prior research on subordinate-leader communication, limited research is found on the role of gender in MLT. The purpose of this research is to bridge that gap by using the MLT scales developed by Mayfield, Mayfield, and Kopf [16] [17] to investigate the role of gender in leader-subordinate communication.

The research reported in this study built on the ML scale research by administering the survey questions developed by Mayfield, et al [16] to a group of employees of the southeast regional division of a Fortune 500 company.   Using the company's Intranet, a link to the interactive survey for this project was sent through the organization's email system to all employees. This resulted in 136 usable questionnaires and formed the basis for this study. The survey was voluntary, and there was no tracking of whether an employee had completed the survey. The sample demographics, summarized in Table 1, include 82% of the respondents were men and 18 % were women. Individuals in supervisory roles made up 31 % of the respondents. Individuals with high school, trade school, or associate's degrees made up 57% of the sample, 34% had bachelor's degrees, and 9% had master's degrees or higher. Thirty percent of the participants were 35 years of age or younger and 30 % were older than 45 years. A majority of the sample, 65%, had 10 years or less of service with the company, while only 6% had more than 25 years of service. Technical or engineering positions made up 59% of the sample, 15% of the positions were direct supervisory positions, 16% were sales-related positions, and 10% were administrative positions. The survey demographic data are summarized in Table 1.

METHODS

Two quantitative techniques were applied to the dataset. First, a difference between means tests was applied to questionnaire ratings of both male and female workers. Next, by using the questionnaire ratings, factor analysis was applied to the

TABLE 1

Survey Demographics

Category	Number	Percent
Male	112	82%
Female	24	18%
Age		
16-25	4	2.9%
26-35	36	26.5%
36-45	54	39.7%
46-55	32	23.5%
56-65	8	5.9%
No Response	2	1.5%
Education		
High School	19	14.0%

Trade School	28	20.6%
Associate Degree	30	22.1%
Bachelor's Degree	46	33.8%
Master's Degree or higher	12	8.9%
No Response	1	0.7%
Length of Service		
0-5	60	44.1%
6-10	28	20.6%
11-15	16	11.8%

combined dataset (n = 136), the dataset from male respondents (n = 112) and the dataset from female respondents (n = 24). Factor analysis loadings were used to reduce the questionnaire statements into factors that, it is hypothesized, will reflect the three ML scales.

The model specifications, namely that motivating language consists of three components, meaning-making language, direction-giving language, and empathetic language, are based on the ML scales conceptualized by Sullivan [24] and further developed by Mayfield et al [16] [17].

RESULTS

Comparison of Mean Ratings Given by Male and Female Employees

The ML Scale derives from a questionnaire containing 24 questions developed by Mayfield, Mayfield, and Kopf [16] [17]. Employees were directed as follows: "The examples below show different ways that your boss might talk to you. Please choose the answer that best matches your perceptions. Be sure to mark only one answer for each question.

Very Little (VL)   Little (L)   Some (S)   A Lot (A)   A Whole Lot (WL)"

These ratings were converted to a five point Likert scale with 5 assigned to A Whole Lot and 1 assigned to Very Little. A comparison of the mean rankings assigned by the male respondents (n = 112) and the female respondents (n = 24) and a difference between the means test provide noteworthy results. Table 2 displays the mean rankings of the male respondents and female respondents along with the p-value for the difference between means tests. We will comment on questions with p-values that are below the 0.1 level of significance.

The question: "My supervisor tells me stories about key events in the organization's past," received an average response of 2.25 by female employees and 2.74 by the male employees. This results in a statistically significant difference in mean ratings by these groups. One interpretation, based on the rating scale of 1 being strongly disagree to 5 being strongly agree, is that supervisors tend to relate past organization history to male employees more readily than they relate this type of information to female employees.

TABLE 2

Difference between Means Test for Male and Female Employee Rankings

Variable	Language Subscale	GENDER FEMALE	MALE	p-value
USFL_EXP		3.67	3.40	.262
HLP_DIRS		3.38	3.23	.525
EZ_INSTR		3.54	3.31	.284
WK_ADVIC		3.33	3.17	.483
GD_DEFNS	Direction-Giving Language	3.04	2.91	.618
CLR_INST		3.46	3.23	.316
EVAL_INF		3.79	3.46	.132
CHNG_INF		3.33	3.17	.486
PAST_INF		2.96	2.94	.928
SHAR_NWS		3.42	3.40	.946
GVSPRAIS		3.46	3.56	.664
ENCOURGE		3.46	3.49	.887
CONCERN	Empathetic Language	3.29	3.35	.797
PROF_DEV		3.50	3.35	.550
WELL_BEI		2.96	3.05	.700
SHW_TRST		4.08	4.21	.531
EVNT_STR		2.25	2.74	**.071***
USFL_INF		2.48	2.95	**.044****
ADMR_STR		2.22	2.43	.433
WRK_STRS	Meaning-Making Language	2.30	2.49	.460
ORGSCADV		1.52	1.76	.297
FITN_ADV		1.74	1.97	.323
RWRD_STR		2.04	2.16	.631
LEFT_STR		1.54	2.09	**.012****

*Significant at least at the 0.1 level of significance
*Significant at least at the 0.05 level of significance
Scale: 1 = Very Little, 2 = Little, 3 = Some, 4 = A Lot, 5 = A Whole Lot

A second question with statistically significant differences in responses by the men and women is: "My supervisor gives me useful information that I couldn't get through official channels." Women in the sample assigned an average rating of 2.48 while men in the sample rated this question at 2.95. Supervisors are more prone to relay unofficial company information to their male subordinates than to their female subordinates.

The last question of note is, "My supervisor tells me stories about people who have left this organization." This question had a score of 1.54 from the women in the survey and 2.09 ranking from the men. Neither men nor women had much experience with stories about people who had left the organization; both scores are below "3" and fall in the "disagree" portion of the scale. Men, however, were more likely to hear these stories as compared to the women in the survey.

The impact this type of supervisor communication selectivity has on the career paths of these employees was beyond the scope of this research. The perception from the survey respondents is that when compared to male employees, female employees tend to evaluate their supervisors as less likely to tell them information on the organization's past, unofficial but useful information that could affect the employee's work, and stories about people who had left the organization.

Factor Analysis of the Combined Dataset

We wanted to determine whether the questionnaire data would reduce to the three ML scales developed and tested by Mayfield and Mayfield [16] [17]. Through factor analysis, a statistical technique used to reduce a group of variables into a smaller group of factors, three ML scale factors emerged. First, we analyzed the factor loadings of the combined dataset (n = 136). As seen in Table 3, factor analysis indicated that the items of the ML scale loaded similarly to those defined by Mayfield et al. [16] [17] as well as by Sharbrough et al. [23]. Those authors reported three well-defined, stable factors: direction-giving language, empathetic language, and meaning-making language. The finding further confirmed that the respondents were interpreting the ML questionnaire in a way comparable with respondents in previous ML research. In Table 3 each question's largest factor loading is underlined. The questions had factor loadings that matched the three ML subscales defined by Mayfield and Mayfield [16] [17]. An exception was the loading pattern on "SHAR_NWS". Mayfield and Mayfield [16] [17] classified this as "direction-giving" language. The loading pattern for the combined dataset classified this as "empathic" language and "meaning making" language.

TABLE 3

Factor Loadings for Motivating Language Statements
Combined Dataset n = 136

			ROTATED FACTOR ANALYSIS RESULTS		
			COMBINED n = 136		
			DIRECTION GIVING	EMPATHIC	MEANING MAKING
DIRECTION GIVING	1	USFL_EXP	**0.828**	0.269	0.206
	2	HLP_DIRS	**0.831**	0.289	0.179
	3	EZ_INSTR	**0.787**	0.153	0.261
	4	WK+ADVIC	**0.697**	0.384	0.324
	5	GD_DEFNS	**0.444**	0.341	0.415
	6	CLR_INST	**0.796**	0.222	0.254
	7	EVAL_INFO	**0.428**	0.309	0.418
	8	CHG_INFO	**0.531**	**0.541**	0.227
	9	PAST_INFO	**0.648**	0.271	0.398
	10	SHAR_NWS	0.096	**0.443**	**0.487**
EMPATHIC	11	GVS_PRAIS	0.182	**0.844**	0.156
	12	ENCOURGE	0.310	**0.864**	0.141
	13	encourge	0.371	**0.805**	0.147
	14	PROF_DEV	0.528	**0.599**	0.255
	15	WELL_BEI	0.496	**0.621**	0.268
	16	SHW_TRST	**0.486**	**0.442**	0.047
MEANING MAKING	17	EVNT_STR	0.263	0.110	**0.792**
	18	USFL_INF	0.441	0.176	**0.538**
	19	ADMR_STR	0.167	0.222	**0.881**
	20	WRK_STRS	0.249	0.214	**0.829**

21	ORGSCADV	0.138		0.168	**0.708**
22	FITN_ADV	0.232		0.263	**0.724**
23	RWRD_STR	0.223		0.184	**0.853**
24	LEFT_STR	0.168		0.135	**0.762**
		0-299		not significant	
		300-399		significant	
		400-499		highly significant	
		500+		extremely significant	
Highest factor loading for each statement is underlined					

Factor Analysis of Male Dataset

The factor analysis results for the group of male employees, presented in Table 4 below, shows factor loadings on three clearly defined factors that parallel the factor structure discovered for the combined dataset.

Some differences may warrant attention. We do see that, for the male respondents, direction-giving statements, Question 5.) GD_DEFNS: and Question 7) EVAL_INFO, and Question 8) CHG_INFO have significant factor loading on two factors: direction-giving and meaning-making language or direction-giving and empathetic communication. While factor loadings for the male respondents match the ML scales developed by Mayfield et al [16], we also note that men interpret some ML statements as both direction giving and meaning making or empathetic. In the case of these questions, gender plays a role in interpretation.

Another statement with dual interpretation is question 16 SHW_TRST. Mayfield et al [16] classified this as an empathic communication. Our factor loadings indicated the male subordinates give a dual interpretation of direction giving and empathic communication.

TABLE 4

Factor Loadings for Motivating Language Statements
Male Respondents n = 112

			ROTATED FACTOR ANALYSIS RESULTS		
			MALE n = 112		
			DIRECTION GIVING	EMPATHIC	MEANING MAKING
DIRECTION GIVING	1	USFL_EXP	**0.763**	0.419	0.213
	2	HLP_DIRS	**0.761**	0.402	0.205
	3	EZ_INSTR	**0.805**	0.217	0.284
	4	WK+ADVIC	**0.632**	0.467	0.344
	5	GD_DEFNS	**0.436**	0.241	**0.485**
	6	CLR_INST	**0.822**	0.177	0.299
	7	EVAL_INFO	**0.417**	0.380	**0.480**
	8	CHG_INFO	**0.473**	**0.620**	0.252
	9	PAST_INFO	**0.667**	0.304	0.388
	10	SHAR_NWS	0.092	0.322	**0.556**
EMPATHIC	11	GVS_PRAIS	0.130	**0.815**	0.167
	12	ENCOURGE	0.283	**0.867**	0.145
	13	encourge	0.329	**0.819**	0.157
	14	PROF_DEV	0.410	**0.670**	0.261
	15	WELL_BEI	0.413	**0.644**	0.327
	16	SHW_TRST	**0.441**	0.435	0.016
MEANING MAKING	17	EVNT_STR	0.293	0.074	**0.733**
	18	USFL_INF	0.397	0.249	**0.522**
	19	ADMR_STR	0.152	0.183	**0.895**
	20	WRK_STRS	0.261	0.204	**0.820**
	21	ORGSCADV	0.102	0.202	**0.734**
	22	FITN_ADV	0.171	0.300	**0.739**
	23	RWRD_STR	0.234	0.173	**0.844**
	24	LEFT_STR	0.243	0.183	**0.719**
		0-299		not significant	
		300-399		significant	
		400-499		highly significant	
		500+		extremely significant	
Highest factor loading for each statement is underlined					

Factor Analysis of Female Respondents Dataset

Factor analysis applied to the responses from the 24 female respondents resulted in three well-defined factors. The loading pattern, shown in Table 5, matches that developed by Mayfield et al [16] as well as that shown in the combined dataset (see Table 3).

As seen by the significant factor loadings on two ML scales, Question 18, a "meaning making" communication, was interpreted as both "meaning making" and "direction giving" language.

Further variances in interpretation of supervisors' communication come from two questions Mayfield, et al [16] classified as direction giving. Female employees rated their supervisors' communication of Question 5 "My supervisor gives me good definitions on what I must do in order to receive rewards." and Question 8, "change information" as both "direction-giving" and "empathetic" language. An additional reinforcement of the stereotypical tendency of female communication to be empathetic comes from a question that Mayfield; et al [16] intended to represent "direction-giving language." Question 10 SHAR_NWS states "My supervisor shares news with me about organizational achievements and organizational financial status." Factor loading is highly significant on the "empathetic language" factor and not significant on the "direction-giving language" factor. The authors conclude that female employees construed this type of communication to be empathetic rather than direction giving. Empathetic language encompasses relationships and the emotions of a leader expressed through shared feelings, praise, and criticism. [16]

Looking at the "meaning-making" question, Q_18) "My supervisor gives me useful information that I couldn't get through official channels," female survey respondents interpreted this to be both "meaning-making" communication and "direction-giving" communication. Since the factor loading was highly significant on the "meaning-making" scale, which confirms the original Mayfield et al. [16] research, the authors conclude that the question is part of the "meaning making" factor. The dual interpretation of this useful information message points to potential gender differences.

In the empathetic language question set, female workers interpreted two questions, Q14 PROF_DEV and Q16 SHW_TRST, as both "empathetic communication" and "direction-giving communication." The significant loadings on the "empathetic language" factor match that developed by Mayfield et al [16]. Gender plays a role in ML as evidenced by female workers assigning these statements a twofold interpretation.

Our research confirms prior ML scale research. Each set of questions had significant factor loading on the factor subscales hypothesized by Mayfield et al [16] [17]. However, when the responses from the male workers and female workers were analyzed separately, several of the questions were perceived as belonging to two communication scales. Female workers interpreted some empathetic language statements as both empathetic language as well as direction-giving language. In addition, one of the "meaning-making" statements was understood as both "meaning-making" and "direction-giving" language.

For male respondents, several "direction-giving language" statements received significant classification as both "direction giving" and "meaning making" or "empathetic" language. Thus, gender plays a role in the interpretation of some ML statements.

What generalizations follow from the separate analysis of male and female worker responses to MLT questions? How do these results compare to or support prior research on gender differences in supervisor-subordinate communication? The next section addresses these questions.

TABLE 5

Factor Loadings for Motivating Language Statements
Female Respondents n = 24

			ROTATED FACTOR ANALYSIS RESULTS		
			FEMALE n = 24		
			DIRECTION GIVING	EMPATHIC	MEANING MAKING
DIRECTION GIVING	1	USFL_EXP	**0.834**	0.123	0.257
	2	HLP_DIRS	**0.874**	0.254	0.101
	3	EZ_INSTR	**0.702**	0.110	0.229
	4	WK+ADVIC	**0.746**	0.341	0.302
	5	GD_DEFNS	**0.443**	**0.675**	0.189
	6	CLR_INST	**0.714**	0.544	0.096
	7	EVAL_INFO	0.276	0.189	**0.320**
	8	CHG_INFO	**0.471**	**0.540**	0.179
	9	PAST_INFO	**0.532**	0.320	0.423
	10	SHAR_NWS	0.071	**0.737**	0.241
EMPATHIC	11	GVS_PRAIS	0.191	**0.828**	0.238
	12	ENCOURGE	0.203	**0.847**	0.226
	13	encourge	0.249	**0.902**	0.140
	14	PROF_DEV	**0.630**	0.545	0.373
	15	WELL_BEI	0.542	**0.721**	0.068
	16	SHW_TRST	**0.648**	0.464	0.155
MEANING MAKING	17	EVNT_STR	0.272	0.195	**0.855**
	18	USFL_INF	**0.636**	0.025	**0.562**
	19	ADMR_STR	0.242	0.205	**0.888**
	20	WRK_STRS	0.209	0.177	**0.905**
	21	ORGSCADV	0.060	0.268	**0.501**
	22	FITN_ADV	0.210	0.361	**0.635**
	23	RWRD_STR	0.145	0.207	**0.915**
	24	LEFT_STR	0.137	0.064	**0.628**
		0-299		not significant	
		300-399		significant	300-399
		400-499		Highly significant	
		500+		extremely significant	

DISCUSSION

How do these research findings compare to prior research on gender differences in supervisor-worker communication? Sells et al [22] found that the language of male supervisors who were paired with male trainees was more task oriented (and less relationship oriented) than the language of female supervisors matched with male trainees. Our research outcome that the ML subscale of "direction-giving" language had a clear and significant loading pattern for male subordinates coincides with the Sells et al [22] discovery.

Further, our research on gender and direction-giving language interaction found that male workers had a clear consensus on direction-giving and meaning-making communication. The factor loadings on both the direction-giving and meaning-making language subscales were significant. This backs up earlier research that found conversations of men more likely to be task oriented. These earlier research efforts found that male supervisor-trainee communication focused on completion of tasks. (Aries, [3] [4]; Carli, [7]; Tannen, [25])

We see, in Questions 5), 7), and 8) the tendency for male employees to interpret some "direction-giving" questions as both "direction giving" and "meaning making" or "empathetic" communication. Question 5 asks, GD_DFNS "My supervisor gives me good definitions on what I must do in order to receive rewards." Question 7 EVAL_INFO asks, "My supervisor offers me specific information on how I am evaluated." In Question 8 respondents were asked, "My supervisor provides me with helpful information about forthcoming changes affecting my work."

Our research on gender-empathetic language interaction lends further reinforcement to studies of the communication characteristics of women. The works of Aries [3] [4], Carli [7], and Tannen [25] found that women's conversations were more likely to address feelings and to emphasize relational concerns. These research efforts found that female supervisor to trainee communication tended to reinforce the quality of their relationship.

Our research builds on prior research on communication patterns of women by investigating the role of gender in ML theory. Table 5 factor loadings for the female survey respondents show significant factor loadings on the "empathetic language" subscale. A variance is noted when two of the empathetic language statements received significant loadings on the "direction-giving language" subscale. Q14 PROF_DEV states, "My supervisor expresses his/her support for my professional development." Q16 SHW_TRST states, "My supervisor shows trust in me." This warrants further study. Do female workers perceive some shared feeling statements to be direction-giving communication?

Further support of the importance of empathetic communication for female workers comes from the dual interpretation of two "direction-giving" statements. Question 5 and Question 8, both "direction giving" statements, were also rated as "empathetic" communication. For these types of statements, female employees understood their supervisors' efforts to give directions to be efforts to share their feelings.

STUDY LIMITATIONS AND OPPORTUNITIES FOR FURTHER RESEARCH

While the findings of this research effort are useful in better understanding the differences that men and women employees perceive in leader motivating language, there are limitations to the study. Obviously, the sample size of only 24 women as opposed to 112 men should make generalizations tenuous. While the difference between means tests compensates for this size differential, caution should still be exercised. In addition, the sample for this study is composed of employees of a Fortune 500 industrial supply and maintenance company, and its employees may not be representative of other industries.

An additional limitation involves the focus on subordinate's perceptions of spoken messages. Listening by the supervisor, the receiving side of the communication process, is not considered in MLT. It is highly likely that the ability and intensity of a leader's listening to employees may also have an impact on their level of motivation. Finally, this effort did not explore the gender of the supervisor as a variable. Previous research (reported above) indicates that leader and subordinate gender has a significant impact on both the way that leaders communicate with subordinates and how those messages are perceived. This effort only addressed a part of the relationship between those variables.

Additional research is needed to further validate both the instrument used as well as the results of the study. This is especially critical because of the limited sample of women employees. Further research could also clarify the dual interpretation of certain types of messages, particularly by women subordinates. Additional research on these issues could provide useful information about how supervisors could more effectively motivate both male and female subordinates. In addition, gathering information about the gender of leader-subordinate dyads could add additional insight to the relationship between ML and leadership in mixed gender dyads.

A possibly enlightening use of the MLT instrument would be to gather information on ML and leadership style simultaneously to provide information about how language use may vary according to leadership style.

REFERENCES

[1] Abramowitz, S. I., & Abramowitz, C. V. (1976). Sex role dynamics in psychotherapy supervision. *American Journal of Psychotherapy*, *30*, 583–592.

[2] Alonso, A., & Rutan, J. S. (1978). Cross-sex supervision for cross-sex therapy. *American Journal of Psychiatry*, *135*, 928–933.

[3] Aries, E. (1976). Interaction patterns and themes of male, female, and mixed groups. *Small Group Behavior*, *7*, 1–18.

[4] Aries, E. (1982). Verbal and nonverbal behavior in single-sex and mixed sex groups: Are traditional sex roles changing? *Psychological Reports*, *51*, 134–137.

[5] Burleson, B. R. (2003). The experience and effects of emotional support: What the study of cultural and gender differences can tell us about close relationships, emotion, and interpersonal communication. *Personal Relationships, 10*, 1–23.

[6] Byron, Kristin. (2007). Male and female managers' ability to 'read' emotions: Relationships with supervisor's performance ratings and subordinates' satisfaction ratings. *Journal of Occupational and Organizational Psychology,* 80, 713–733

[7] Carli, L. L. (1989). Gender differences in interaction style and influence. *Journal of Personality and Social Psychology*, *56*, 565–576.

[8] Cejka, M. A., & Eagly, A. H. (1999). Gender-stereotypic images of occupations correspond to the sex segregation of employment. *Personality and Social Psychology Bulletin, 25*, 413–423.

[9] Martell, R., Parker, C., Emrich, C., & Crawford, M. (1998). Sex stereotyping in the executive suite: Much ado about something. *Journal of Business and Psychology, 13*, 127–138.

[10] Mayfield, M. (2000). Leader loyalty and group performance. Presented at the *Leadership in a Global Community* 2000 Conference.

[11] Mayfield, J., & Mayfield, M. (1998). Increasing worker outcomes by improving leader follower relations. *Journal of Leadership Studies*, *5*, 72-81.

[12] Mayfield, J., & Mayfield, M. (2002). Leader communication strategies: Critical paths to improving employee commitment. *American Business Review*, *20*, 89-94.

[13] Mayfield, J., & Mayfield, M. (2004). The effects of leader communication on worker innovation. *American Business Review*, *22*, 46-51.

[14] Mayfield, J.; Mayfield, M. (2006) The Benefits of leader communication on part-time worker outcomes: a comparison between part-time and full-time employees using motivating language. *Journal of Business Strategies, 23* (2) 131 – 153.

[15] Mayfield, J., Mayfield, M. (2007) The effects of leader communication on a worker's intent to stay: An investigation using structural equation modeling. *Human Performance, 20* (2), 85-102.

[16] Mayfield, J., Mayfield, M., & Kopf, J. (1995). Motivating language: Exploring theory with scale development. *Journal of Business Communication*, *32*, 329-344.

[17] Mayfield, J., Mayfield, M., & Kopf, J. (1998). The effects of leader motivating language on subordinate performance and satisfaction. *Human Resource Management*, *37*, 235-248.

[18] Monge, P.R., Bachman, S.G., Dillard, J.P., & Eisenberg, E. M. (1982). Communicator competence in the workplace: model testing and scale development. In M. Burgoon (ed.), *Communication Yearbook 5* (pp. 505-528). New Brunswick, JJ: Transaction Books.

[19] Nelson, M. L., & Holloway, E. L. (1990). The relation of gender to power and involvement in supervision. *Journal of Counseling Psychology*, *18*, 473–481.

[20] Putti, J., A. & Phua, J. (1990). Communication relationship satisfaction and organizational commitment. *Group & Organization Management, 15,* 1, 44-52.

[21] Robbins, S. (2001). *Organizational behavior: Concepts, controversies, applications* 9th ed. U.S.A.: Prentice Hall.

[22] Sells, J., Goodyear, R., Lichtenberg, J., Polkinghorne, D. (1997). Relationship of supervisor and trainee gender to in-session verbal behavior and ratings of trainee skills. *Journal of Counseling Psychology*, *44*, (4), 406-412.

[23] Sharbrough, W., Simmons, S., & Cantrill, D. Motivating Language in Industry: Its Impact on Job Satisfaction and Perceived Supervisor Effectiveness. *Journal of Business Communication,* 43, (4). 322-343.

[24] Sullivan, J. (1988). Three roles of language in motivation theory. *Academy of Management Review, 13,* 104-115.

[25] Tannen, D. (1994). *Gender and discourse*. New York: Oxford University Press.

[26] Twohey, D., & Volker, J. (1993). Listening for the voices of care and justice in counselor supervision. *Counselor Education and Supervision*, *32*, 189–197.

The Allurement of Administration and Management

Amber C. Stegelin and Forrest E. Stegelin
Doctoral Graduate Student, University of South Carolina and
Associate Professor, University of Georgia, respectively

For decades the arguments have been waged in schools of business and education as to whether leaders are made, and not born, or vice-versa. Regardless of one's personal philosophy, most administration or management junkies agree that business entrepreneurship is learned, and best learned via an internally designed educational program. In today's economy, where both the business world and the academic realm are besieged with budget woes and an uncertain economic future, questions about management's role in leading either a company or an academic institution come to bear. Here is the reality, and the rub – there is no one administrative model that adequately serves all business managers and academic institution administrators, even though each sector shares a common origin with similar evolution paths, and adheres to a compilation of basic managerial principles. In the current debate surrounding the need for more mission-oriented work aimed at practical problem solving for clientele, there are many similarities, yet several differences in the application of principles of management to a business and to an academic institution. The purpose of this paper is to share a few of the managerial methodologies and models applicable to academia, entrepreneurial businesses, and both.

Business-Focused Managerial Models and Methodologies

Management by Objective

For over half a century, Management by Objective (MBO) has been synonymous with strategic planning management processes (Duft). MBO was first outlined by George S. Odiorne in 1965, in a book by the same name, *Management by Objective*. Peter Drucker added to the topic when he indicated managers should avoid the activity trap of getting so involved in the business's day-to-day activities that they forget their main purpose or objective.

MBO relies on the defining of objectives for each employee and then comparing and directing their performance against the objectives which have been set. It aims to increase the business's organizational performance by aligning goals and objectives throughout the organization, relying on employees to get strong input to identifying their own objectives, timelines for completion, performance feedback measures, and recourse evaluations.

Management-by-objective principles are:
- cascading the organizational goals and objectives;
- specific objectives for each member;
- participative decision making;
- explicit time period; and
- performance evaluation and feedback.

It was MBO that introduced the SMART method for checking the validity of objectives.

Total Quality Management

Total Quality Management (TQM) is a holistic management approach that emphasizes not only process manufacturing and product quality but quality employee relationships, employee management networking, management styles, pride and responsibility, and customer service, among other things (Drucker). The 14 points of management of Dr. W. Edward Deming represent for many people the essence of TQM.

Deming's fourteen points of management include:
- create constancy of purpose for improvement of product and service;
- adopt the new philosophy;
- cease dependence on mass inspections;
- end the practice of warding business on the basis of price tags alone;
- improve constantly and forever the system of production and service;
- institute training;
- adopt and institute leadership;
- drive out fear;
- break down barriers between staff areas;
- eliminate slogans, exhortations, and targets for the workforce;
- eliminate numerical quotas;
- remove barriers that rob people of pride of workmanship;
- encourage education and self-improvement for everyone; and
- take action to accomplish the transformation.

Eight Attributes of Management Excellence

In Tom Peters and Bob Waterman's classic management text, *In Search of Excellence*, the eight attributes of management excellence were described. The eight attributes are:
- a bias for action;
- close to the customer;
- autonomy and entrepreneurship;
- productivity through people;
- hands-on, value-driven;
- stick to the knitting;
- simple form, lean staff; and
- simultaneous loose-tight properties.

The last attribute on the list is a summary of the other seven. "Simultaneous loose-tight properties" is in essence the coexistence of firm central direction and maximum individual autonomy. According to Peters and Waterman, "Organizations that live by the loose-tight principle are on the one hand rigidly controlled, yet at the same time, allow (indeed, insist on) autonomy, entrepreneurship, and innovation from the rank and file."

Balanced Scorecard

The integration of four perspectives (financial, customer, business process, and learning and growth) has made the Balanced Scorecard Method of Kaplan and Norton a very successful

methodology, as well as a strategic approach and performance management system for translating a company's vision into implementation (Duft). Within each of these four perspectives, a basic question is posed with an imbedded score sheet for evaluating objectives, measures, targets and initiatives.

In the financial perspective evaluation, the question posed is "To succeed financially, how should we appear to our stakeholders?"   This question infers risk assessment and cost-benefit metrics are also considered with traditional financial data. Similarly, in the customer perspective score card, the question raised is "To achieve our vision, how should we appear to our customers?" The customer perspective emphasizes customer satisfaction, retention, conviction, and loyalty indicators.

The business process perspective refers to internal business processes, and asks "To satisfy our stakeholders, including our customers, what business processes must we excel at?" This perspective allows managers to know how well their business is running and whether its products and services conform to customer requirements.

The last perspective, learning and growth, asks "To achieve our vision, how will we sustain our ability to change and improve?" The learning and growth perspective includes training and cultural attitudes, mentors and tutors, ease of communication, and technological tools.
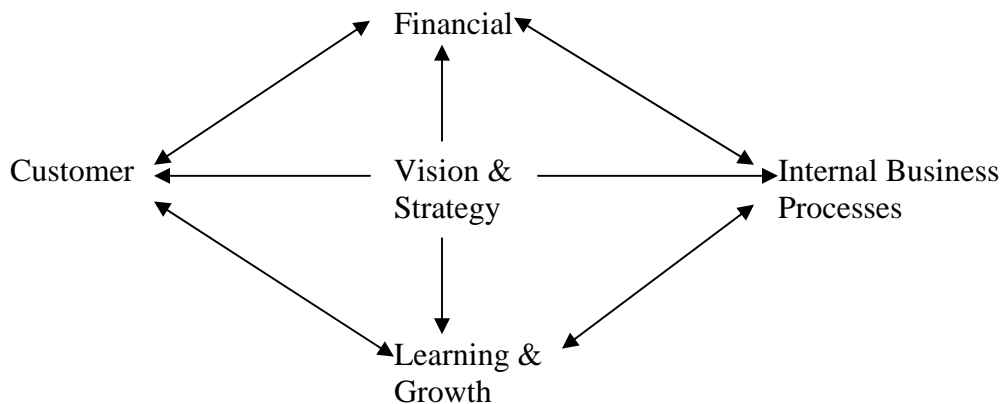
Other Methodologies

Other managerial methodologies used in business include statistical decision methodologies (risk assessment, sensitivity analysis, probability analysis, profile triangulation, and inventory control methods). These latter models and methods seek to quantify managerial decision making.

Academic Institution Focused Administration Methodologies and Models

The nature of higher education lends itself to numerous ambiguities including goals, client support, technology, autonomy of employees, and management of external threats (Baldridge et. al, 1991). With reference to business models, these variances create a difficult task of distinguishing effective models of governance. The following examples are specific to many

institutional variables; therefore, the amount of effectiveness will rely largely on university mission, institutional goals, and administrative style.

The Academic Bureaucracy

This concept emphasizes formal authority and includes several common elements of bureaucracy (e.g., specified hierarchy, copious documentation and processing, fixed budgeting and salary allowance). The model emphasizes the administrative roles required to maintain a college campus and is commonly utilized at larger institutions. This approach is suggested to have the following commonalities with bureaucracies (Stroup, 1966):

- Competence is the criterion used for appointment.
- Officials are appointed, not elected.
- Salaries are fixed and paid directly to the organization, rather than determined in "free-fee" style.
- Rank is recognized and respected.
- The career is exclusive; no other work is done.
- The style of life of the organization's members centers on the organization.
- Security is present in the tenure system.
- Personal and organizational property, are separated.

Although this form describes the top-down management practices, it fails to discuss other potential perspectives including individuals with informal influence or the interpersonal relationships that help facilitate the daily operations of a university.

The University Collegium

This approach attempts to include all of the major players in the collegial environment, including faculty. Three major components constitute this framework:

- Description of collegial decision-making: bureaucracy remains external entity, focus instead on the "community of scholars" to preserve necessary functions (Goodman, 1962).
- Discussion of the faculty's professional authority: emphasis on professor's knowledge and ability rather than official rank. Personal freedom, not organizational control, is requisite for professional success (Parsons, 1947).
- Inclusion of humanistic ideals: stressing importance of personal interaction between faculty and students, as well as encouraging students to become intimately involved with selected academic subject.

The collegial model is often noted for its altruistic tendencies, yet unrealistic standards. Less emphasis is placed on the non-academic decisions that are germane to administration responsibilities. Therefore, the effectiveness of a university run solely by collegial characteristics is questionable (Baldridge et al, 1991).

The University as a Political System

This model emphasizes personal preferences and interactions as the backbone of university management. Smaller interest groups often provide the "power plays, conflicts, and rough-and-tumble politics" common to academic environments (Baldridge, 1971).

- Inactivity prevails: Because of the tedious nature of policy development, the activists and administrators are often left to complete these undesirable acts.
- Fluid participation: participants are "here today and gone tomorrow" due to laborious process. By not becoming closely involved, only those willing to invest necessary time will shape final proposals.
- Limitation of resources creates friction among interest groups. The varying missions and goals of these factions increase difficulty of dividing allocations in effective and harmonious manner. The perception of a continuous lack of educational resources creates a consistent strain.
- Conflict is a natural component to any effective organization.
- Hindering of formal authority decision-making. Because many campus issues concern smaller competing interest groups, the final verdict depends more on the negotiations of the participants rather than the power of the formal authority.
- Outside influence: external boards, regional legislation, and competing institutions can exert power over campus policy development.

Much debate exists about the political model and its tenets. Naysayers note that ambiguities associated with the goals of higher education, combined with conflicting viewpoints by administration and faculty, helps to create a tense environment for already-strained resources. However, the power-play between the interested parties almost always guarantees action, a characteristic less visible in a sometimes deliberate world of higher education.

Other models of academic governance

Additional governance models contain elements of the aforementioned approaches. The "organized anarchy" arrangement of university systems is a common example. As explained by Cohen, March and Olson (1972), organizations are "a loose collection of ideas [rather than] a coherent structure; it discovers preferences through action more than it acts on the basis of preferences." The results are usually unpredictable and can not be easily duplicated. Other models focus on the value systems of the individuals and university system as the guiding motivation for how the institution is managed and still others emphasize "culture"—the historical and undergirding shared values and experiences of institutional participants—as the source of governance actions and decisions (Masland, 1991; Tierney, 1991). However, one complexity is how to incorporate the single values of individuals into a guiding epistemology for governance. Furthermore, because universities are often tailoring the process to benefit the ever-changing needs of their clients (e.g., students), it is questionable whether staff can create a stable, value-based environment that will reconcile with shifting societal views (Chaffee, 1983).

Common or Shared Methodologies and Models

McKinsey 7-S Framework

A managerial/administrative model that is frequently observed in the business school and the school of education literature is the McKinsey 7-S framework (Waterman, Peters and Phillips). The 7-S framework is a value-based management model that describes how an individual can holistically and efficiently structure an organization.
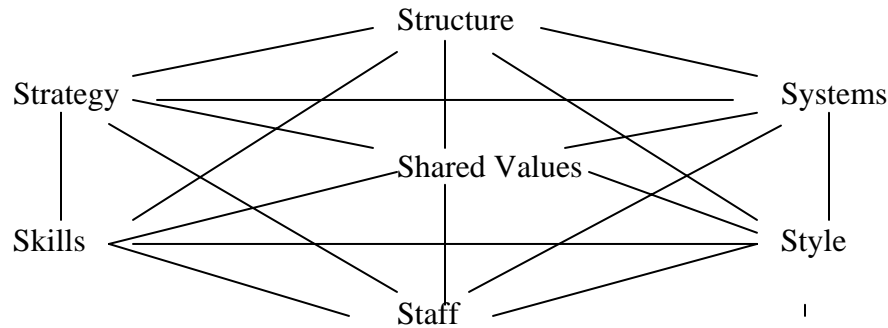
Figure 1. McKinsey 7-S Framework

Together these seven factors determine the way in which an entity operates and functions. For clarification purposes, the following delineation is provided to compare who or what might be considered within each of the factors.

7-S Factors	Academia	Entrepreneurial
Shared Value	Central beliefs & attitudes; what is your purpose; our wow-factor ("top" institution, employable graduates, journal articles	Core objectives; mission & vision statement; strategic plan; competitive advantage; dividends; sales; service
Strategy	Plans to meet the shared values, given the externalities (budgets, enrollments, tuition, faculty, accreditation, etc.)	Allocation of scarce resources (labor, capital, management, time) to reach identified goals
Structure	Autonomy of departments, staff, schools, disciplines as they relate to other units (functional [top-down], network, matrix, autonomous, etc.)	The way units, departments, functions relate to each other (fragmented, centralized, out-sourced, top-down, etc.)
System	Procedures & routines that characterize how important work is done (classes, faculty appointments, refereed publications, advising, evaluations)	Processes, tools & techniques to accomplish goals (human resources, finance & credit, research & development, performance evaluation, sales & marketing, quality control)
Staff	Numbers & types of personnel (faculty, staff, administrators, alumni, students, clientele, community citizenry)	Personnel numbers & types employees, support staff, supervisors, customers, stakeholders, etc.)

| Style | Cultural behavior achieving shared values (technology in classroom, distance education, public service, student-teacher ratios, open-door polices) | How key managers behave in achieving organizations goals (management types and management styles) |
| Skills | Distinctive capabilities of personnel or of academic institution as a whole (research, outreach, instruction, grants & awards, scholarly output) | Distinctive capabilities of core competencies (customer-focused, product-driven, cost-volume-profit mandates, technology leader, etc.) |

Result-Oriented Management

Another dual-purpose management model is the result-oriented management system, described by the Dutch researchers, Jan Schouten and Wim van Beers. "Resultaatgericht Management" (RGM), in Dutch, aims to achieve maximum results based on clear and measurable agreements made upfront, often in a person's job description (Duft). RGM is primarily a management model based on the thought that people will work with more enthusiasm and fun if:

- they clearly know what is expected of them;
- are involved in establishing these expectations;
- are allowed to determine themselves how they are going to meet these expectations; and
- obtain feedback bout their performance.

In result-oriented management, the academic administrator or business manager sets goals and determines priorities and makes resources available that are needed (time, money, facilities). The employee provides time, knowledge, skills and abilities, and indicates under which conditions the required results can be delivered, thereby taking the personal responsibility for achieving those results.

Result-oriented agreements are the central element to this management system. All parties have the same expectations about their targets or goals, and can approach each other on the results. In the business-world, these agreements are goal-oriented and SMART (specific, measurable, accepted, relevant, and traceable) within a specified timeframe.

RGM helps to translate the big picture into departmental or divisional goals and individual tasks or goals. Implementation of these result-oriented agreements tends toward self-steering, and periodic reporting and appraisal for progress control and adjustments.

Selected References

Baldridge, J. V. (1971). *Power and Conflict in the University*. New York: John Wiley.

Baldridge, J. V., Curtis, D. V., Ecker, G. P., & Riley, G. L. (1991). Alternative models of governance in higher education. In M. Peterson (Ed.), *ASHE Reader on Organization and Governance in Higher Education*: Ginn Press.

Cohen, M. D., March, J. G., & Carnegie Commission on Higher Education. (1974). *Leadership and ambiguity: the American college president*. New York,: McGraw-Hill.

Cohen, M., March, J., & Olsen, J. (1972). A garbage can model of organizational choice. *Administrative Science Quarterly, 17*, 1-25.

Drucker, P.A. (2002). *Managing in the Next Society*. New York: St. Martin's Press.

Duft, K.D. (1979). *Principles of Management in Agribusiness.* Reston, VA: Reston Publishing Company

Masland, A. (1991). Organizational culture in the study of higher education. In M.W. Peterson (Ed.), *Organization and governance in higher education* (p. 118-125). Needham Heights, MA: Ginn Press.

Parsons, T. (1947). Introduction. In M. Weber (Ed.), *The Theory, of Social and Economic Organization.* New York: Free Press.

Peters, T.J. and R.H. Waterman, Jr. (1982). *In Search of Excellence.* New York: Warner Books.

Stroup, H. (1966). *Bureaucracy in higher education*. New York: Free Press.

Tierney, W. (1991). Organizational culture in higher education: defining the essentials. In M.W. Peterson (Ed.), *Organization and governance in higher education* (p. 126-139). Needham Heights, MA: Ginn Press.

Waterman, R.H. Jr., T.J. Peters and J.R. Phillips (1980). "Structure Is Not Organization," in *Business Horizons*. Bloomington, IN: Foundation for the School of Business, Indiana University.

ADVANCING AN UNDERSTANDING OF THE ROLES OF RISK, UNCERTAINTY AND UNSTABLITY: THE REALITY OF NEGATIVE SYNERGY

Mayes D. Mathews
Saint Leo University
mayes.mathews@saintleo.edu
757-566-0928

Shannon Jackson
Saint Leo University
shannon.jackson@saintleo.edu
757-877-1166

ABSTRACT

Groups engaged in activities without certainty must find mechanisms to help them cope with risk. Risk may invigorate some group activities, stifle other activities, or may have no effect at all on yet others. But, any group engaged in matters of choice must either accept or reject alternatives based upon perceptions of risk and how those perceptions affect the outcome of free choice. But the choice environment may also be confounded by the presence of synergistic relationships that may further complicate free choices.

INTRODUCTION

Traditional works dealing with groups do not normally consider situations where the group is uncertain as to the potential outcomes, especially in those situations where potential outcome could involve negative synergy. Of course, Von Neuman and Morgenstern (1947) have shown that it is possible to construct a set of values or utility functions for a particular consumer that can be used to predict choices in some uncertain situations. Continuing controversy about their work revolves around the ordinal or cardinal nature of their utility index.

Unfortunately Von Neuman and Morgenstern utility functions are unrealistic when considering group behaviors. Their work assumes particular reactions are predictable to behavior which is considered to be a particular known consequence which is always *a priori*. So, when considering group behavior, their analysis may prove to be unreliable.

This paper will investigate this interesting aspect of human behavior and will develop a utility function that may be used to further describe situations or systems existing in an environment where negative synergy may exist (Mathews, 2007). After a brief overview of general theories about groups, the concept of negative synergy will be introduced. It will then be followed by a presentation of a utility function that could be the basis for future explorations of groups that are risk avoiding, risk seeking, or are neutral in risk tolerance.

GENERAL OBSERVATIONS ABOUT GROUP BEHAVIOR
CLASSICAL GROUP BEHAVIOR MODELS

There are four widely accepted models of group behavior that may be applied to management decision situations: the Rational or Classical Model, Simon's Bounded Rationality Model, Vroom and Yetton's Normative Model, and the Intuitive (or heuristically based) Model. In addition, there are a number of protocols for enhancing group decision action. This section of the paper will discuss the four decision models and various suggestions for improving the efficacy of group activity.

The Rational Model. The dominate model of group behavior since WWII (Prusak, 2005) has been the Rational Model. The model is based on the following eight steps:

1) identification of the problem
2) identification of the decision criteria
3) allocation of weights to criteria
4) development of alternatives
5) analysis of alternatives
6) selection of an alternative
7) implantation of the alternative
8) evaluation of the decision effectiveness (Robbins and Coulter, 2005)

The model, however, has inherent flaws. For instance, it assumes that the exact problem to be dealt with can be clearly identified. So, for example, according to the Rational Model, if the manager sees there is a problem with turnover in the organization, the model assumes that turnover is the problem to be solved rather

than as a symptom of a larger problem within the organization. Possible errors in the identification of a problem can, obviously, lead to problems with the rest of the model since the original assumption in the eight step process may be erroneous. Other problems with the model lie in assumptions of rationality; that, for instance, assume that there is only one single well defined goal to be obtained; all alternatives and consequences can be known; preferences are always clear and those preferences remain constant; there is unlimited time and monies available, and that a final decision can be an optimal decision. (Robbins and Coulter, 2005)

The Bounded Rationality Model. The problems with the Rational Model, led some, like Herbert Simon, a political scientist, to explore the limits of rationality in the model. Simon suggested, in his investigation of the model, that the Rational Model "leaves no room for regrets, second thoughts, or 'weakness of will'." (Simon, 1986) He suggested, instead, that business decisions are made under conditions of "bounded rationality." (Simon, 1947) In this model of Bounded Rationality, the inherent flaws of the Rational Model are taken into consideration in the decision making process and suggests that managers make choices rationally, but are "bounded" by their inability to process the information required to make an optimal decision. Simon coined the term "satisfice" (Simon, 1947) to mean that managers, because of their limitations to process information, are not able to make an optimal decision, but merely a satisfactory and sufficient decision. (Robbins and Coulter, 2005)

The Intuitive Model. The third widely accepted model of group behavior found in the business literature is the Intuitive or heuristically based model. The Intuitive model also points to problems in the Rational Model. For instance, Nutt said that when manager's use the Rational Model to make decision they "struggle to reach the 50% success mark." (Sinclair, Ashkanasy, 2005). The literature (Wally and Baum, 1994; Tomer, 1996; Kuo, 1998; and Agor, 1984) suggests that the Rational model is being replaced by a more "holistic model" (Sinclair, Ashkansy) model that takes into account the threat of high decision costs, increased time constraints and more ambiguous, dynamic environments.

The Intuitive Model suggests that manager's make "gut" decisions or decisions based on past experiences so they can "act quickly with what appears to be limited information." (Robbins and Coulter, 2005). One study "revealed that almost one-third of (them) emphasized 'gut' feelings over cognitive problem solving and decision-making." (Robbins and Coulter, 2005),

   <u>The Normative Model.</u> Whichever the model followed, the individual behavior is emphasized. Vroom and Yetton's Normative Model is one of the few business models that emphasizes consultation and group dynamics. (Vroom and Yetton, 1973). Vroom and Yetton based their group decision making model on the ideas that situational factors cause "almost unpredictable leader behavior." (faculty.css.edu, 2006). The authors explain that five different decision procedures are followed: two autocratic, two consultative and one totally group based:

A1: Leader takes known information and then decides alone
A2: Leader gets information from followers, and then decides alone
C1: Leader shares problem with followers individually, listens to ideas and
    then decides alone.
C2: Leader shares problem with followers as a group, listens to ideas and
    then decides alone
G2: Leader shares problems with followers as a group and then seeks and
    accepts consensus agreement.

   Vroom and Yetton assumes that participation of those involved in a process increases acceptance of the results and that increased acceptance increases commitment to the resulting actions taken as a result of their decision. (Vroom and Yetton, 1973).

   But even with the increased attention to participation by others in group processes, there are factors that suggest that the results of group activity are different than for individual activities. For instance, there "are some decisions which employees simply accept because they are indifferent to them." (Hoy, Tarter and John, 1993). In addition, if there is little group commitment to a decision, then participation in the decision making process should be limited because it may impact the direction in which the decision maker wishes the solution to turn. (Hoy, Tarter and John, 1993).

FORMS OF SYNERGY

Synergy is generally thought of only as a positive force in systems. However, as will be seen, negative forms may exist as well.

<u>Positive Synergy</u>. Usually synergy is thought of as getting more done with less (Francis & Young, 1979). In reality, synergy is found abundantly in a variety of natural systems. The idea that the whole is somehow greater than the sum of the parts of a system is divergently applied universally across such disciplines as engineering, medicine, chemistry, marketing, managerial leadership, psychology, and sociology. The benefits of shared energies are apparent. For example: a monkey and a gorilla stand under a banana tree each hungry for a piece of ripe fruit. Neither can reach high enough to gather it in. But, if the monkey stands on the shoulders of the gorilla, they can accomplish together what neither of them could have accomplished alone.

Doctors know that certain medications are useful in treating diseases. A person who is diabetic may reduce the risk of death through damage to their heart, liver, eyes, nerves and kidneys by taking insulin injections. Or the patient may reduce the risk of death through blood clots which can induce strokes and heart attacks by simply taking a children's strength dose of aspirin every day. But when both are taken together, the risk of death is dramatically reduced to levels that greatly enhance longevity.

A business that has a potential advertising budget of two million dollars might spend the entire amount on magazine ads and expect to gain an additional five million dollars in revenue. Or they may elect to apply the increase to their personal selling budget by that amount and obtain a four million dollar increase in revenue. But the more powerful result might be to apply one and a half million to advertising and the other half million to personal selling with a resultant increase of revenue of twelve million dollars. Why? The marketing manager would say that each promotion method reinforces the other. But, in reality, this is but an excellent example of synergy. The whole is greater than the sum of the parts.

Synergy has an important place in all aspects of systems theory as seen in science, medicine, and business. Understanding when and how to apply

synergistic relationships may be a key success factor for many business and industrial leaders.

Negative Synergy.   Negative synergy may be thought of as the logical opposite of synergy. (Phillips, 2001) What is often not as well recognized nor appreciated is this reverse effect: negative synergy which represents a condition where the sum of the subsets of a system is less than the sum of the whole. But this negative synergy concept, too, has widespread but under-recognized applications. For example, the loss of a right eye has serious consequences. The beholder may lose peripheral vision, there may be a loss of depth perception, and some disfigurement may exist. Likewise, the loss of a left eye may result in similar serious consequences: the beholder may lose peripheral vision, there may be a loss of depth perception, and some disfigurement may exist. Either eye is obviously a subset of the whole vision system. The loss of either subset is not desirable. But now consider the loss of both eyes. The consequences are much more severe than the loss of either subset alone. Total blindness then has a negative synergistic effect that is much more adverse to the total visionary system than that experienced by the loss of either individual subsystem.

In the Sudan, relief efforts are frustrated. The region is characterized by Over-population, too many people. Additionally, pool soil conditions coupled with low annual rainfall results in overgrazing by the animal population to the point that herdsmen loose a significant number of animals each year due to malnutrition and drought. Likewise, the region will not provide enough surface crops to sustain the number of people living in there. An epic surge of HIV/AIDS related deaths has left entire generations of children without any surviving parents or home life of any form. Any of these issues would be difficult to overcome but the sum of all is devastating. The cumulative effect of negative synergy is so overwhelming that the solution to the situation in the Sudan is almost beyond human comprehension or understanding. The result of the effect of negative synergy leaves policymakers without a clue as to how to best proceed. (Mathews, 2006)

Hurricane Katrina provided an example of how a series of natural and human factors can saturate decision makers with conditions that are of such a magnitude that they are unsolvable. Driving winds and devastating rains set up conditions of failure that could have been anticipated: power outages, flooded streets, fallen trees, and damaged bridges. Rainfall caused Lake Pontchatrain to swell its banks but that, too, could have been anticipated based upon models in place by the National Oceanographic and Weather Service. The US Army Corps of Engineers certainly knew the design parameters for the levees surrounding New Orleans and must have certainly been aware of the effect of invasion of wetlands was having on the ocean shoreline. Each of these factors represented a significant threat. But no one recognized the impact that negative synergy would have on the city. None were prepared for an event where the result was much worse than the component parts.

Negative synergy is a force to be reckoned with. Decision makers must be aware of its potential impact. They must be as aware of the possibility negative synergy appearing in relationships as they are of the occurrence of the effects of positive synergy.

THE INITIAL UTILITY FUNCTION

Von Neuman and Morgenstern utility functions consider a mapping whereby particular actions (A) are followed by specific consequences (C) which are known, *a priori*, in advance so that A → C where A={a,b,c …} and where C= {m,n,o …} and likewise every a → m, b→n, c→q, etc.

But, in reality such a mapping is unrealistic. All midsized computers produced at the same production facility do not always exhibit the same operating characteristics. As a result of variances in component characteristics and in assembly standards, some substandard computers are produced. Instead, consider the following:

Let   A = a situation where a group acquires a satisfactory standard computer.

B = a situation where a group acquires no computer.

C = a situation where a group acquires a substandard computer.

Assume that the group prefers to purchase A to B and also prefers to purchase B to C. Not having a computer is assumed to be preferred to having a substandard one because of the nuisance involved in trying to operate a computer with inferior components or assembly. Given a choice:

(1) The group may choose to maintain the status quo, i.e., to have no computer at all. This choice has a certain outcome. The probability of the outcome is p = 1.

(2) The group may elect to enter into a risk situation where the purchase may result in owning a satisfactory computer (alternative A) or an unsatisfactory one (alternative C).

(3) Or perhaps the purchaser may opt for the null alternative B and will not purchase a computer at all.

It is possible to construct a utility index of group choice in the face of uncertainty if the group conforms to six axioms:

Continuity. If A is preferred to B and B is preferred to C, then there exists some preference probability, p, where $0 \leq p \leq 1$ such that the group is indifferent to outcome {p, B} with certainty and the alternative risk of an undesirable purchase {(1-p) A, C}.

Transitivity. If A is preferred to B and B is preferred to C, the group will prefer A to C.

Independence. If the group is indifferent between A and B, then C is any other acceptable outcome. If one group option G_1 offers outcomes A and C with probabilities (p,) and (1 - p,) and another outcome G_2 = B and C with the same probabilities (p,) and (1 - p,), the group is indifferent between the two outcomes G_1, and G_2. Similarly, if the group prefers A to B, then the group will prefer G_1 to G_2.

Preferences. For two alternatives A and B, the group must either prefer A to B, prefer B to A, or the group is indifferent between A and B.

Unequal probability. If the group prefers A to B and if the group prefers G_1 = {p, A, B} and G_2 = {p_2, A, B}, then the group will prefer G_1 to G_2 only if $p_1 > p_2$.

Compound outcomes. If $G_1 = (p_1, A, B)$ and $G_2 = (p_2, P_3, P_4)$ and where $G_3 = (p_3, A, B)$ and $G_4 = (p_4, A, B)$ and; if any outcome is acceptable, then it follows that $G_2 \cong G_4$ if $p_1 = (p_2\ p_3) + (1-p_2)(p_4)$ given the probability of obtaining conclusion A through G_2 is p_2. Likewise, the probability of obtaining A through G4 is $(1 - p2)\ (p4)$. In other words, the group will only evaluate the options, one at a time in terms of obtaining a favorable outcome. The number of times the group is exposed to the outcome does not vary the expected outcome.

It should be noted that for presentation convenience, this paper only considers situations with two outcomes. The analysis could be extended to cases with any number of outcomes $G_n = (p_1, p_2 \dots p_{n-1}, p_n ; A_1, A_2 \dots A_{n-1}, A_n)$ where n = the number of possible outcomes; and where $0 < p_i < 1$ is the probability of outcome A, and where $1 \cong \sum_{i+1}^{i+n} p_i\ A_i$.

DEVELOPING A GROUP PREFERENCE BASED UTILITY FUNCTION

Assume that a Group Based Utility Function (u) exists which conforms to the above listed axioms, the expected utility (E) for the two outcome group choices $G = (p, A, B)$ would be

$$E\ [u\ (G)] = p\ u\ (A) + (1 - p)\ (u)\ (B)$$

If the group faces choices $G_1 = (p_1, A_1, A_2)$ and $G_2 = (p_2, A_3, A_4)$, an expected theorem would state that, if p_1 is preferred to p_2; then $E\ [(P_1)\ ] > E\ [\ u\ (P_2)\ ]$. The significance of this observation is helpful to this discussion because it provides that uncertain situations can be analyzed in terms of maximization of the expected utility of the group decision. Under conditions developed by Henderson and Quandt (p 54-55) infer that the following observations may be inferred about group decision making following the above listed axioms.

- Any positive monotonic transformation of the utility function will leave the rankings of the decision unchanged. This result does not also hold true for rankings of uncertain outcomes in terms of expected utility.
- Expected increasing utility rankings are invariant under linear transformations.

- The expected utility function presented above may be used to construct utility values for any group that conforms to the Von Neuman - Morgenstern axioms.

- The utilities derived from a Von Neuman - Morgenstern analysis are cardinal since they are derived from a group's risk behavior and are valid for predicting choices as long as the group strives for maximum utility.

- Utility values are derived from decisions about mutually exclusive choices (as long as the group strives to maximize the expected utility). Therefore it would be meaningless to attempt to infer from the utility of event A and the utility of event B, the utility of joint event A U B.

- If uA = KuB, it is not meaningful to assert that the group will prefer choice A K times as much as choice B. However, the use of an interval scale does imply that the group would. chose one over the other.

GROUP BEHAVIOR UNDER UNCERTAINTY

So far, the group utility function has been treated only in the most general terms. Now it is time to be more specific as to how groups behave under conditions of uncertainty. Five new assumptions are now introduced here in regard to the previously generalized utility function: (1) the utility function is measured in terms of wealth (w), a monetary unit; (2) the utility function is a strictly increasing function; (3) the utility function is continuous; (4) the first order derivative is continuous; and (5) the second order derivative is continuous.

The expected value (E) of a group decision or choice which results in different wealth levels (w) may be expressed as:

$$E\,(w) = p\,w_1 + (1 - p)\,w_2$$

Risk Neutral. A group is risk neutral as to the outcome of a decision by the group when the expected value of the choice is equal to the expected utility of the choice. That is:

$$U\,[pw_1 + (1 - p)\,w_2\,] = p\,U\,(w_1\,) = (\,1 - p\,)\,U\,(w_2\,)$$

Such a group is driven by expected values and is oblivious to risk. If the group is risk neutral toward all choices, the equation above implies a linear utility function of the form $U = \partial + B w$ ($B > 0$).

Risk adverse. A group is risk aversive to a choice if the expected value of the choice is greater than the expected value of the utility. In other words:

$$U [p w_1 + (1 - p) w_2] > p U (w_1) = (1 - p) U (w_2)$$

Such a group would prefer a certain outcome to an uncertain one with the same unexpected value. If this above utility function holds true for all cases of $0 < p > 1$ and all values w_1 and w_2 are within the domain of the utility function so described, then the utility function is strictly concave over its entire domain:

$$\frac{D^2 U}{D^2 w^2} < 0$$

Such a group is risk adverse over the entire domain of w.

Risk Seeking. In general, it seems that most groups are risk adverse most of the time. This opinion is not research based and might be a potential topic for further research. But, to make this a comprehensive analysis, it must also cover groups that prefer decisions with uncertain outcomes. Such a group is would be a risk seeking group that prefers choices with uncertain outcomes. A group is risk seeking when the utility of the expected value of the wealth level is less than its expected utility. In other words the inequity described above is now reversed.

$$U [p w_1 + 1 - p) w_2] < PU (w_1) + 1 - p) (w) (w_2)$$

If $\frac{d^2 U}{d^2 w^2} > 0$, the utility function is strictly convex and the group is risk seeking.

RISK, UNCERTAINTY, AND UNSTABILITY: THE REALITY OF NEGATIVE SYNERGY

Antidotal observed behavior shows that groups may develop a synergistic relationship within the group that is at times risk averting and at other times risk seeking. The effect of synergy only serves to amplify the utility index since (seen below), it is strictly concave.

$$U [p w_1 + (1 - p) w_2] < PU (w_1) + 1 - p) (w) (w_2)$$

Of course, if $d^2U/dw^2 < 0$ and the utility function holds for all values of p in the range $0 < p < 1$ and $w_1 \rightarrow \in \{w_1, w_2\}$, then the strictly concave function represents a group that is risk adverse.

Meanwhile, actual observed behavior shows that a group may be adaptively comfortable with situations that are sometimes seen in an environment that is at times characterized by positive synergy and at other times by negative synergy. Consider, for example, a college football team that is playing an opponent with significantly higher standing. College players who make up the team are almost always risk adverse. They want to be noticed, recruited, and accepted by high paying professional clubs. Normally, the team will take the safer play. But, with the team behind by one point at twenty to twenty-one and with thirty-five seconds left in the game, the quarterback's utility function is defined such that he is willing to go for the extra two points with an expected value of one in a million (i,e,, the opponent is really good) to win the game by a two point conversion rather than a more probable one point goal attempt. At first, such behavior might appear inconsistent. But, as negative synergy comes into play on the more probable single point play; his utility function may assume the shape of an ogee curve: convex over some of the domain and concave over another portion. If w_1 is the team's point potential loss if the two point play does not succeed and w_2 is the team's teams point potential gain if the kicking attempt succeeds, the general utility function is strictly concave over the domain $0 \leq w_n \leq w_\Theta$, and strictly convex when the $w_\Theta < w_n$.

In other words, a quarterback is risk averse in situations where the outcome is no greater than w_Θ. Nearly all anecdotal experiences seem to lie within the domain $0 \geq w_n \geq w_\Theta$. But when $w_n \rightarrow w_\Theta$, the team may be willing to take a chance on winning the game and improve their opportunity for Uw_{max}.

To determine the effect of synergy upon decision making, examine the sign of the second derivative. However, recall that, by axiom, it is invariant under linear transformation. Accordingly, the second derivative cannot be used to indicate the level of synergy affecting the group.

A measure of an absolute level of synergy, s, may be provided by the ratio

of the second and first derivatives.

$$s = \frac{U^n(w)}{U^m(w)} = \frac{d\,l_n\,u^s(w)}{dw}$$

This measure is positive, negative, or zero as the group decision process exhibits positive and negative or zero synergy.

If $V = a + bU$ and if $(b > 0)$ then

$$s = \frac{V^n(w)}{V^m(w)}$$

$$= \frac{\beta U^n(w)}{\beta U^m(w)}$$

$$= \frac{U^n(w)}{U^m(w)}$$

which establishes the desired invariants.

SUMMARY

This paper has developed a two group utility function that can be used to describe perceptions of risk under conditions of uncertainty in group decision making. The conditions were expanded without proof to encompass conditions where groups are risk adverse, risk neutral, and risk seeking.

In reality, when considering the effect of synergy – both negative and positive a group will exhibit risk aversion in some situations and risk seeking behavior in others. At first such behavior may appear inconsistent. But, if second derivatives of the group behavior utility function were convex in some domains and concave in others, concavity might be a possible cause of this apparent inconsistency and should be the subject of further investigation.

REFERENCES

Bruner, J. S. (1961). "The act of discovery". Harvard Educational Review 31 (1): 21–32. Bruchholz, S., & Roth, T. (!987). Creating a high performance team. New York, NY; John Wiley & Sons.

Buhler, Patricia. Managing in the new millennium: A key to successful management. *Supervision*. 62, 13.

Cochran, Leslie H. 1989. *Administrative Commitment to Teaching*. Cape Girardeau, Mo.: Step Up, Inc, ISBN 0963143808.

Fisher, Anne. Get employees to brainstorm online. *Fortune*, 150, 11, 72. Frances, D.,& Ypoung, D. (1979) *Improving work groups: A radical manual for team building.* San Diego, CA: University Associates.

Henderson, J.M and Quant, R.E.(1980) *Microeconomic Theory: A Mathematical Approach*. New York: McGraw Hill.

Hyman, Ronald T. 1980. *Improving Discussion Leadership*. New York: Columbia Univ., Teachers College Press, ISBN 0137926073.

Janis, Irving (1972) *Victims of Groupthink*. Houghton Mifflin: Boston, MA. Kerr, Norbert and R. Scott Tindale. Annual Review of Psychology. Palo Alto: 55, 623

Kuhn, T., & Poole, M.S. *Human communication research,* 26, 4, 558-590.

Mathews, M. "General Economic Systems, Instability States and Negative Synergy" *International advances in economic research,* 13, 2, 254+

Mathews, M. "Negative synergy: a macro perspective for environmental issues" *International advances In economic research, 12, 4, 424+*

Murali, D., (2005) "With synergy, differences are celebrated provided you have the energy" *The Hindu Business Line.*

Nutt, P.C Surprising but true: Half the decisions in organizations fail. *Academy of Management Executive*, 13, 75-89.

Sweller, J. (1988). "Cognitive load during problem solving: Effects on learning". *Cognitive Science* 12 (1): 257-285.

Phillips, D. (2006) *Negative synergy*. Home.att.net/`dwane.phillips/advisors/nsynergy.htm.

Prusak, Lawrence. The madness of individuals. *Harvard Business Review,* 83, 6.

Simon, Herbet (1847) *Administrative Behavior.* Macmillan: New York.

Simon, Herbert A. "Decision Making and Problem Solving." Research Briefings 1986: Report of the Research Briefing Panel on Decision Making and Problem Solving. 1986 National Academy of Sciences, Washington, DC.

Sinclar, Marta and Neal Ashkansay. Management learning. *Thousand Oaks*, 36, 3, 353-371.

Team building tips (2006) *http://www.unix.oit.umass.edu/~mee.teamsmm6.htm*.

Von Neuman, J. and Morganstein, O. (1947) *Theory of Games and Economic Behavior.* Princeton ,N.J., Princeton University Press. Chapter 1.

Vygotsky, L. S. (2006 (New Ed.)). *Mind in Society: Development of Higher Psychological Processes.* Cambridge, MA: Harvard University Press. ISBN 0674576292.

ATTITUDES TOWARDS CODES OF ETHICS: ARE THERE DIFFERENCES BETWEEN BUSINESS AND NON-BUSINESS STUDENTS?

Nabil A. Ibrahim, Augusta State University, Augusta, GA 30904 nibrahim@aug.edu
Chris Bourdouvalis, Augusta State University, Augusta, GA 30904 cbourdou@aug.edu

ABSTRACT

This paper extends previous research by investigating the basis for attitudes toward codes of ethics. Specifically, its purposes are twofold. First, to examine students' attitudes toward codes of ethics. Second, to ascertain whether differences between business and non-business students do exist with respect to these attitudes. A survey of 622 students revealed significant differences between the two groups with respect to seven of the eight variables studied.

INTRODUCTION

The ethical standards and attitudes of managers and business students have been among the principal issues confronting business and society for many years. Of particular interest to educators, practitioners, and regulators is the extent to which corporations are responsive to the expectations of shareholders and society. Widespread media accounts of recent illegal and fraudulent actions involving some of the largest corporations and financial institutions have shaken the public's confidence and diminished investors' trust in the soundness of corporate decisions and the integrity and competence of business executives. As a result, numerous calls for reform and closer scrutiny of business ethics are being made by many, including business practitioners and researchers.

REVIEW OF THE LITERATURE

Several organizational variables help shape ethical behavior. Some companies legitimize the consideration of ethics as an integral part of decision making by providing strong guidance and continuously reminding managers of what is ethical. Codes of ethics are an increasingly popular tool. Businesses rely on them to reduce ambiguity, promote ethical practices, and establish a strong ethical environment. These are formal documents, expressed in language anyone can understand, that state an organization's primary values and the ethical rules and principles employees are expected to adhere to (see, e.g., Adams et al., 2001; Farrell and Farrell, 1998; Valentine and Barnett, 2002, 2003). They are "moral standards used to guide employee or corporate behavior" (Schwartz, 2001, p. 248). Kaptein (2004) shows that among the two hundred largest corporations in the world, 52.5 percent have adopted some type of code of ethics. Codes of ethics are particularly helpful when an individual's self-interest is incompatible with acting in accordance with his or her ethical standards.

It must be remembered that codes of ethics have limits because they cannot anticipate every situation that may arise. Also, in some cases, they are principally public relations statements. Their effectiveness depends heavily on whether they are current and robust, whether they are strictly implemented, and how employees who break the codes are treated. Most importantly,

1

they require management's genuine commitment and their explicit and unequivocal support. The Enron corporation "while continuing to use three different sets of accounts, …also gave its four-page ethical codes to all new employees to sign on their first day" (Hemingway and Maclagan, 2004, p. 35). A number of writers have shown that codes of ethics may be used to provide organizations with legitimacy (e.g., Boiral, 2003; Weaver et al., 1999). Indeed, more than three decades ago, Meyer and Rowan (1977) argued that managers may symbolically employ legitimizing structures such as codes of ethics solely to create a positive impression. Suchman (1995) contends that ''organizations often put forth cynically self-serving claims of moral propriety and buttress these claims with hollow symbolic gestures...'' (p. 579).

Some studies of codes of ethics have focused on specific industries. For example, Montoya and Richard (1994) compared health care facilities and energy companies. Emmelhainz and Adams (1999) targeted firms in the apparel industry, Kolk and van Tulder (2002) surveyed international garment companies, van Tulder and Kolk (2001) concentrated on the sporting goods industry, and Preble and Hoffman (1999) analyzed the franchising industry.

Others have focused on a variety of professions. Gaumnitz and Lere (2002) examined fifteen professional organizations such as the Institute of Internal Auditors and the American Marketing Association. Somers (2001) compared management accountants working in organizations with and without a code of ethics. Pierce and Henry (2000) and Harrington (1996) surveyed information systems professionals, Nwachukwu and Vitell (1997) examined marketing and advertising professionals, and Valentine and Barnett (2002) concentrated on sales organizations.

Other studies investigated whether organizations with codes of ethics elicited greater commitment from their professional staff. For example, Valentine and Barnett (2003) report that sales managers employed by companies with a code of ethics exhibit greater commitment toward their organization than those whose companies had not developed such a code. Similarly, Somers (2001) found that accountants' organizational commitment was higher in companies with a code of ethics than was commitment in those that did not have one.

Still others have examined codes of ethics in certain countries. Brytting (1997) surveyed companies in Sweden. Lefebvre and Singh (1996) compared companies in Canada and the U.S. Bondy, Matten, and Moon (2004) compared Canadian, German, and U.K. companies. Boo and Koh (2001) surveyed top and middle-level managers in Singapore. Stohs and Brannick (1999) interviewed managers in Irish owned companies.

A sizeable academic literature has investigated students' attitudes toward business ethics. The research has come from many disciplines, and has focused on a wide range of issues. Business leaders and organizational theorists have long recognized the importance of including these prospective leaders and executives in ethics research. Their perceptions may be a harbinger of attitudes in the business community. In their research, Glenn and Van Loo (1993) noted that there were indications that business students were making less ethical choices in the 1980s than in the 1960s. More recently, Webster and Harmon (2002) compared today's college students with college students of the 1960s and found "a continuing societal movement toward Machiavellian behavior" (p. 435).

One important stream of research has compared the ethical perceptions of business and non-

business majors. Overall, empirical studies have produced conflicting results. More than three decades ago, Hawkins and Cocanougher (1972) examined students' reactions to ethical matters in business. Their study revealed that those majoring in business were more tolerant of questionable business practices than were non-business students. More recent studies have confirmed these earlier findings. For example, St. Pierre, Nelson, and Gabbin (1990) found that accounting students scored lower on a test of moral reasoning than psychology students. In a survey of individual subscribers to *Business Ethics Quarterly*, Hosmer (1999) reported that, compared to non-business students, accounting and finance students were more likely to view business ethics as generally unimportant. Smyth and Davis (2004) concluded that among two-year college students, business students were more unethical in their behavior and attitudes than non-business majors. Crown and Spiller (1998) found that business students are more tolerant of unethical behavior than are non-business students. McCabe and Trevino (1993) reported that college students intending careers in business cheat more often than those who were planning non-business careers. In his survey of students at a small college, Baird (1980) found that business school majors were more likely to cheat on tests than liberal arts or education majors. In addition, business school students were less likely to disapprove of cheating behavior. Similarly, Roig and Ballew (1994) concluded that business students had a more tolerant attitude about cheating. Sparks and Johlke (1996) found that students not majoring in business believed that salespeople behaved unethically more than business students; they "hold stricter ethical standards than business majors" (p. 885).

Although the preponderance of these investigations reported significant differences between the two groups, some studies produced different results. For example, Beltramini, Peterson, and Kozmestsky (1984) concluded that "somewhat surprisingly, the ethical concerns of the students surveyed were not substantially different across academic classifications or academic major" (p.199). Similarly, Arlow (1991) reported no systematic differences in the ethical perceptions of students depending on their major.

Given these conflicting results, a meta-analysis of 30 such studies found mixed results: 20% were significant, 57% were non-significant, and 23% were mixed. Also, in their review of eight studies examining differences and similarities between business and non-business students, Ford and Richardson (1994) reported that four studies did not find any significant differences, while the other four provided results which were both significant and contradictory. Borkowski and Ugras (1998) conducted a meta-analysis of several hundred studies carried out between 1985 and 1994. Their results were similarly inconclusive and they concluded that this relationship "is still difficult to interpret" (p. 1117).

While many studies have attempted to determine whether there were differences in ethical attitudes and behavior between business and non-business students, significant gaps in the literature remain. One area which has been largely overlooked and, therefore, warrants further investigation is whether there are differences with respect to attitudes toward codes of ethics. The current study attempts to partially fill this void. One important longitudinal study examining business students' attitudes toward ethics codes was conducted by Peppas (2003). He assessed opinions of ethics codes and what their reasonable enforcement would accomplish via an instrument developed by Becker and Fritzsche (1987) to survey managers in Germany, France and the U.S. Peppas' study was conducted in 1998 and 2002 to compare attitudes at two different points in time. The findings indicated that, with one exception, attitudes toward codes

of ethics were not significantly different in 2002 from what they were in 1998. That is, they did not change following the highly publicized reports of corporate unethical conduct and scandals. While this study has made important contributions to our understanding of attitudes toward codes of ethics, all of its subjects were business students. No attempt was made to include non-business students to examine differences between the two groups in spite of the possible influence of academic major on ethical attitudes as reported by other studies. This concern warrants further investigation.

Therefore, this paper extends previous research by taking its point of departure in Peppas' appeal that "the findings of (his) study beg for further research ... to shed light on and to examine the *basis* (italics mine) for attitudes toward codes of ethics..." (p.85). Specifically, its purposes are twofold. First, to examine students' attitudes toward codes of ethics. Second, to ascertain whether differences between business and non-business students do exist with respect to these attitudes.

METHODOLOGY

Data were collected as part of a larger cross-national study of business ethics. A total of 628 graduating undergraduate students from five universities in the southeastern and northeastern U.S. were surveyed. All were volunteers who were briefed on the importance of the study and told that all the questionnaires were anonymous. Although participation during class time was voluntary, only eighteen students refused to participate in the study. Of the 628 completed questionnaires, six did not disclose whether they were business or non-business students and were, therefore, excluded from the analysis.

Table 1. "Codes of Ethics" Section

Assume for the moment that an Ethical Practices Code has been drawn up by professional pharmacists in your state. The following statements assess what you think such a code and its reasonable enforcement would accomplish.

1. The code would raise the ethical level of business in this profession
2. The code would be easy to enforce
3. In situations of severe competition, the code would reduce unethical practices
4. Individuals working in this profession would welcome the code
5. The code would protect inefficient pharmacists
6. The code would reduce the profitability of pharmacies
7. The code would help pharmacists by clearly defining the limits of acceptable conduct
8. People would violate the code whenever they thought they could avoid detection

---

A demographic section gathered data on the respondents' gender, age, academic major, year of study, and work experience. The questionnaire included an additional section designed to assess attitudes toward ethics codes for professional pharmacists. This profession was selected primarily due to its innocuous character, and because it does not tend to elicit negative reactions and is not afflicted by disapproving opinions or attitudes. The eight items in this section were

inspired by the research of Becker and Fritzsche (1987) and Peppas (2003). Respondents were asked to assume that an Ethical Practices Code had been developed for professional pharmacists. Then they were requested to indicate on a five-point Likert scale (1= Strongly Disagree, 5 = Strongly Agree) the extent to which they disagreed or agreed with eight statements relating to the possible consequences of such a code in this profession.

Table 1 shows the eight statements. To evaluate the clarity of the instructions and items, the questionnaire was pilot tested on a group comprised of graduate students in a research methods class. Several minor problems in the format and wording of the items were found and changes and refinements were made accordingly. The eight items were treated as the dependent variables in the analysis, while academic major (business/non-business) constituted the independent variable.

RESULTS

Fifty-eight percent of the students were male. The average age was 25 years. Overall, they had 4.5 years of work experience. T-tests and chi-square tests showed no significant differences between the business and non-business students with respect to gender, age, and years of work experience. The average scores from the entire sample for the eight items are shown in Table 2.

Table 3 displays descriptive statistics for the eight items. The analysis of the results was conducted in several stages. First, since the means of the two groups' scores on each of the items

Table 2. Means and Standard Deviations for the Entire Sample

		Mean	s.d.
1.	The code would raise the ethical level of business in this profession	3.06	1.16
2.	The code would be easy to enforce	3.03	0.92
3.	In situations of severe competition, the code would reduce unethical practices	2.89	0.87
4.	Individuals working in this profession would welcome the code	4.45	1.57
5.	The code would protect inefficient pharmacists	3.27	1.17
6.	The code would reduce the profitability of pharmacies	3.29	1.27
7.	The code would help pharmacists by clearly defining the limits of acceptable conduct	3.54	1.23
8.	People would violate the code whenever they thought they could avoid detection	3.42	1.26

Table 3. ANOVA Results for Differences between Business and Non-business Students

Dependent Variables	Business (n = 298) Mean	s.d.	Non-business (n = 324) Mean	s.d.	F	p
The code would raise the ethical level of business in this profession	2.91	(1.08)	3.19	(1.22)	9.12	.003
The code would be easy to enforce	2.96	(0.88)	3.10	(0.84)	4.12	.043
In situations of severe competition, the code would reduce unethical practices	2.69	(0.94)	3.09	(0.81)	32.49	.000
Individuals working in this profession would welcome the code	4.42	(1.61)	4.48	(1.53)	0.23	.634
The code would protect inefficient pharmacists	3.66	(1.26)	2.91	(1.09)	128.82	.000
The code would retard the growth of businesses in this industry	3.72	(1.36)	2.89	(1.18)	66.36	.000
The code would help pharmacists by clearly defining the limits of acceptable conduct	2.91	(1.26)	4.11	(1.19)	149.18	.000
People would violate the code whenever they thought they could avoid detection	3.81	(1.31)	3.06	(1.22)	54.61	.000

6

are different, a multivariate analysis of variance (MANOVA) procedure was considered to be the most appropriate analytic technique for exploring differences in scores between the business and non-business students. This procedure compensates for variable intercorrelation and provides an omnibus test of any multivariate effect. However, as a preliminary check for robustness, Box's M test was conducted a priori to determine if the covariance matrices of the two genders are equal. Results indicated they were not significantly different thus validating the appropriateness of the use of the MANOVA for the analysis. The MANOVA revealed significant differences between the two groups (Wilks' $\Lambda = 0.533$, $p = .008$). That is, overall, the two groups had different scores for the eight items.

Next, to understand the underlying contributions of the variables to the significant multivariate effect, each independent variable was tested using a one-way analysis of variance (ANOVA) with the two groups treated as our two levels of the independent variable. The results, depicted in Table 3, show that differences between the two groups were significant on seven of the eight variables.

DISCUSSION

Surprisingly little attention has been given to students' perceptions of codes of ethics. A particularly critical subject concerns similarities and differences between business and non-business students with respect to ethical codes. This study led to several insights about this relationship with important implications for educators and practitioners. First, when the results shown in Table 3 are analyzed, several patterns emerge. Overall, the business students felt that the pharmacists would welcome the code (mean = 4.42); however, many believed these same pharmacists would violate the code whenever they thought they could avoid detection (mean = 3.81). Indeed, their average scores were even lower for "the code would raise the ethical level of business" (mean = 2.91), "the code would be easy to enforce" (mean = 2.96), "in situations of severe competition, the code would reduce unethical practices" (mean = 2.69), and "the code would help pharmacists by clearly defining the limits of acceptable conduct" (mean = 2.91. Interestingly, the mean scores for these four items were *below* the midpoints of the scales. That is, although they believed that the code would be well received by pharmacists, in their opinion its impact would be modest. Finally, the business students' scores for "the code would protect inefficient pharmacists" and "the code would retard the growth of businesses in this industry" were *above* the midpoints of these two scales (means = 3.66 and 3.72, respectively).

The non-business students felt that the pharmacists would welcome the code (mean = 4.48) and that "the code would help pharmacists by clearly defining the limits of acceptable conduct" (mean = 4.11), but were less certain that these same pharmacists would not violate the code whenever they thought they could avoid detection (mean = 3.06). Their average scores for "the code would raise the ethical level of business" (mean = 3.19), "the code would be easy to enforce" (mean = 3.10), "in situations of severe competition, the code would reduce unethical practices" (mean = 3.09) were well below their overall feeling that the pharmacists "would welcome the code" (mean = 4.48) but were slightly *above* the midpoints of the scale. Finally, the business students' scores for "the code would protect inefficient pharmacists" and "the code would retard the growth of businesses in this industry" were *below* the midpoints of these two scales (means = 2.91 and 2.89, respectively).

7

When the business students' scores are compared with those of their non-business counterparts, the ANOVA results show that, in general, the latter were more positive with respect to the impact of codes of ethics - they were more confident that the code would raise the ethical level of business ($F = 9.12$, $p = .003$), including in situations of severe competition ($F = 32.49$, $p < .0001$). In addition, non-business students were more sanguine with respect to the ability of enforcing such a code ($F = 4.12$, $p = .043$), and were more confident that the code would help pharmacists by clearly defining the limits of acceptable conduct ($F = 149.18$, $p < .0001$). On the other hand, business students were more certain that the code would retard the growth of business in this industry ($F = 66.36$, $p < .0001$), would protect inefficient pharmacists ($F = 128.82$, $p < .0001$), and that pharmacists would violate the code whenever they thought they could avoid detection ($F = 54.61$, $p < .0001$). Finally, with virtually identical means (4.42 for the business students and 4.48 for the non-business students), both groups were confident that pharmacists would welcome the code, and the ANOVA did not detect any significant differences between them ($F = 0.23$, $p = .634$).

Taken as a whole, these results corroborate previous research showing that business students are more tolerant than non-business students of questionable business practices. The implications of these results for educators are that these differences might reflect the type of education business students are (or are not) receiving and/or the values they bring to those classes. As these students move into positions of future corporate leadership, they could play a major role in elevating or reducing corporate ethical standards. This paper's findings will be disturbing to advocates of business ethics particularly since other studies report that, compared to non-business students, business students are more willing to cheat, especially once they move into the business world (Kidder, 1995; McCabe, 1992). The results seem to offer proponents of greater emphasis on societal issues and ethical conduct in business education support for their normative suggestions. For example, Hathaway (1990) contends that business students should be trained in understanding the responsibility of business to its larger social system. Only then can they "become better managers...and lead a corporation or two toward the kind of responsible behavior sorely needed in this troubled world" (p. 61). Indeed, some authors have argued that, if business schools themselves are to act as socially responsible organizations, they have a moral obligation to foster an awareness of the broader implications of business decisions (Gandz and Hayes, 1988).

For business practitioners, these results evoke a greater urgency for the need to advance organizational ethics. As today's business students enter the corporate world, this study suggests that business leaders must recognize that codes of ethics alone are necessary but insufficient. "Merely having standards is not enough, a company must make the standards understood, and ensure their proper dissemination within the organizational structure" (Palmer and Zakhem, 2001, p. 83). Codes are more effective when they are supported by formalized training programs that promote ethical conduct. According to Valentine and Fleischman (2007), "ethics codes and training signify that the company is institutionalizing an ethical culture by improving individual moral development" (p. 167). Today many businesses and professional societies are setting up seminars and workshops in ethics training. Typically, their code of ethics is used as a guide or standard. The purpose of such training is to sharpen the written ethical code, demonstrate its relevancy, and bring it to life (Valentine and Fleischman, 2008).

In addition, the effectiveness of codes of ethics depends heavily on managers' behavior. Often

"there is a gap between the existence of explicit ethical values and principles, often expressed in the form of a code, and the attitudes and behaviour of the organisation" (Webley and Werner, 2008, p. 45). A number of studies (e.g., Fisher and Baron, 1982; Greenberg and Scott, 1996) have concluded that employees often feel justified in engaging in unethical behaviors when they believe that their leaders have acted unethically toward them. There must be a high degree of commitment to business ethics from top management. They set the tone; they are the role models in terms of words and actions. Managers must embrace ethics and continually reaffirm their support for ethical conduct (Aguilar, 1994). A number of writers contend that ethical behavior is an important component of leadership (Morgan, 1993), and that the perceived ethical standards of a leader can affect the ethics of subordinates (e.g., Fulmer, 2004; May et al., 2003). Ambrose and Schminke (1999) argued that "the greatest influence on an individual's ethical behavior may be the ethical behavior of one's immediate supervisor" (p. 469). Perceptions of poor leader ethics might promote unethical behaviors among subordinates in at least two ways. First, subordinates that perceive the behaviors of leaders to be unethical might act unethically themselves in order to retaliate. Second, the behaviors of leaders often set precedents for employee behaviors (Kemper, 1966). The employees will believe that unethical behaviors are tolerated in their organization and may, therefore, act less ethically than they otherwise would.

A recent development in the study of leadership and ethics is a focus on authenticity among leaders. Authentic leaders are "transparent with their intentions [and have] a seamless link between their espoused values, actions, and behaviors" (Luthans and Avolio, 2003, p. 242). They are aware of their values and beliefs concerning what is or is not ethical and behave in ways that are consistent with those values and beliefs (Harter, 2002). These leaders can create a climate of authenticity in which all members of an organization are empowered to behave in ways they feel are ethical (May et al., 2003).

Codes of ethics, then, influence employee behavior when they function "not as a set of stand-alone rules, but as an integrated, embedded part of a larger part of organizational culture" (Stevens, 2008, p. 604). The influence of an organization's culture on employee ethics can also be understood in terms of Schneider, Goldstein, and Smith (1995) attraction-selection-attrition framework. They argue that organizational cultures proliferate by attracting individuals that fit with the existing culture and by eliminating members that do not. Thus, if an organization's culture consists of norms that support ethical behavior, ethical individuals will be attracted to that organization whereas unethical individuals will not. Conversely, an organization with an unethical culture might attract individuals that have unethical tendencies while driving ethical employees away.

Although this study offers an improved understanding of differences between business and non-business students, caveats must be offered regarding the conclusions generated by this research. First, additional research with larger national samples from each group would be necessary to confirm these findings. As Shaub (1994) points out, an individual's ethical perspective could be influenced by geographical and cultural location. Another caveat concerns the respondents' somewhat limited full-time work experience. An additional limitation concerns the generalizability of these results. A study such as this one is based largely on aggregate measures. However, it opens a line of inquiry on whether these results are valid when only those majoring in a particular discipline (e.g., accounting, management, etc.) are surveyed. This would ensure a greater homogeneity within the group being studied. Finally, a comparison of business students

and practitioners would be another productive avenue. For example, it would be useful to examine differences between future managers, younger managers, and managers with more extensive work experience. This type of analysis would yield insight into the perceptions of these three generations' attitudes toward codes of ethics.

In conclusion, the findings of this study provide helpful insights into an area of growing concern to society and all types of organizations. The numerous managerial ambiguities that are inherent in business decisions are further complicated by growing societal demands on corporations and increased awareness of the ethical dimension of decision making. This issue is likely to gain increased attention by educators and practitioners in the coming years.

REFERENCES

Adams, J., A. Tashchian and T. Shore: 2001, 'Codes of Ethics as Signals for Ethical Behavior', *Journal of Business Ethics* **29**(3), 199–211.

Aguilar, F.: 1994, *Managing Corporate Ethics: Learning from America's Ethical Companies How to Supercharge Business Performance* (Oxford University Press, New York, NY).

Ambrose, M. and S. Schminke: 1999, 'Sex Differences in Business Ethics: The Importance of Perceptions', *Journal of Managerial Issues* **11**(4), 454-464.

Arlow, P.: 1991, 'Personal Characteristics in College Students' Evaluations of Business Ethics and Corporate Social Responsibility', *Journal of Business Ethics* **10**(1), 63-69.

Baird, J.: 1980, 'Current Trends in College Cheating', *Psychology in the Schools* **17**(4), 515-522.

Becker, H. and D. Fritzsche: 1987, 'A Comparison of Ethical Behaviour of American, French and German Managers', *Columbia Journal of World Business* **19** (Winter), 87-95.

Beltramini, R.F., R. Peterson, and G. Kozmetsky: 1984, 'Concerns of College Students Regarding Business Ethics', *Journal of Business Ethics* **3**(3), 195-200.

Boiral, O.: 2003, 'The Certification of Corporate Conduct: Issues and Prospects', *International Labour Review* **142**(3), 317-340.

Bondy, K., D. Matten and J. Moon: 2004, 'The Adoption of Voluntary Codes of Conduct in MNCs: A Three-Country Comparative Study', *Business and Society Review* **109**(4), 449–477.

Boo, E. H. Y. and H. C. Koh: 2001, 'The Influence of Organizational and Code-supporting Variables on the Effectiveness of a Code of Ethics', *Teaching Business Ethics* **5**(4), 357–373.

Borkowski, S., and Y. Ugras: 1998, 'Business Students and Ethics: A Meta-Analysis', *Journal of Business Ethics*, **17**(11), 1117-1127.

Brytting, T.: 1997, 'Moral Support Structures in Private Industry – The Swedish Case', *Journal of Business Ethics* **16**(7), 663–697.

Crown, D. F, and M. S. Spiller: 1998, 'Learning from the Literature on Collegiate Cheating: A Review of Empirical Research', *Journal of Business Ethics*, **17**(6), 683-700.

Emmelhainz, M. A. and R. J. Adams: 1999, 'The Apparel Industry Response to ''Sweatshop'' Concerns: A Review and Analysis of Codes of Conduct', *Journal of Supply Chain Management* **35**(3), 51–57.

Farrell, H. and B. Farrell: 1998, 'The Language of Business Codes of Ethics: Implications of Knowledge and Power', *Journal of Business Ethics* **17**(6), 587–601.

Fisher, J.D. and R. Baron: 1982, 'An Equity-Based Model of Vandalism', *Population and Environment* **5**(3), 182-200.

Ford, R. and W. Richardson: 1994, 'Ethical decision making: A review of the Empirical Literature', *Journal of Business Ethics* **13**(3), 207-224.

Fulmer, R.F.: 2004, 'The Challenge of Ethical Leadership', *Organizational Dynamics* **33**(3), 307-317.

Gandz, J. and N. Hayes: 1988, 'Teaching Business Ethics', *Journal of Business Ethics* **7**(9), 657-669.

Gaumnitz, B. and J. Lere: 2002, 'Contents of Codes of Ethics of Professional Business Organizations in the United States', *Journal of Business Ethics* **35**(1), 35–49.

Glenn, J. and M. Van Loo: 1993, 'Business Students' and Practitioners: Ethical Decisions Over Time', *Journal of Business Ethics* **12**(11),835-847.

Greenberg, J., and K. Scott: 1996 'Why Do Workers Bite the Hand that Feeds Them? Employee Theft as a Social Exchange Process', In B.M. Staw & L.L. Cummings (eds.), *Research in Organizational Behavior* (JAI Press, Greenwich, CT), 111-156.

Harrington, S. J.: 1996, 'The Effect of Codes of Ethics and Personal Denial of Responsibility on Computer Abuse Judgments and Intentions', *MIS Quarterly* (September), 257–278.

Harter, S.: 2002, 'Authenticity', In C. R. Snyder, & S. Lopez (eds.), *Handbook of Positive Psychology* (Oxford University Press: Oxford, UK), 382-394.

Hathaway, J. W.: 1990, 'Students Teach Business a Lesson', *Business and Society Review* **72** (Winter), 58-61.

Hawkins, D. I. and A. B. Cacanougher: 1972, 'Students Evaluations of the Ethics of Marketing Practices: The Role of Marketing Evaluation; *Journal of Marketing* **36**(2), 61-64.

Hemingway, C. A. and P. W. Maclagan: 2004, 'Managers' Personal Values as Drivers for Corporate Social Responsibility', *Journal of Business Ethics* **50**(1), 33–44.

Hosmer, L. T.: 1999, 'Somebody Out There Doesn't Like Us: A Study of the Position and Respect of Business Ethics at Schools of Business Administration', *Journal of Business Ethics* **22**(2), 91-106.

Kaptein, M.: 2004, 'Business Codes of Multinational Firms: What Do They Say?', *Journal of Business Ethics* **50**(1), 13–31.

Kidder, S.: 1995, How Good People Make Tough Choices: Resolving the Dilemmas of Ethical Living (William Morrow, New York).

Kolk, A. and R. van Tulder : 2002, 'The Effectiveness of Self-regulation: Corporate Codes of Conduct and Child Labour', *European Management Journal* **20**(3), 260–271.

Kohlberg, L.: 1984, 'The Relationship of Moral Judgment to Moral Action, Morality, Moral Behavior and Moral Development' (John Wiley & Sons, New York, NY).

Kohlberg, L.: 1969, 'Stage and Sequence: The Cognitive-Developmental Approach to Socialization', In D. Goslin (ed.), *Handbook of Socialization Theory and Research* (Rand McNally, Chicago), 347–480.

Lefebvre, M. and J. Singh: 1996, 'A Comparison of the Contents and Foci of Canadian and American Corporate Codes of Ethics', *International Journal of Management* **13**(2), 156–170.

Luthans, F. and B. Avolio: 2003, 'Authentic Leadership: A Positive Developmental Approach' In K. Cameron, J. Dutton, and R. Quinn (eds.), *Positive Organizational Scholarship*, (Berrett-Koehler, San Francisco), 241-258.

May, D.R., T. Hodges, A. Chan, A, and B. Avolio: 2003, 'Developing the Moral Component of Authentic Leadership', *Organizational Dynamics* **32**(3), 247-260.

McCabe, D.: 1992, 'The Influence of Situational Ethics among College Students', *Journal of Sociological Inquiry* **62**(3), 365-374.

McCabe, D. and L. K. Trevino: 1993, 'Academic Dishonesty: Honor Codes and other Contextual Influences', *The Journal of Higher Education* **64**(5), 522-539.

Meyer, J. and B. Rowan: 1977, 'Institutional Organizations: Formal Structure as Myth and Ceremony', *American Journal of Sociology* **83**(2), 340-363.

Montoya, I. D. and A. J. Richard: 1994, 'A Comparative Study of Codes of Ethics in Health Care Facilities and Energy Companies', *Journal of Business Ethics* **13**(9), 713–717.

Morgan, R.B.: 1993, 'Self- and Co-Worker Perceptions of Ethics and their Relationships to Leadership and Salary', *Academy of Management Journal* **36**(1), 200-214.

Nwachukwu, S. L. S. and S. J. Vitell, Jr.: 1997, 'The Influence of Corporate Culture on Managerial Ethical Judgments', *Journal of Business Ethics* **16** (8), 757–776.

Palmer, D. and Zakhem, A.: 2001, 'Bridging the Gap between Theory and Practice: Using the 1991 Federal Sentencing Guidelines as a Paradigm for Ethics Training', *Journal of Business Ethics* **29**(1/2), 77-84.

Peppas, S.: 2003, 'Attitudes toward Codes of Ethics: The Effects of Corporate Misconduct', *Management Research News* **26**(6), 77-99.

Pierce, M. and J. Henry: 2000, 'Judgments About Computer Ethics: Do Individual, Co-Worker, and Company Judgments Differ?', *Journal of Business Ethics* **28**(4), 307–22.

Preble, J. F. and R. C. Hoffman: 1999, 'The Nature of Ethics Codes in Franchise Associations Around the Globe', *Journal of Business Ethics* **18**(3), 239–253.

Roig, M. and C. Ballew: 1994, 'Attitudes toward cheating of self and others by college students and professors', Psychological Record **44**(1), 3-12.

Schneider, B., H. Goldstein, and D. Smith: 1995, The ASA Framework: An Update', *Personnel Psychology* **48**(4), 747-779.

Schwartz, M.: 2001, 'The Nature of the Relationship Between Corporate Codes of Ethics and Behavior', *Journal of Business Ethics* **32**(3), 247–62.

Shaub, M.: 1994, 'An Analysis of the Association of Traditional Demographic Variables with the Moral Reasoning of Auditing Students and Auditors', *Journal of Accounting Education* **12**(1), p. 1-26.

Smyth, M. L. and J. R. Davis: 2004, 'Perceptions of Dishonesty among Two-Year College Students: Academic Versus Business Situations', *Journal of Business Ethics* **51** (1), 63–74.

Somers, M.: 2001, 'Ethical Codes of Conduct and Organizational Context: A Study of the Relationship between Codes of Conduct, Employee Behavior and Organizational Values', *Journal of Business Ethics* **30**(2), 185–95.

Sparks, J. and M. Johlke: 1996, 'Factors Influencing Student Perceptions of Unethical Behavior by Personal Salespeople: An Experimental Investigation', *Journal of Business Ethics* **15**(8), 871-887.

St. Pierre, E. K. and E. S. Nelson and A. L Gabbin: 1990, 'A Study of the Ethical Development of Accounting Majors in Relation to Other Business and Nonbusiness Disciplines', *The Accounting Educators' Journal* **3** (Summer), 23-35.

Stevens, B.: 2008, 'Corporate Ethical Codes: Effective Instruments for Influencing Behavior', *Journal of Business Ethics* **78**(4), 601-609.

Stohs, J. H. and T. Brannick: 1999, 'Codes and Conduct: Predictors of Irish Managers' Ethical Reasoning', *Journal of Business Ethics* **22**(4), 311–326.

Suchman, M. C: 1995, 'Managing Legitimacy: Strategic and Institutional Approaches', *Academy of Management Review* **20**(3), 571-610.

Valentine, S. and G. Fleischman: 2008, 'Ethics Programs, Perceived Corporate Social Responsibility and Job Satisfaction', *Journal of Business Ethics* **77**(2), 159-172.

Valentine, S., and G. Fleischman: 2007, 'Ethics Programs, Perceived Corporate Social Responsibility and Job Satisfaction', *Journal of Business Ethics* **77**(2), 159-172.

Valentine, S. and T. Barnett: 2002, 'Ethics Codes and Sales Professionals' Perceptions of Their Organizations' Ethical Values', *Journal of Business Ethics* **40**(3), 191–200.

Valentine, S. and T. Barnett: 2003, 'Ethics Code Awareness, Perceived Ethical Values, and Organizational Commitment', *Journal of Personal Selling and Sales Management* **23**(4), 359–367.

Van Tulder, R. and A. Kolk: 2001, 'Multinationality and Corporate Ethics: Codes of Conduct in the Sporting Goods Industry', *Journal of International Business Studies* **32**(2), 267–283.

Weaver, G. R., L. K. Trevino and P. L. Cochran: 1999, 'Corporate Ethics Programs as Control Systems: Influences of Executive Commitment and Environmental Factors', *Academy of Management Journal* **42**(1), 41–57.

Webley, S. and A. Werner: 2008, 'Corporate Codes of Ethics: Necessary but not Sufficient', *Business Ethics: A European Review* **17**(4), 405-415.

Webster, H. A. and R. L Harmon: 2002, 'Comparing levels of Machiavellianism of today's college students with college students of the 1960s', *Teaching Business Ethics* **6**(4), 435-445.

Assessing College Students' Impressions of Managers: The Significance of a College Degree

James O. Smith, Department of Management, College of Business,
East Carolina University, Greenville NC 27858, **SMITHJAM@ECU.EDU**,
(252)737-1296

Joseph Tomkiewicz, Department of Management, College of Business,
East Carolina University, Greenville NC 27858, **TOMKIEWICZJ@ECU.EDU**,
(252) 328-6836

William C. McDowell, Department of Management, College of Business,
East Carolina University, Greenville NC 27858, **MCDOWELLW@ECU.EDU**,
(252)737-1539

Alan T. Oglesby, TERRYOGLESBY@GMAIL.COM

ABSTRACT

This study investigated the impressions which college students held concerning managers who did not possess a college degree compared to those who possess a degree. While the sample held generally somewhat positive impressions of these managers they indicated little difference between the two groups with regard to the gender, major or employment status of the respondent.

INTRODUCTION

While there are many articles written concerning impressions or attitudes of managers with different characteristics including being Hispanic, African American, female and even gay or lesbian (2,3,4,5,6,9 & 10); there is scant information available regarding the impression held of managers without college degrees. Either through promotion or entrepreneurship individuals without a degree can become managers as there are no licensing requirements for most managerial jobs in the non-technical private sector. Surprisingly, there is very little written about these managers including attitudes of coworkers or the impressions of potential subordinates or peers.

This paper investigates college students' impressions of mangers that do not hold a degree. Based on Adam's equity theory, there will be a variation in the perceptions that subordinates

hold of their supervisors (1). These students' perceptions of their supervisors are expected to be higher if the supervisor has a degree equal to or greater than their own degree and lower if the supervisor has a degree lower than their own degree. It is believed that these impressions held by subordinates of their supervisors will be reflected in their subsequent behavior toward those supervisors. Thus knowing something about the impression of future peers and subordinates will help in understanding the place of these managers in the organization.

SAMPLE

The sample was collected in the Fall semester of 2008 and was composed of students enrolled in the entry level management course at a large regional university in the southeast. The students were a mix of business and non-business majors. There were 285 completed surveys. Table One displays the sample demographics.

TABLE ONE
SAMPLE DEMOGRAPHICS

Average age	21.2 years
Male	59.3 percent
Currently employed	58.2 percent
Years in current job	2.2 years
Business major	51.8 percent

The instrument for this study is a modified version of the Blacks in Business Scale [BIBS], developed in the 1970's by Stevens(8) and used to measure attitudes toward blacks as managers. This scale is widely accepted and has been modified for several uses. For this study the scale is modified to assess attitudes toward managers without college degrees. They are thus compared to other managers who possess a degree. The type of degree or major is not specified. Respondents are asked to indicate agreement or disagreement on a 7-point Likert-type scale with each of 33 statements (The BIBS as modified for this study is displayed in Table One; sample means are also included.) Scores can range from 33, indicating a highly unfavorable attitude toward those without a degree as managers, to 231, indicating a highly favorable attitude toward individuals with a college degree as managers. Since higher scores indicate more positive attitudes concerning the group in question, several questions were reversed in coding. Scores above four on individual items indicate a more positive attitude about managers without a college degree than scores below four.

Individual responses of the instrument were analyzed using t-test in order to see whether respondents had either positive or negative feelings about the questions posed or were they indifferent. Table Two displays the modified BIBS instrument and the sample means.

TABLE TWO

MODIFIED BIBS AND MEANS FOR TOTAL SAMPLE

	QUESTION	MEAN
1	In business situations, it is not acceptable to have Managers without a college degree in positions of authority.	3.92
2	Managers without a college degree possess the dominance to be a successful leader.	4.15
3	Managers without a college degree tend to allow their emotions to influence their managerial behavior more than would Managers with a college degree.	4.15
4	Managers with a college degree should be given preference over Managers without a college degree in being hired or promoted.	2.93**
5	Managers without a college degree cannot cope with stressful situations as effectively as Managers with a college degree can.	4.96**
6	In general, Managers with a college degree and Managers without a college degree are equally suitable for the professions (e.g., lawyer, doctor, etc.) and management positions.	2.66**
7	It is as desirable for Managers without a college degree as for Managers with a college degree to have a job that requires responsibility.	4.91**
8	Managers without a college degree lack the objectivity required to evaluate business situations properly.	4.44**
9	Challenging work is as important to Managers without a college degree as it is to Managers with a college degree.	5.29**
10	If a job as manager were available, given two equally qualified applicants, one Manager with a college degree and one Manager without a college degree, the Manager with a college degree should be recommended.	2.59**
11	A job that allows one to develop their own special abilities is more important to Managers with a college degree than it is to Managers without a college degree.	4.44**

12	In a demanding situation, a Manager without a college degree would be no more likely to break down than would a Manager with a college degree.	4.27*
13	Recognition for a job well done is equally important to Managers without a college degree and to Managers with a college degree.	5.68**
14	Managers without a college degree are less capable of learning mathematical and mechanical skills than are Managers with a college degree.	4.74**
15	Managers without a college degree are ambitious enough to be successful in the business world.	5.35**
16	Managers with a college degree and Managers without a college degree should not be given equal opportunity for participation in management training programs.	4.95**

17	Managers without a college degree do not have the capability to acquire the necessary skills to be successful managers.	5.40**
18	Manager without a college degree can acquire full job equality without any loss of their identity.	4.41**
19	On the average, Managers without a college degree are equally capable of contributing to an organization's overall goals as are Managers with a college degree.	4.76**
20	It is acceptable for Managers without a college degree to assume leadership roles as often as Managers with a college degree.	4.42**
21	It is justifiable for a Manager with a college degree to resent working for a Manager without a college degree as a superior.	4.13
22	Managers with a college degree have justifiable reason to feel uncomfortable having to take orders from Managers without a college degree.	4.01
23	The business community should never accept Managers without a college degree in key managerial positions.	4.89**
24	In job appointment and promotion, Managers with a college degree should be preferred to Managers without a college degree.	3.63**
25	All things considered, Managers with a college degree are intellectually superior to Managers without a college degree.	4.61**
26	Society should regard work by Managers without a college degree as	4.71**

valuable as work by Managers with a college degree.

27 It is not acceptable for Managers without a college degree to compete with 4.45**
    Managers with a college degree for top executive positions.

28 It is only fair that Managers without a college degree and Managers with a 3.83
    college degree should receive the same pay for identical work.

29 Managers without a college degree can be aggressive in business situations 4.95**
    that demand it.

30 Most Managers without a college degree are capable of making 4.81**
    managerial decisions under stress.

31 Managers without a college degree are competitive enough to be 4.84**
    successful in the business world.

32 Managers without a college degree possess the self-confidence required of 4.64**
    a good leader.

33 It is as important for Managers without a college degree as for Managers 5.60**
    with a college degree that their work be interesting.

ANALYSIS

When the sample means for each of the 33 questions were compared to four [four being a neutral opinion] using a one-sample t-test, significant differences [$p \leq .05$] were found on 27 of the 33 questions. Six of the twenty seven significant items had means below four indicating a less than favorable attitude toward managers without a degree. Also past experience with this instrument indicates that these means are rather low when compared to scores for Hispanics, lesbians, gays and disabled persons. (5,6,7,8,9,10)

The means were also compared to determine if there were differences in impressions by the sex, college major or employment status of the respondents.

When these ANOVA's were run by sex and major only one item showed a significant difference at the .05 level. Question 17 was different with regard to major.

Further analysis was conducted using ANOVA's of the thirty-three questions by current employment status and by whether the respondent's current supervisor had a college degree.

Again only one item was found to have significance difference between the groups. Question seven indicated a difference between the groups with those without a degree being more favorably viewed.

DISCUSSION

There appears to be some support for a favorable impression of managers without college degrees among the sample. However, this support was rather mild—bordering on the neutral and was not associated with several factors which might have been expected to influence the impression.

In general the conventional wisdom is that women are more willing to hold more favorable impressions of various groups as managers than men. (5,6,7,8) This was not the case, when the group was managers without degrees. There was no difference noted between man and women in their impressions.

Similarly it was expected that there should be some differences between college majors. It was assumed the business majors would be more negative than others but this proved not to be the case. It was also assumed that being employed should have some impact and again only one item was significant. It was assumed that those with a current supervisor without a college degree would be more favorable just because of the familiarity. This was not the case as only one item showed any difference.

In summary, there is support of a slightly positive impression of managers without a college degree among college students taking the first management course. However, the support is relatively weak and is not related to sex, college major, employment status or whether or not the current supervisor has a degree. The mild support could be explained as being relatively close to neutral and indicating that the respondents really did not consider managers without degrees to be worthy of much consideration. Thus they would have very bland impressions. If this is case, then almost no independent variable or set of variables will really explain the results. However, as this effort was preliminary, there are still several variables left to analyze. Remaining are the parents educational level and industry of the parents employment. Also, if there are enough cases it would be interesting to analyze the data by individual majors.

REFERENCES

1. Adams, J. S. 1963. "Toward an Understanding of Inequity." *Journal of Abnormal and Social Psychology* 67: 422-436.
2. Herek, Gregory M. & Glunt, Eric, "Interpersonal contact and heterosexuals' attitudes toward gay men: Results from a national survey" *Journal of Sex Research*, 2003, Aug 30(3) 239-244.
3. Hernandez, B.; Keys, C.; & Balcazar F. "Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review" *Journal of Rehabilitation*; 2000, Oct-Dec.
4. Horvath, Michael & Ryan, Ann Marie, "Antecedents and potential moderators of the relationship between attitudes and hiring discrimination on the basis of sexual orientation" *Sex Roles,* 2003 Feb 48(3/4) 115-130.
5. Smith, J.O. & Tomkiewicz, J. "Attitudes toward disabled persons as managers" *Proceedings of SeinForms*, 1999.
6. Smith, J.O. & Tomkiewicz, J. "Attitudes toward gay white males as managers" *Proceedings of SeinForms*, 2004.
7. Smith, J.O. & Tomkiewicz, J. "An analysis of "familiarity" as it relates to attitudes toward gays and lesbians" *Proceedings of SeinForms*, 2007.
8. Stevens,G "Attitudes toward Blacks in management are changing" *Personnel Administrator,* 1984, 29, 163-171.
9. Tomkiewicz, J. & Adeyemi-Bello, T. (1997). Perceptual differences in racial descriptions of euro-american and hispanic persons, *Psychological Reports*, Vol 80 (3, Pt 2): 1339-1343.
10. Tomkiewicz, J. & Brenner. O.C. (1996). The relationship between race (hispanic) stereotypes and requisite management characteristics, *Journal of Social Behavior and Personality*, 11, 3, 511-520.

A PRELIMINARY EXAMINATION OF THE FACTORS OF FACULTY *PERSONAL* PRODUCTIVITY: IS THERE A BETTER WAY?

Robert A. Herring III, School of Business and Economics, Winston Salem State University, Winston-Salem, NC 27110, 336-750-2338, herringr@wssu.edu

M. Eileen Higgins, College of Business, Frostburg State University, Frostburg MD 21532, 301-898-1812, eileenbenj@aol.com

Robert Dengler, Roosevelt University, 430 S. Michigan Ave, Chicago, IL 60605, 708-207-6939, RobtDengler@msn.com

ABSTRACT

The term "faculty productivity" is often used in academic circles. In many cases it is a synonym for productivity in the areas of *research and publishing*. However, the authors contend that there is a significant need of faculty to be more productive in *all* the roles of their lives. The authors examine all areas of faculty personal productivity, and emphasize that it applies to teaching, research, and service, as well as other roles and tasks. Among the productivity factors examined are clutter control, time management, focus, organizing, and management of email. Recommendations for further research are made.

BACKGROUND

The term "faculty productivity" is often used in academic circles. However, in most cases, it is essentially a synonym for productivity in the areas of *research and publishing*. Although related, that is *not* the way in which the authors of this paper are using the term.

We are interested in *all areas* of individual faculty personal productivity (FPP) for faculty members (hereinafter referred to as "professor" or "professors" for better flow in writing) in colleges and universities. For successful academic careers, it is important that college and university professors be productive in *all* of the many roles of their jobs. We, in academia, are all familiar with the "big three" roles of teaching, research, and service. Productivity is important in each of these. But what about all of the big and little administrative—and too often *clerical-level*—details that professors too often have to contend with? We propose that *productivity in all of these areas* is equally important.

If one does look at research and publishing output as a primary goal, the more efficient one is in the other roles, the more time will be available for research and publishing. Not too infrequently one hears recommendations made to increase research productivity by such means as favorable teaching schedules, allocating large blocks of time, sequestering oneself away from interruptions, etc. (Arnold, 2008; Perlemutter, 2008).

However, this is but one example of the factors that we are interested in researching. We are equally interested in how to increase productivity in such areas as class preparation, grading

papers, and the many other activities associated with the teaching role. Service too is of consideration; there is the question of how can one obtain committee assignments that are most congruent with one's talents and interests, and also are the *most congruent* with the days and times that the professor is in the office. Are there ways to delegate some administrative and clerical tasks to graduate or undergraduate assistants, or to perhaps better coordinate such activities with secretaries and office assistants?

Alternatively, how can professors find ways and time to do all of those tasks that *used to be done* by secretaries and office assistants in earlier years? For example, one of the authors of this paper teaches almost exclusively at a satellite campus where there is *no* clerical or secretarial support. Only occasionally are graduate assistants available to assist one or two professors at the satellite campus. Time-consuming, yet not counted in productivity calculations, are those tasks done by professors who do not have clerical support such as *all* typing; photocopying; mailing; phone calls; meeting arranging, taking, typing, and distributing meeting minutes; ordering review copies of books and all other items that have to be ordered; typing and copying syllabi and handouts for classes; creating Power Point slides for classes, presentations, conferences, etc. There are even those on some campuses who complain that they, too, have very little clerical support for even the most basic things such as photocopying handouts and other class materials and find themselves spending a portion of their days on nonacademic-specific tasks.

Various "administrivia" tasks, although they may be necessary to the effective functioning of a department, school, or university, are *interrupters* that can impede focusing on the main tasks. Multitasking is often recommended for today's professionals with busy schedules. However, there is evidence that multitasking, while it may seem that one is getting more done, may actually be *inhibiting* overall efficiency and effectiveness (Morgenstern, 2004).

There are many self-help books available devoted to increasing personal productivity by one means or another, of which the listings in the bibliography are merely a sample. It is not our attempt to duplicate such efforts. Perhaps, ultimately, comprehensive recommendations can be made that are specifically aimed at the duties of a professor.

NEED FOR THE STUDY

The following is an excerpt from a book review of Torkel Klingberg's *The Overflowing Brain* (Chabris, 2008) which appeared recently in the *Wall Street Journal*:

> Take a look at your computer screen and the surface of your desk: A lot is going on. Right now, I count 10 running programs with 13 windows on my iMac, plus seven notes or documents on my computer desk and innumerable paper piles, folders and books on my "main" desk, which serves primarily as overflow space. My 13 computer windows include four for my Internet browser, itself showing tabs for 15 separate Web pages. The tasks in progress, in addition to writing this review (what was that deadline again?), include monitoring three email accounts, keeping up with my Facebook friends, figuring out how to wire money into one of my bank accounts, digging into several scientific articles about genes, checking the weather in the city I will be visiting next week and reading various blogs, some of which are actually work-related. And this is at home. At

the office, my efforts to juggle these tasks would be further burdened by meetings to attend, conference calls to join, classes to teach and co-workers to see. And there is still the telephone call or two -- on one of my three phone lines (home, office, mobile).

This review brings home the utter complexity of the work of a modern-day professional or knowledge worker. Given the nature of the topic, this paper will pose more questions than it will answer. Thus we postulate that there is a very real need for this research and that it could result in enabling professors to be more productive. Obviously, the effective use of time is an important factor in the successful career of a professor (Plater, 1995)

To some degree the issue of the productivity of "professionals" and "knowledge workers" (these are very broad terms) could be generalized to faculty productivity. However, the authors postulate that there are some unique differences:

1. Professors typically have at least the following three roles:

   a. teacher
   b. researcher/writer
   c. service provider

2. In most cases the subject matter of research and subsequent academic publications such as conference proceedings papers, journal articles, and books or book chapters is *largely or wholly at the discretion of the faculty member.* This stands in contrast to the situation at other organizations in which research is conducted--where the research is likely dictated by organizational needs, particularly in a private sector company.

3. The degree of autonomy of the professor is greater than that of almost any other occupation. Although this quality of academic life is highly prized, it does have its downsides. It becomes critical for professors to learn how to set goals and priorities and to manage and schedule their own time. It seems reasonable that the failure to do so is a primary cause of some professors failing to achieve tenure.

4. The three roles stated above often come into conflict with one another. The time horizons for each are often very different. Consider the Time Management Matrix (Covey, Merrill, A. & Merrill, Rebecca R. (1994, p. 37),). This is a 2 X 2 matrix of Urgent—not Urgent, by Important—not Important. Many of the tasks of the teacher and service role are urgent; tomorrow's lesson plan must be developed, and the report due for tomorrow's committee meeting must be finished. However, a journal manuscript may be of prime importance in a professor's life; but it is often not urgent in that it can often be put off another day. Days turn into months, months turn into years; lack of publication due to such postponement can derail a professor's career.

LITERATURE REVIEW AND GAP

Despite examination of a number of data bases with varying key words, we have been able thus far to find only a handful of references which could be considered scholarly research even peripherally related to the topic (Milem, Berger, & Dey (2000), Shevat, (1987), Terpstra & Honoree (2009).

Despite the plethora of time management books written for the general public, the authors found only a handful of on-line academically oriented articles and newsletters on the topic of time management: (e.g., McGee (2006)).

A PROPOSED LIST OF FACTORS OF FACULTY PERSONAL PRODUCTIVITY

From common experience there are a number of factors that have an impact on the productivity (or lack thereof!) of faculty members. Furthermore, most if not all of the factors are interrelated. A few significant ones are the following:

Clutter Control

The cluttered professor's office, with books and papers scattered all over, including on the floor, is a stereotype. However, the stereotype certainly has some truth to it. Although the resident of such an office may say "I know it looks messy, but I know where everything is" it is doubtful that such is the case in many situations. The authors have personally struggled with clutter control, and, in fact, still struggle with this and many of the other factors.

Time Management

Perhaps more books have been written about time management than any of the other factors (e.g., Smith, 1992). Why does professor X get so much more done in a typical day than professor Y? Certainly a knowledge and practice of time management principles *within the context of the faculty role* is a major factor.

Focus

The ability to focus on important tasks and see them through to completion is paramount to a successful career. There may well be other factors that in turn affect focus, such as "flow," defined by Czikszentmihalyi (1990, xi) as "the positive aspects of human experience—joy, creativity, the process of total involvement with life…." How can faculty members get into a state of *flow* more often and tap the inner wellspring of creativity?

Organizing

Collections of books, articles, and other publications--whether in paper or electronic form--are both a blessing and a curse for many faculty. Research/writing and course management alone require files of some manner. What things should be saved, and in what format, and where? Certainly the lack of an ability to effectively organize and file often leads to problems with clutter.

Management of E-Mail

This one deserves a category all by itself. Many professors see e-mail management as one of their major challenges. There are some books and articles that have been written about coping with this modern-day problem (Herding cats and barrels of monkeys, Morgenstern (2004)).

Other

Many other relevant productivity factors could be postulated. Among these are *The 4 Golden P's:*
- **P**rioritizing
- **P**ersistence
- **P**rocrastination
- **P**sychological factors (individual differences; e.g., obsessive-compulsive tendencies.

Additionally, the support of college and university administration, at all levels, can play a significant role in encouraging, or hindering, FPP.

Finally, the role of the "inner self" is relevant to FPP. For example, Allen (2001) states "Getting things done is about the agreements we make with ourselves and how well we're going to honor them. We spend so much time worrying about the agreements we make with others, but it begins with making and keeping agreements with ourselves, eliminating the negativity that happens when we don't."

"You do not need to leave your room. Remain sitting at your table and listen. Do not even listen, simply wait. Do not even wait, be quite still and solitary. The world will freely offer itself to you to be unmasked, it has no choice. It will roll in ecstasy at your feet". *–Franz Kafka*

Certainly, most of us know that to make headway in our lives and with our ideas we have to take time for reflection. But in the sticky area of productivity, when all we want to do is step on the gas and go full-tilt ahead, who has time for reflection? Not making (or taking) time for this essential element of creativity is bound to eventually increase stress and wheel-spinning, both counter-productive to productivity. How can professors make more time for quality, uninterrupted reflection?

DISCUSSION

First of all, what are the relevant research questions for this topic? A few preliminary ones can be stated:

- *What elements of FPP do professors consider to be relevant to being successful?* Note: Being successful can also include accomplishing necessary tasks in a shorter rather than a longer period of time, in order to allocate time to other activities (family, leisure, community, etc.) of a well-rounded professor's life.
- *Are some techniques more effective than others in addressing the factors?*

- *Is there an interest among professors in enhancing their FPP?*
- *Are there best practices that can be identified?*

Two of the authors conducted a presentation at the November 2008 meeting of the Decisions Sciences Institute in Baltimore, Maryland (Dengler and Herring, 2008). There it was proposed to accomplish the following:

- To generate research in the subject.
- On an ongoing process, to identify and provide access to self-help resources and best practices to assist academics with personal productivity.
- To design and conduct a web-based survey of DSI and Academy of Management members.
- To encourage other interested persons to develop collateral paper presentations for DSI 2009 on related subjects.

An ultimate goal, after significant research has been conducted and findings generated, is to be able to provide tools for professors to maximize their FPP. The authors invite comment and suggestions from readers in furtherance of this stream of inquiry.

REFERENCES

Allen, D. *Getting Things Done: The Art of Stress-Free Productivity*. Viking Penguin, NY, 2001

Arnold, D. Publishing tips for business faculty, *Southeast Decision Sciences Institute Proceedings* (CD-ROM), 2008.

Chabris, C. F. You have too much mail: The overflowing brain, *Wall Street Journal, December 15, 2008, A17.*

Covey, S. R., Merrill, A. Roger & Merrill, Rebecca R. *First Things First.* Simon & Schuster, New York, NY, 1994.

Czikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*, Harper Perennial.

Dengler, R. & Herring, R. (2008). Interactive workshop on academic personal productivity. Presented at the Decision Sciences Institute annual meeting November 2008, Session QP-21.

Herding cats and barrels of monkeys: Time management for faculty: http://cuttingedge-ucation.wetpaint.com/page/Time+Management+for+Faculty?t=anon

Ibekwe, L. A. (2007). Using Total Quality Management to achieve academic program effectiveness: An evaluation of administrator and faculty perceptions in business schools at historically black colleges and universities. Dissertation

McClain, L. T. Lessons in time management, *The Chronicle of Higher Education*, December 16, 2003. http://chronicle.com/jobs/news/2003/12/2003121601c.htm

McGee, J. A reading list for aspiring knowledge workers, *Future Tense,* February 27, 2006, http://futuretense.corante.com/archives/2006/02/27/a_reading_list_for_aspiring_knowledge_workers.php

Milem, J. F.; Berger, J. B.; Dey & E. L. Faculty time allocation: A study of change over twenty years. *Journal of Higher Education*, 71(4), 454-75.

Morgenstern, J. *Never check e-mail in the morning: And other unexpected strategies for making your work life work*. Fireside, New York, NY, 2004.

Perlmutter, D. D. Do You Really Not Have the Time? *The Chronicle of Higher Education August 22, 2008,* http://chronicle.com/jobs/news/2008/08/2008082201c.htm

Plater, W. M. Future work: Faculty time in the 21st century. *Change*, 27(3), 22-33

Smith, K. *It's about time.* Crossway Books, Wheaton IL, 1992.

Terpstra, D. E. & Honoree, A. L. The effects of different teaching, research, and service emphases on individual and organizational outcomes in higher education institutions. *Journal of Education for Business*. 2009, 84(3), 169-177.

SELECTED BIBLIOGRAPHY

The following are selected references germane to the subject of FPP which were *not* cited in the paper:

Aslett, D. *Clutter's Last Stand,* Writer's Digest Books, Cincinnati OH, 2008.

Aslett, D. *The Office Clutter Cure,* Marsh Creek Press, Pocatello ID, 2008.

Aslett, D. *How to Have a 48-Hour Day,* Marsh Creek Press, Pocatello ID, 1996.

Bruch, H & Sumantra, G. *A Bias for Action,* Harvard, MA, 2004

Conlon, M. Smashing the clock. *Business Week,* December 11, 2006, (#4013), 60-68.

Hummel, C. E. *Tyranny of the urgent.* Intervarsity Press, Downers Grove IL, (1994).

Ibekwe, L. A. (2007). Using Total Quality Management to achieve academic program effectiveness: An evaluation of administrator and faculty perceptions in business schools at historically black colleges and universities. Dissertation

Johnson, S. *Who moved my cheese?* G. P. Putnam's Sons, New York NY, 1998.
Kayser, T. A. *Mining group gold: How to cash in on the collaborative brain power of a group.* McGraw-Hill, NY, 1995

Kelley, R. E. *How to be a star at work: Nine breakthrough strategies you need to succeed.* Times Books (Random House), New York NY, 1998.

Mandel, M. The real reasons you're working so hard…and what you can do about it. *Business Week,* October 3, 2005, 60-67.

Palmer, P.J. *The courage to teach: Exploring the inner landscape of a teacher's life.* Jossey-Bass, 1998.

Ridenour, F. *The traveler's guide to--life at warp speed: 30 short readings to help you slow down and catch up with God.* Regal Books, Ventura CA, 1990.

Shevat, R. S. An examination of the consonance between faculty work preferences and administrative expectation and the perceived need for the reorganization of work for purposes of faculty satisfaction and institutional efficiency in one college, 1987, Dissertation.

ADDITIONAL SELECTED WEBSITES

Center for Excellence in Teaching, Boston University, *Time Management for Faculty,* http://www.bu.edu/cet/develop/time.html

Green, Sheila D., *Green Productivity Solutions,* http://www.sgps.biz/page2.html

Stephen R. Covey, The seven habits of highly effective people. Discussion Notes Prepared by Joseph M. Mellichamp, http://www.leaderu.com/cl-institute/habits/habtoc.html

MBAS AND MODERN STREET GANGS
A BUSINESS STUDY

Tim Nichols
MBA Student, North Carolina State University
College of Management, Campus Box 7229
Raleigh, North Carolina 27695-7229
(919) 515-6833, twn@duke.edu

Paul K. Bergey
Associate Professor, North Carolina State University
College of Management, Campus Box 7229
Raleigh, North Carolina 27695-7229
(919) 515-6949, pkbergey@ncsu.edu

ABSTRACT

This paper considers the unregulated internal business practices of the contemporary street gang that are associated with instilling gang loyalty. Through this optic, one can better understand the key influences on gang loyalty. Subsequently, the author interprets whether or not the influences can be transferred into the modern business paradigm. Using observations through existing research and reporting, the author intends to identify key influences, provide analysis, and suggest whether these influences may, in some form, be relevant to modern, legitimate businesses.

INTRODUCTION

The composition and structure of the modern street gang defies homogeneity. Multiple, complementary research efforts demonstrate varying levels of organization, profitability, and routine among the numerous, disparate gang entities. In fact, comparisons of first generation gangs with older gangs demonstrate an evolutionary process, an increasing need for organization and accountability commensurate with growth, greater formality and ritual, and an increased focus on a developed image (Esbensen, 2004). There appears to be, however, one aspect of the modern street gang, whether first generation or older, that manifests immediately and exists throughout the evolutionary process. That aspect is gang loyalty. In addressing the fundamental question of "what modern business can learn from modern street gangs," the most apparent response would be that modern street gangs develop and maintain a strong sense of organizational loyalty—a characteristic becoming increasingly absent in the modern legitimate business environment. In Daniel Pink's *Free Agent Nation*, the author contends that the rupture in employee loyalty was triggered by the disappearance of the paternal corporate model, the rise of the idea economy and the decline of the industrial economy, the increase in individual prosperity, and the tenuous existence of modern corporations (Pink, 2001). Currently, talented and skilled employees exhibit an increasing propensity toward abandoning their current

employment for more attractive prospects. This pattern of employment departs from the previous culture of employee-organization loyalty. Additionally, it highlights an important variable in business operations that frequently reduces efficiency, dilutes cohesion, and challenges productivity.

The purpose of this paper is to consider the key influences on gang loyalty and to then interpret whether or not the influences can be transferred into the modern business paradigm. In each of the following subsections, the author intends to describe a key influence, to provide analysis, and to suggest whether the influence may, in some form, be relevant to modern, legitimate businesses.

THE INDELIBLE TRANSITION

Entry into a modern street gang requires a verbal and physical commitment of the candidate to support and defend the gang. In order to both test and foster loyalty between the candidate and the gang, a series of possible rituals accompany the transition into the gang. The "rite of passage" may include conducting a crime in the presence of gang members; in doing this, the candidate demonstrates a willingness to put the gang in front of personal inhibitions. A gang candidate may be required to fight other gang members, possibly multiple gang members, at once; what seems contrary to the concept of loyalty appears to be a required demonstration of toughness…which entitles the candidate to a position among the equally tough members of the gang. Additionally, initiation in this manner serves to strengthen social cohesiveness of the whole organization (Esbensen 2004). James Diego Vigil describes this as, "the desire to belong, prove oneself, gain respect, and show loyalty are all intertwined with the appropriate (by gang standards) role behaviors expected of the initiate" (Esbensen, 2004, p. 223). Finally, ritualistic initiations may include very detailed pledges of allegiance and the application of tattoos, scars, or brands in order to codify the permanence of the individual's relationship with the gang.

Each of the aforementioned actions relate to a similar concept of selfless behavior on the part of the individual and elitism on the part of the gang. Modern gangs attempt to create an organizational culture in which membership and loyalty are paramount, and other obligations are to be treated as secondary. Additionally, membership in a gang is intended to convey an elevated or esteemed appearance to the candidate. Candidates for gang membership undergo testing and evaluation of their willingness to fully commit. Although the tests are rudimentary and biased towards the physically courageous and criminally disposed, such values appear to be conflated into a single impression – loyalty (Levitt & Dubner, 2006).

Modern business enterprises attempt to invest in the idea of elitism in order to attract, hire, and maintain choice employees. In exercising this discretion, certain organizations only hire employees from elite colleges or graduate schools.   These efforts vaguely attempt to add "elite-ness" to their organizations. Similarly, the grueling and difficult probationary period for lawyers, doctors, and other professionals hoping to advance presents generally similar ideas as to the aforementioned "rite of passage." The differences, however, are noteworthy. Loyalty does not appear to be fostered with the same centrality of purpose; instead, these probationary trials attend to the discovery of the candidate's professional skill, work ethic, and productivity. While this may appear to be a marginal difference, it is not. Therefore, the central thrust in

2

"probationary" efforts for modern business are not focused on enhancement of loyalty. In order to more closely emulate gang machinations, modern business would need to adopt a greater emphasis on the individual's commitment to the organization. Although this concept veers away from the strategic direction of contemporary business models, it demonstrates, in effect, one of the causes related to ruptured loyalty.

LOYALTY MONEY AND TRIBUTE PAYMENTS

Another intriguing method of reinforcing loyalty in the modern street gang can be observed through the collection of "loyalty money." This specific term is contrived, but its description warrants attention. According to Sudhir Venkatesh, those members existing on the lowest tier of the gang hierarchy (the "rank and file" members) are required to pay monthly dues or "loyalty" premiums in order to remain in good standing with the gang (Levitt & Dubner, 2006). As members rise through the ranks, they are relieved of the burden of dues, but they are then required to submit a portion of their illicitly earned income to the next echelon in the gang hierarchy as a form of tribute payments. As depicted in figure 1, the required loyalty payments parallel the following model: rank and file pay dues to local gang leadership; foot soldiers pay tribute to gang leadership; gang leadership pays tribute to the central leadership. In return, the central gang leadership provides protection, access to illicit drugs (wholesale), and leadership (Esbensen, 2004). Although this may seem counterintuitive to the concept of loyalty, it reveals a recurring and powerful binding influence between the disparate layers of a gang hierarchy.

Loyalty payments demonstrate an enforced deference to an organizational hierarchy; moreover, such payments entangle all members of the gang organization. The least active individuals pay for the image and protection of gang membership, and the most active members are compensated for their comprehensive enforcement of gang image. Any threat to the established symbiotic relationship threatens the image and security of the gang—making loyalty doubly important to its effective operation.

The requirements for such an organizational scheme are based on a distributed hierarchy with a very small central leadership. In fact, only a very small portion of members in a large gang actually make a profit (Levitt & Dubner, 2006). Centralized wealth through distributed effort appears to create a desirable separation between leaders and regular gang members. This distinction is reinforced by gang leaders extracting shares of the gang's illicit business revenues in descending order of importance. Gang profits are first paid to the central leadership, then to the local gang leader. Finally, the remainder is distributed to the foot soldiers of the gang. In doing this, the gang leader maintains, reinforces, and protects his status and position and, through tributes to the central gang leadership, maintains the possibility of his future promotion.

FIGURE 1. GANG LOYALTY PAYMENT MODEL
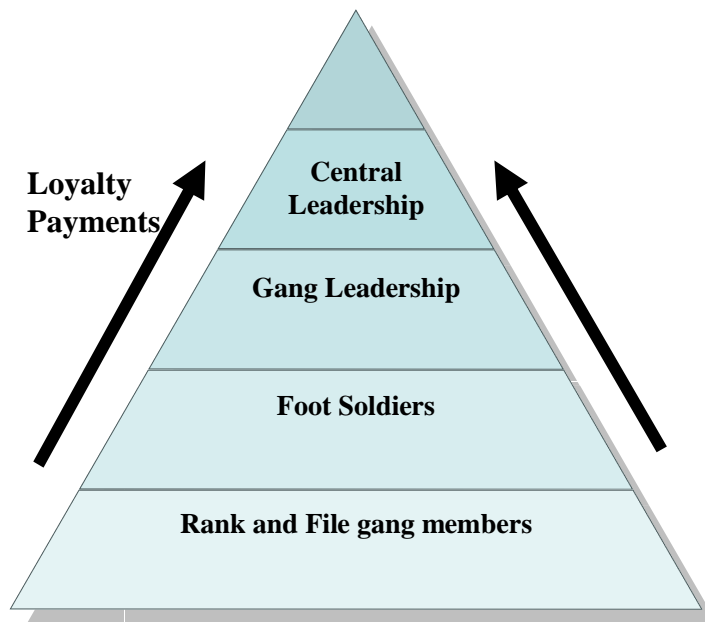
Modern business managers exist in an environment of centralized wealth; however, there are no overt efforts to extract loyalty payments from employees. Instead, business managers are tied to the profitability of the company through the efforts of its employees. In a similar fashion to gang operations, corporate leaders benefit the greatest from profitable results. Simply stated, this makes the employees a "means" rather than an "end" in the quest for loyalty. In a criminal gang, the fellow gang members are both the means and the ends—reinforcing the absolute necessity of gang loyalty. Modern business does not reflect a similar condition.

THE RIGOROUS PATH TO THE UNACHIEVABLE

The previous sections discussed concepts involving behavior ascribed to gang members in order to foster and demonstrate loyalty. The final section of this discussion deals with a more individual perspective of why a gang member is loyal. The allure of promotion appears to be a prominent force among gang members. Recognizing that the prospect of other opportunities for those vulnerable to gang influence is noticeably small (i.e. exacerbated by socio-economic class, high percentage of split families, absent fathers, poor education, and widespread drug use), it follows that gang members pursue promotion within the gang to achieve greater respect and, most notably, more money. Steven Levitt relates this to an organizational "tournament" during which very few members ascend to the executive ranks (Levitt & Dubner, 2006). To reinforce hierarchical rigidity, Gang leadership flaunts its elevated status in a way that Shelby Steele called, "compensatory grandiosity" (Steele, 1991, p. 62). The more grandiose a leader's status appears, the more it appeals to those on the lower hierarchical levels. Additionally, gang leaders repeatedly reinforce the rigid stratification within the gang in order to protect their standing. A perspective from the lower levels of gang membership highlights the same differences. Foot soldiers lack the authority, the financial standing, and the respect associated with the leaders, but they believe such status is achievable through hard work. Rank and file members see the same, achievable status when they observe foot soldiers. As stated before, the allure is enhanced by the

4

lack of other, outside options for advancement. According to interviews with incarcerated or retired gang members, the upward flow of revenues entices gang members to reaffirm and demonstrate their loyalty in hopes of advancing within the gang hierarchy (Esbensen, 2004).

The elevated status of corporate leaders demonstrates a strong relationship with the stratified status of gang hierarchies. With corporate executives making 300 dollars for every dollar earned by a lower level employee, the modern business paradigm produces similar seeds of envy. The difference, however, lies with the perception that such an elevated status is achievable by any employee within the modern corporation. Legitimate bureaucracies are characterized by rigid rules and processes that retard the pace of upward movement. Therefore, the modern working man probably holds a more realistic view towards the possibilities of his rapid advancement. This reality results in a more defined "disloyalty" between employees and businesses and is an important topic discussed in *Free Agent Nation* (Pink, 2001).

Regarding the manner in which gang members flaunt their status, this characteristic transcends to the legitimate business world and appeals on a basic level to a broad population. The grandiosity of professional athletes enhances their appeal and makes younger athletes work harder to achieve the same status. The grandiose, ego-feeding lives of modern business executives (i.e. Donald Trump, Jack Welch) makes young business men and women envy their material richness. A preponderance of students attending MBA programs identify "promotion" as their single rationale for attendance. It would, therefore, be inappropriate to discount the attraction related to executive privilege in modern business.

GANGSTER BURNOUT, THE RECRUIT-REBUFF DICHOTOMY, AND KEEPING THE PRIVILEGED FEW.

As previously mentioned, the centralized gang leadership retains its wealth through: a) maintaining the reputation of the gang; b) fostering successful business operations; and c) preserving the limited size of the governing body. In this regard, basic business rules apply such that fewer executives reap greater rewards (Venkatesh, 2008). A careful balance, therefore, must be achieved by the senior leadership in order to effectively entice participation and effort by junior gang members (retail operations) using the lure of future executive status while vigilantly guarding *actual* promotions to the aforementioned executive status—thereby preventing dilution of profits. Venkatesh explains this approach: "Faced with continuous turnover, the gang brings aboard new recruits who are sustained by the objectively very slim—but symbolically very powerful–belief that they will achieve substantial earnings while working for the gang" (Esbensen, 2004, p. 244).

Similarly, as gang members become older and more experienced, they typically grow more encumbered by other financial requirements (family, etc.). It is at this point when they realize the insufficiency of their gang-based income to meet their needs. Recognizing that their ascension to executive status is unrealistic, these older, more experienced gang members seek legitimate employment or alternative means for meeting their financial requirements. Such a realization by the gang member effectively completes the "life cycle" of most gang members (Esbensen, 2004). The aging member becomes disenchanted and departs; the gang's executive leadership indirectly obviates a threat to their executive status; and efforts continue to recruit and

5

employee young, energetic, and idealistic youth to join the gang in order to affect the necessary operational tasks. This "recruit-rebuff" dichotomy presents an interesting topic for future research due to its tenuous, heavily personality-dependent nature. In the end, departed members maintain their loyalty to the gang, retain the respect of fellow members, and participate in social activities. Most significantly, they have effectively removed themselves from the "tournament" to reach executive status.

Executive primacy remains a central theme in the modern business environment. Those who have attained such an elevated status want to preserve it. Similarly, loyalty remains a tangible characteristic related to the quest for executive status. It is not uncharacteristic, however, for a business leader to create conditions that retard the rise of junior executives who appear threatening. A modern example would be Morgan Stanley CEO Jamie Dimon's abrupt departure from CITIBANK. Dimon was the protégé to CITIBANK CEO Sandy Weill for 16 years prior to being fired by Weill. Interestingly, a number of gang-like similarities surfaced in this 1998 event that caught Wall Street by surprise. Weill had hired Dimon directly from Harvard business school in 1983, and Dimon followed Weill through a series of executive positions leading to his chairmanship of CITIBANK. Dimon's performance, however, began to encroach, and, in some cases, overshadow, Weill's prestige (Spiro, 1998). The friction between the two executives increased until a dispute over Dimon's refusal to promote Weill's daughter poured the foundation for his eventual dismissal. The central motivation of Sandy Weill compares directly with that of a street gang's executive leadership: power sharing is distasteful and should be avoided. In this recent vignette, Dimon's loyalty to Weill was mutually beneficial until the point where he achieved apparent peer status. Weill's defensive maneuver reflects the aforementioned recruit-rebuff model and its variable relationship to the concept of loyalty.

WHEN MBAS GO GANGSTER

Conspicuously absent in the business construct of the modern street gang is the concept of external or outside regulation. In reality, gang business decisions result from loyalty, pragmatic efforts to increase profit, and efforts to avoid criminal prosecution. The modern legitimate business environment, however, is replete with external regulation. When business managers attempt to employ the pragmatics of gang operations, trouble soon follows.

In his recent book, *Stolen without a Gun*, convicted felon and MBA Walt Pavlo recounts the many illegal decisions he made while a junior executive at MCI Communications. His loyalty to the company and his desire to excel fostered the decisions to disregard oversight regulations. Throughout the book, Pavlo demonstrates a steely pragmatism in hiding an ever-growing problem with customer debt to MCI. Similar to the atmosphere set by gang leaders, the atmosphere of MCI's corporate executives reflected a "make profit, no excuses" mindset. Pavlo loyally obeyed. Specifically, the MCI sales force was directed to recruit high-risk customers (illegitimate businesses, fortune tellers, phone sex vendors) in order to demonstrate an increased customer base. This business line, categorized as "carrier sales," grew dramatically as MCI lowered its credit standards for long distance resellers. These vendors quickly amassed a huge debt to MCI with virtually no intention to meet their obligations. As Pavlo recounts, "the corporate chiefs, eyes always on the stock price and therefore on MCI's earnings reports, had a

6

special fondness for carrier sales. No one wanted to disturb the goose laying the golden eggs" (Pavlo, 2007, p. 63).

Pavlo identifies a decisive moment at which his loyalty to MCI became irreconcilably fractured. When his mentor and boss, a retired Naval officer, realized the hopelessness of their debt collection requirements (they were allowed to write off 15 million dollars a year in unrecoverable debt but had accrued at least ten times that amount) and requested transfer, Pavlo began a formative transition to a "whatever it takes" approach to accomplishing the corporate goal. He became an MBA gangster. Pavlo lied on reports, illegally moved debt around the company to hide it, and entered into criminal relationships in order meet his work requirements. He became resentful towards MCI for their inability to understand the impossible tasks for which he held responsibility. Prior to his felony conviction, Pavlo had hidden over half a billion dollars in unrecoverable debt simply to make MCI look attractive to a potential buyer. After years in Prison, Pavlo identifies his corporate loyalty and his personal motivation to ascend to executive status as the main reasons for falsifying information. His idealism changed to self-survival after discovering that the MCI executives gave him an impossible task and shared none of his legitimate concerns (Pavlo, 2007).

CONCLUSION

The results of this exploratory research clearly surface other, related areas for further academic development. Organization loyalty remains a central topic in the discussion of modern business operations as well as in the unregulated activities of criminal gangs. Both entities have demonstrated processes by which individual rigor and commitment is observed and evaluated; similarly, the transition from apprentice business professional to "partner" or candidate to gang member reveals a discernable, value-added investment by the organization to the individual in the form of recognition, benefits, or compensation. The underlying intent of this informal contract between an individual and an organization reflects both a pragmatic and utilitarian purpose. The individual seeks ascension to higher levels of reward through membership, and the organization functions only through the consistent utilization and loyalty of lower level employees.

Clearly, the aforementioned model arises from organizational and individual necessity. Therefore, the subsequent appearance of the "recruit-rebuff" process demonstrates an interesting dichotomy—juxtaposing the desire for promotion by junior members—gaining experience, providing service, and receiving disproportionately lower level of compensation—with the executive membership's desire to maintain the current stratification—seeking to protect their disproportionately high level of compensation, power, and notoriety. The discussion of the emergent rivalry of contemporary business leaders Jamie Dimon and Sandy Weill poignantly reflect the "recruit-rebuff" dichotomy. Similarly, Venkatesh describes the fervid resistance by the Chicago Gang's central leadership to grow its numbers and dilute profit. The "recruit-rebuff" process demonstrates significant potential for follow-on research.

Finally, the discussion on organizational loyalty would not be complete without an example of misplaced loyalty. Walt Pavlo's felonious actions while serving as a junior executive at MCI reflect the challenges associated with a poor organizational climate. Corporate executives

7

expected results *sans* excuses from Pavlo, but his ability to affect his responsibilities became obviated by other corporate decisions. In an effort to demonstrate his loyalty and remain competitive for advancement, Pavlo perpetuated criminal actions to ostensibly hide the emerging problems facing MCI. Pavlo had, in effect, become an MBA gangster—willing to commit a crime in order get promoted. Future research focused on evaluating "post-membership" loyalty would address this issue; additionally, further investigation into the relationship between misplaced loyalty and the recruit-rebuff process would highlight potential areas for organizational dysfunction. The proposed question in this research paper, "what can modern business managers learn from criminal gangs," reveals an intriguing variable with which both organizations contend: loyalty.

REFERENCES

Books

Esbensen, F., Tibbetts, S. G., & Gaines, L. (2004). *American youth gangs at the millenium.* Long Grove, IL: Waveland Press, Inc.

Levitt, S. D., & Dubner, S. J. (2006). *Freakonomics.* New York, NY: HarperCollins.

Pavlo, Jr., W., & Weinberg, N. (2007). *Stolen without a gun.* Tampa, FL: Etika Books.

Pink, D. H. (2001). *Free agent nation.* New York, NY: Warner Business Books.

Steele, S. (1991). *The content of our character.* New York, NY: HarperPerennial.

Venkatesh, S. A. (2008). *Gang leader for a day.* New York, NY: Penguin Press.

Articles

Donohue, III, J. J. & Levitt, S. D. (1988). Guns, violence, and the efficiency of illegal markets. *The American Economic Review*, *88*(3), 463-467.

Levitt, S. D. & Venkatesh, S. A. (2001). Growing up in the projects: The economic lives of a cohort of men who came of age in Chicago public housing. *The American Economic Review*, *91*(2), 79-84.

Levitt, S. D. & Venkatesh, S. A. (2000). An economic analysis of a drug selling gang's finances. *The Quarterly Journal of Economics*, *115*(3), 755-789.

Spiro, L. N. & Silverman, G. (1998, Nov 16). Where does the buck stop at CITI? *Business Week*, 3604, 180-184.

.

9

Diversity Management Recognition and the Impact on Stock Price Valuation

Amy McMillan-Capehart

College of Business

East Carolina University

3124 Bate Building

Greenville, NC 27858

(252) 328 5337

mcmillancapeharta@ecu.edu

Joshua R. Aaron

College of Business

East Carolina University

134 Slay

Greenville, NC 27858

(252) 737-1597

aaronj@ecu.edu

Diversity management refers to a variety of issues and activities related to the recruitment, hiring, and effective use of diverse human resources (Richard & Kirby, 1997). These activities are often referred to as "diversity initiatives" and involve actions such as creating an organizational culture that values diversity, facilitating higher career involvement of non-traditional employees, and dealing with employee resistance to diversity (Richard & Kirby, 1997). Simply having a diverse workforce is not enough to harness the benefits. An organization must place significant emphasis on diversity.

Organizations that effectively manage their culturally diverse workforce through diversity initiatives will reap the rewards (Stevens, Plaut, & Sanchez-Burks, 2008). Organizations that value diversity enjoy many organizational benefits such as increased creativity, enhanced teamwork, and greater innovation (Loden, 1996; Williams & O'Reilly, 1998). However, when diversity is not a primary concern of managers, organizations may experience higher absenteeism, higher turnover, reduced productivity, and lost sales (Loden, 1996; Williams & O'Reilly, 1998). As such, organizations that effectively manage their diverse employees can obtain a competitive advantage over firms that do not (Konrad, 2003; Richard, Murthi, & Ismail, 2007).

Simply hiring diverse employees does not guarantee enhanced creativity, decision making, or flexibility. Instead, the multiculturalism and uniqueness of a diverse workforce must be cultivated and promoted so employees feel free to express their viewpoints (Comer & Soliman, 1996). Poor diversity management often results in conflict and high employee turnover. As such, a "value-in-diversity" (VID) approach is necessary in order to enjoy the positive effects of diversity while avoiding the negative effects (Cox, 1994). Firms that value

diversity encourage all employees to participate in organizational decision-making and to fully develop their unique skills and perspectives (Comer & Soliman, 1996).

This study makes the following contributions. First, we examine the impact of diversity management on firm performance. To accomplish this goal we use DiversityInc.'s Top 50 Companies for Diversity list as a proxy for organizations that are not only diverse but are also recognized for managing diversity. Second, we examine the impact of diversity and diversity programs across industries. In particular, we examine whether diversity management is more or less related to performance in service oriented or manufacturing firms.

Theoretical Development

The resource-based view provides a theoretical rationale for hypothesizing a positive impact of diversity. This theory posits that sources of sustainable competitive advantage should be valuable, rare, imperfectly imitable, and non-substitutable (Barney, 1991). Resource-based theory proposes that organizations can best achieve a sustainable competitive advantage by selectively obtaining and effectively utilizing physical, human, and organizational resources (Barney, 1991). Diversity management involves the effective utilization of a diverse group of human resources.

Cox and Blake's (1991) cultural diversity arguments support Barney's (1991) theory that a competitive advantage can stem from unique social relationships that cannot be duplicated (e.g., synergies resulting from culturally diverse employees). These social relationships are often valuable, rare, non-imitable, and non-substitutable. In particular, Cox and Blake's (1991) resource-acquisition argument, suggests that those companies that have the best reputations for managing diversity will attract the best personnel. In addition, their marketing argument proposes that culturally diverse employees bring insight and knowledge about diverse market

segments that can increase sales for the organization. For example, organizations can increase the number of women and minorities to better match the demographic characteristics of their markets (Cox & Blake, 1991; Konrad, 2003; Pfeffer & Salancik, 1978). Organizations that can successfully attract a diverse workforce will be better positioned to sell to a broader and more diverse customer base, potentially increasing organizational performance.

As the labor pool becomes more and more diverse, individuals are beginning to cite diversity programs as a primary prerequisite for employment. In particular, applicants are looking at demographic profiles, training programs, and recognition and reward systems in order to determine if an organization truly values diversity (Loden, 1996; Cañas & Sondak, 2008). As such, it is apparent that valuing diversity can provide organizations with a competitive edge in the labor market. Organizations that are successful in implementing diversity initiatives are able to attract and retain a diverse workforce. This is particularly important because an increasing number of employees are retiring. Organizations that are able to attract and retain a diverse workforce that is highly skilled and knowledgeable will be able to achieve a competitive advantage and enjoy increased levels of firm performance.

Organizations that have high levels of diversity must take action to create diversity management programs that address these issues, plus many more that may arise. For example, firms that received awards from the Department of Labor for their diversity initiatives enjoyed higher stock performance immediately following the award (Wright, Ferris, Hiller, & Kroll, 1995). These results indicate that firms may indeed obtain a competitive advantage by effectively managing diversity. The implications are even greater when we consider the increasing diversity of the workforce. Firms that are heterogeneous will be forced to take action and manage their diversity in order to reap the benefits. As such we present the following hypothesis:

H1: Diversity management recognition will result in a positive impact on performance.

As mentioned previously, employing a diverse workforce may not only attract the best talent in the labor force but may also attract customers from different groups. In particular, people from a minority culture may be more likely to conduct business with someone that is from the same culture. Additionally, racial minorities are more likely to purchase from organizations with a positive diversity image (Cox, 1993). As such, a diverse workforce is a resource that organizations, in particular, service organizations, can take advantage of for increased firm performance (Richard, Murthi, Ismail, 2007). Manufacturing organizations, on the other hand are more likely to achieve a competitive advantage through technology, equipment, and raw materials, than through human resources. As such, we present the following hypothesis:

H2: The relationship between diversity management recognition and firm performance will be stronger for service organizations than for manufacturing organizations.

Sample

We use the DiversityInc. Top 50 Companies for Diversity List from 2003-2007. These five years produce a total of 250 observations (See Table 1). The Top 50 competition is driven by metrics obtained in a detailed survey of more than 200 questions. Companies that are included in the DiversityInc. Top 50 Companies for Diversity list demonstrate consistent strength in the four areas the survey measures: CEO Commitment, Human Capital, Corporate and Organizational Communications, and Supplier Diversity. Companies are assessed within the context of their industries, geography and employee skill sets. Any company that does not offer domestic-partner health benefits is automatically excluded from the Top 50. The companies on the list must be publicly traded in order for us to collect the dependent variable, cumulative

abnormal returns. Several of these firms are private companies (primarily accounting firms), reducing the total usable observations to 259.

<div style="text-align: center;">INSERT TABLE 1 HERE</div>

Analysis

To estimate abnormal performance, we conducted an event study, employing a CRSP market model. The essence of the event study methodology is to determine if there is a statistically significant change in the stock price of a company in the days immediately following an announcement of interest. Here, we are interested in whether there is a significant increase in stock price in the days following a firm being named to the DiversityInc. Top 50 Companies for Diversity.

We start by considering a market adjusted model using the equally weighted CRSP index. This model is stated as:

$$R_{jt} = \alpha + \beta_j R_{mt} + \varepsilon_{jt}$$

where R_{jt} is the rate of return of the jth firm in month t; R_{mt} is the rate of return on the market index in month t; and β_j is a parameter that measures the sensitivity of R_{jt} to the market index. For robustness, however, we also estimate abnormal returns using buy and hold abnormal returns. The CRSP market model allows us to take all seven DiversityInc lists and aggregate them to one event date. Thus, we are able to examine the returns around the specific date. The date of the DiversityInc press release stating which firms will appear in the Top 50 serves as the event date. We use mean cumulative abnormal returns to examine the performance around the event date. Cumulative abnormal returns are the returns for a specific firm for one day, two days, and one week following the press release date over and above the return for the market as a whole. The use of the CRSP market model allows us to control for market expectation, industry

membership, and firm risk as well as stock market fluctuations. Market expectation and firm

risk are controlled because the market model first calculates what a "normal" return should be in

order to calculate the "abnormal" return. The normal return is itself the market expectation and

takes the inherent risk of the firm into account.

Results

To test hypothesis 1, we conducted an event study using the CRSP equally weighted

market adjusted model. We examined the mean cumulative abnormal return from 3 days before

the press release announcing the list of Top 50 Companies for Diversity to 3 days, 5 days, 10

days, 15 days, 20 days and 30 days after the press release. There are a total of 350 firm

observations on the DiversityInc Top 50 list from its inception in 2002 through 2008. Fifty-three

of those are privately-held firms and must be excluded from the analysis, leaving a sample of

297 observations. The 2002 list had to be discarded because there was no press release. The

2008 list had to be discarded because 2008 data are not available yet on CRSP. Those deletions

left a sample of 216 observations.

INSERT TABLE 2 HERE

In total, we tested six different estimation periods. Four of those six are significant at the

.10 level. Three of the six are significant at the .05 level and two are significant at the .001 level.

The 5 and 10 day cumulative abnormal returns were insignificant, though they were positive

returns.

For robustness, we also examined four other estimation methods: value weighted market

model, equally weighted market model, value weighted market adjusted model, unadjusted raw

returns model. The results proved robust across all of these estimation methods. Every

estimation period yielded a positive cumulative abnormal return for all four methods. Eighteen

of the 24 total estimation periods were significant at the .10 level, fourteen at the .05 level, twelve at the .01 level and eight at the .001 level.

The event study results suggest that, without exception, the market had a positive reaction for the companies on the DiversityInc Top 50 after the press release. Regardless of the estimation period or estimation method, there was always a positive cumulative abnormal return and the returns were mostly statistically significant.

To test hypothesis 2, we divided our sample of 216 firms into service firms and manufacturing firms by SIC code. We defined manufacturing firms as those with SIC codes between 2000 and 3999, following the method outlined by Gomez-Mejia et al. (2003) and used in diversity research by Richard et al. (2007). Twenty-two firms were dropped because we could not locate a valid SIC code, leaving 194 firms (113 service firms, 81 manufacturing firms).

We tested each of these subsamples using the CRSP equally weighted market adjusted model. Again, we examined the mean cumulative abnormal return from 3 days before the press release announcing the list of Top 50 Companies for Diversity to 3 days, 5 days, 10 days, 15 days, 20 days and 30 days after the press release. The results are displayed below:

INSERT TABLE 3 & 4 HERE

Contrary to hypothesis 2, manufacturing firms have a higher mean cumulative abnormal return in the days following the press release announcing the DiversityInc Top 50 Companies. For manufacturing firms, all mean CARs are positive and five of the six estimation periods are significantly positive. Conversely, for service firms, three estimation periods have positive mean CARs and three have negative mean CARs. The 10 day and 30 day returns for service firms are significantly negative. The 15 day and 20 day returns are significantly positive, but the

magnitude of the CAR is much higher for the manufacturing firms (0.72% and 1.78%) than for the service firms (0.14% and 0.32%).

Discussion

The intent of this study was to explore the impact of diversity management recognition on stock value. In addition, we explored the differential impact of diversity management recognition for manufacturing and service firms. We hypothesized that being included on DiversityInc's Top 50 Companies for Diversity list would result in higher returns on stock value than those firms not included on the list. We also hypothesized that service firms would experience higher returns than manufacturing firms due to the high levels of interaction with customers and others outside of the organization.

Results indicate that hypothesis 1 was indeed supported. Organizations that made DiversityInc's Top 50 Companies for Diversity enjoyed higher returns than organizations that did not make the list. This held true for 3, 10, 20, and 30 days out from the press release date. As such, it appears that investors and the market react to positive information regarding an organization's diversity efforts.

Hypothesis 2 was not supported. In fact, manufacturing firms received higher returns than service firms. Further research is needed to explore the reasoning behind these results. We can only offer speculation with regards to why manufacturing firms experienced positive and more significant returns than service organizations.

On possible reason is there is a difference between responses of investors and customers. Our argument for hypothesis 2 draws on extant research which focuses on customer response. Cox and Blake (1991) suggest that organizations can achieve a sustainable competitive advantage by valuing diversity. In particular, their marketing argument suggests that by hiring a

diverse group of employees, organizations begin to resemble their diverse customer base. Research indicates that customers might be more likely to purchase from organizations that are similar to themselves. While this argument is generally accepted in the diversity literature it is possible that investors' expectations of these organizations are different.

Investors might react more strongly to manufacturing firms having a diversity reputation than service firms. The unexpectedness of the event might trigger increases in abnormal returns for manufacturing firms. Our sample consisted of 59% service and 41% manufacturing which might mean it is slightly more difficult for manufacturing firms to make list. Investors could be more impressed with the fact that a manufacturing firm made the list than a service firm.

Finally, there is the possibility that the results related to service firms have been impacted by the poor performance of the financial service firms over the last 5 years. Many of the organizations on the list are financial service organizations. It is possible that the poor performance of these companies in the last 5 years have impacted any possible positive returns based on diversity management.

Future research also needs to consider other differences in the firms that made the list. For example, firm size and firm age might show different results. A small or new firm may receive more of a positive reputational benefit than a large established firm with which investors are familiar.

Additionally, there may be more of a positive reputational benefit the first time a company makes the list. There may be diminishing marginal returns from making repeat appearances on the list. In the future, we can divide the sample into those that are making their initial appearance on the list and those making a repeat appearance. Finally, there are also other

awards and lists to be explored. For example, Fortune publishes a list of Best Companies for Minorities. This would be another potential research study.

Limitations

There are several limitations of our study. First, we are using inclusion on the Diversity, Inc list as a proxy for diversity reputation. Thus, our study is subject to any biases and errors of Diversity, Inc. Second, our study is limited to the years 2003-2007. Diversity, Inc started their list in 2002 but did not have a press release that year. Our methodology requires an event (specific date) to examine any reputational impact. Finally, the study is limited due to our decision to use only the DiversityInc list and not some of the others that are available. Again, our primary reason for doing so is the availability of a specific press release date that we can use as the event date in the event study methodology.

Table 1

Top 50 Companies for Diversity List – DiversityInc.

Company	Years on List	Company	Years on List
Xerox	2007,2006,2005,2004,2003	Sprint	2007,2006,2005,2004
Verizon Communications	2007,2006,2005,2004,2003	Abbott	2007,2006,2005,2004
The Coca-Cola Co.	2007,2006,2005,2004,2003	Accenture	2007,2006
Bank of America	2007,2006,2005,2004,2003	Macy's	2006
Pricewaterhouse Coopers	2007,2006,2004,2003	WellPoint	2006
Procter & Gamble	2007,2005,2004	Kaiser Permanente	2007,2006
Cox Communications	2007,2006,2005	General Motors	2007,2005,2004
Merrill Lynch & Co.	2008,2006	Citigroup	2007,2006,2005,2004,2003
Johnson & Johnson	2007,2006	Toyota Motor	2006
IBM	2007,2003	KPMG	2003
American Express	2007,2006,2005,2004,2003	Consolidated Edison Co. of New York	2007,2006,2004
Marriot International	2007,2006,2005,2004,2003	Colgate-Palmolive	2007,2006,2005,2004
Sodexho	2007,2006,2004	Sempra	2007,2006,2003
JP Morgan Chase	2007,2006,2005,2004,2003	Eastman Kodak	2007,2005,2004,2003
Wachovia	2007,2006,2005,2004,2003	Comerica	2007,2006,2005
Blue Cross Blue Shield of Florida	2007,2006,2003	MGM Mirage	2007,2006
Deloitte LLP	2007,2004,2003	AllState	2007,2006,2005,2004,2003
Ernst & Young	2007,2006	Wal-Mart Stores	2007,2005
HSBC Bank	2007,2006,2005,2004,2003	DaimlerChrysler	2007,2006,2004
Starwood Hotels	2007,2006,2004,2003	Bausch & Lomb	2007,2006,2005,2004
Cummins	2007	Darden	2007,2006,2003
Merck & Co.	2007,2006,2005,2004,2003	Comcast	2007
AT&T	2007	Hewlett-Packard Co.	2007,2006,2004
Turner Broadcasting Systems	2007,2006,2005	Novartis	2007,2006
Prudential	2007,2006,2005,2004,2003	General Mills	2007,2005,2004
Wells Fargo & Co.	2007,2006,2005,2004,2003	Key Bank	2007,2005
Ford Motor Co.	2007,2006,2005,2004,2003	Cingular Wireless	2006,2005
Pepsi Co.	2007,2006,2005,2004,2003	IKON	2006,2005
Pepsi Bottling Co.	2007,2005,2004	Kraft Food	2006,2005,2004
Health Care Service Corp.	2007,2006,2005	Harris	2006

Diversity Recognition

Company	Years on List	Company	Years on List
Starbucks	2006	HBO	2006
SC Johnson	2006,2005,2003	Bell South	2006,2005,2003
Compuware	2006	International Truck and Engine Co.	2004,2003
Altria Group	2005,2003	Shell Oil Co.	2004,2003
SBC Communications	2005,2004,2003	Time Warner	2004
Sears, Roebuck & Co.	2005	USPS	2004
Tribune Co.	2005	Fleet Boston	2003
Pitney Bowes	2005,2004,2003	Freddie Mac	2003
New York Life	2005	Aetna	2003
Knight Ridder	2005	McDonald's	2003
Unilever Foods	2005	Northeast Utilities	2003
MetLife	2005	Washington Mutual	2003
Sun Trust Bank	2005	Texas Instruments	2003
Staples	2005	Intel	2003
Visteon Co.	2005	United Technologies	2003
Nielson Media Research	2005	Seagate	2003
Chubb Co.	2005,2003	Microsoft	2003
MasterCard	2005	Morgan Stanley	2003
InterContinental Hotels Group	2004	Hyatt Hotels	2003
Fannie Mae	2004,2003	Reynolds & Reynolds	2003
The New York Times Co.	2004	Wyndham	2003
Gannett	2004	PHI	2004
UPS	2004	Alliant	2004
Safeco	2004,2003	Denny's	2004

Table 2 – All Firms

Days	Mean CAR	Patell Z
(-3,3)	0.53	1.589$
(-3,5)	0.22	0.531
(-3,10)	0.11	0.758
(-3,15)	0.52	2.186*
(-3,20)	1.11	3.764***
(-3,30)	1.21	3.412***

Table 3 – Manufacturing Firms

Days	Mean CAR	Patell Z
(-3,3)	0.91	1.569$
(-3,5)	0.48	0.639
(-3,10)	3.08	3.846***
(-3,15)	0.72	1.806*
(-3,20)	1.78	3.418***
(-3,30)	3.08	3.846***

Table 4 – Service Firms

Days	Mean CAR	Patell Z
(-3,3)	0.14	0.720
(-3,5)	-0.04	0.129
(-3,10)	-0.22	1.621$
(-3,15)	0.14	1.581$
(-3,20)	0.32	2.175*
(-3,30)	-0.22	1.621$

References

Cañas, K.A., & Sondak, H. 2008. *Opportunities and challenges of workplace diversity.* New Jersey: Pearson Prentice Hall Publishers.

Comer, D., & Soliman, C. 1996. Organizational efforts to manage diversity: Do they really work? *Journal of Managerial Issues*, 13 (4): 470-483.

Cox, T. J. 1994. *Cultural diversity in organizations*. San Francisco: Berrett-Koehler Publishers.

Konrad, A. 2003. Defining the domain of workplace diversity scholarship. *Group and Organization Management,* 28 (1): 4-27.

Loden, M. 1996. *Implementing Diversity*. New York: McGraw-Hill.

Richard, O., & Kirby, S. 1997. Predictors of white American males' attitudes toward diversity selection processes. *Journal of Social Psychology*, 137 (6): 784-786.

Stevens, F. G., Plaut, V.C., & Sanchez-Burks, J. 2008. Unlocking the benefits of diversity: All Inclusive Multiculturalism and positive organizational change. *Journal of Applied Behavior Science,* 44 (1): 116-133.

Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. In B. M. Staw and L. L. Cummings, *Research in Organizational Behavior*, 20: 77-140. Greenwich, CT: JAI Press.

Wright, P., Ferris, S., Hiller, J., & Kroll, M. 1995. Competitiveness through management of diversity: Effects on stock price valuation. *Academy of Management Journal*, 38 (1): 272-287.

Purchasing – From Traditional to Contemporary

Richard E. Crandall
Appalachian State University
CIS Dept, Raley Hall
Boone, NC 28608
(828)-262-4093
crandllre@appstate.edu

William "Rick" Crandall
School of Business
University of North Carolina at Pembroke
Pembroke, NC 28372
(910)-522-5786
rick.crandall@uncp.edu

Abstract

The traditional, or "old school supplier management techniques" (Vonada 2008) used by most buyers was to send a request for quotation (RFQ) to two or three potential suppliers. When they received the RFQ back, they decided to whom they would award the order, usually based on the lowest quoted cost, assuming the delivery time was acceptable. Once the order was placed, the buyers often had to expedite deliveries. Placing repeat orders for the same product offered the buyer opportunities to pressure the supplier for a lower price. Purchasing functions and responsibilities have expanded, especially with the advent of supply chain management and outsourcing. Companies recognize that purchasing should be involved in both tactical and strategic decisions. The movement of purchasing from a tactical implementer to a strategic participant is making a big change in how the purchasing function is viewed within an organization.

1

Purchasing – From Traditional to Contemporary

Introduction

The role of purchasing in an organization is changing. We will describe some of the major changes and their effect on organizations.   Although it is a well-established function in most businesses, there are some hazy areas when considering definitions.

Procurement – the business functions of procurement planning, purchasing, inventory control, traffic, receiving, incoming inspection, and salvage operations.

Purchasing – the term used in industry and management to denote the function of and the responsibility for procuring materials, supplies, and services.

Buyer – an individual whose functions may include supplier selection, negotiation, order placement, supplier follow-up, measurement and control of supplier performance, value analysis, and evaluation of new materials and processes.

Product - any good or service produced for sale, barter, or internal use. (Blackstone 2008).

These definitions indicate purchasing is an activity within the broader function of procurement. Another reputable source reports, "Terms such as purchasing, procurement, materiel, materials management, logistics, supply management, and supply chain management, are used almost interchangeably. No agreement exists on the definition of each of these terms, and managers in public and private institutions may have identical responsibilities but substantially different titles." (Leenders et al. 2002).

The ISM Career Center lists 320 job openings with over 100 different job titles, showing variations on assistant buyer, buyer, purchasing agent, director of purchasing, director of procurement, and sourcing specialist (www.ism.ws/CareerCenter/JobDescriptions, 2008). Other jobs within the purchasing function may include expediter, buyer-planner, or value analyst, depending on the scope and scale of a particular purchasing department.

This is an important function, because purchased materials and services represent over half of the product costs in most manufacturing industries and are even higher for wholesale and retail companies, sometimes exceeding 90 percent. (Joyce 2006) As more manufacturing companies move to a "core competency" strategy, they have outsourced more of the component manufacturing to suppliers to become primarily an assembly operation. In some cases, they have moved even further by outsourcing the entire manufacturing function to contract manufacturers, making it possible to concentrate on product and brand development, and marketing that product.

Traditional Purchasing

The traditional, or "old school supplier management techniques" (Vonada 2008) used by most buyers was to send a request for quotation (RFQ) to two or three potential suppliers. When they received the RFQ back, they decided to whom they would award the order, usually based on the lowest quoted cost, assuming the delivery time was acceptable. Once the order was placed, the buyers often had to expedite deliveries. Placing repeat orders for the same product offered the buyer opportunities to pressure the supplier for a lower price.

The traditional purchasing function was concerned primarily with the buying process in which they placed the orders and followed to assure delivery of the orders. They were concerned with obtaining products to

2

meet the requirements of Functionality – does it do what we want it to? Availability – can we get it when we need it? Cost – does it meet our target costs? Quality – does the quality meet our requirements?

Today, some tactical purchasing functions are routine, such as stock order replenishment; indeed, the actual order placement has been automated through ERP systems, at least in larger companies. (Austin 2008). Carter et al. (2000) forecast that "tactical purchasing activities such as ordering, quoting, expediting, and so forth will be automated and/or outsourced, and headcounts will be reduced."

Contemporary Purchasing

Purchasing functions and responsibilities have expanded, especially with the advent of supply chain management and outsourcing. Companies recognize that purchasing should be involved in both tactical and strategic decisions. The movement of purchasing from a tactical implementer to a strategic participant is making a big change in how the purchasing function is viewed within an organization.

Giunipero and Pearcy (2000) point out that change in business practices, increased globalization, technological advances, and increased demands by management are requiring that purchasing change from an administrative function to a strategic activity. Minahan (2005) warns, "Being efficient in the day-to-day details of procurement is fine. Today, it is just not enough. Leading companies are transforming their transaction-based procurement operations into a strategic resource that can deliver real value to the enterprise." As recently as 2003, however, Goebel, Marshall and Locander pointed out that, while the literature claimed purchasing is a strategic function, other research found the level of strategic participation is low. They suggest purchasing functions must demonstrate a history of cooperation to secure their place as a strategic contributor.

Purchasing organizations are expected to participate, often as part of a cross-functional team, in decisions concerning strategic sourcing:
- supplier evaluation
- supplier selection for long-term relationships
- contract structuring and negotiation
- supplier relationship management (SRM)
- supply chain coordination and collaboration (Anonymous 2005; Kocabasoglu and Suresh 2006)

Contemporary purchasing is more oriented to building long-term relationships with fewer, but more dependable, suppliers. While there is continued, and sometimes fierce, insistence on low prices, there is the need to include other criteria in describing the good or service being purchased. In the broadest sense, the relationship is designed to work for the long-term wellbeing of the entire supply chain. That is a broad assignment and requires an extensive change in the orientation of the purchasing philosophy and of the members of the purchasing department.

In addition to their expanded role in strategic sourcing, some advocate that purchasing take a more inward-looking perspective by participating in activities such as:
- total cost of ownership and value analysis (Joyce 2006)
- product design and specifications (Nelson, Moody and Stegner 2005)
- target costing (Ellram 2000)
- inventory management (Flanagan 2005; Monczka and Morgan 2000)
- monitor strategic materials cost drivers and commodity indices and availability (Austin 2008)

All of the above activities should lead to an effective level of supply chain coordination and eventually collaboration among supply chain participants. The broadened role for purchasing involves more than obtaining goods and services at the lowest cost; it also requires that purchasing "fits the need of the business and strives for consistency between its capabilities and the competitive advantage being sought throughout the supply chain (Gundlach et al. 2006). The purchasing function also has the responsibility in many organizations to act as an interface between suppliers and functional areas within the buying

3

organization. As companies move to cross-functional teams with responsibilities to the customer, the teams must also have access to the suppliers to assure that they meet the needs of the customers.

Training for a purchasing career embodies a number of new skill requirements. One of the most important is human relations skills in negotiation. Even where the buying organization has considerable power over the negotiations because of its size or uniqueness, it is important for the buyers to exercise considerable skill in developing a win-win contract. Human relations skills are also necessary in dealing with other functions within the buying organization to enable those functions to participate in, but not exercise undue control, over the purchasing process. Professionals in marketing, engineering, accounting, and operations are generally both knowledgeable and insistent on getting what they need; it takes a skillful facilitator to lead this sometimes disparate group to an acceptable consensus solution. As one supply chain executive expressed it when talking about the requirements for purchasing professionals, "If all my wishes came true tomorrow, I would hire professionals from this day forward who have multi-disciplined experiences and expertise in program management, project management, engineering, operations and supply chain." (Bernstein 2005)

Dealing with outsourcing

The APICS Dictionary (Blackstone 2008) has additional definitions to consider.

Make-or-buy decision – The act of deciding whether to produce an item internally or buy it from an outside supplier. Factors to consider in the decision include costs, capacity availability, proprietary and/or specialized knowledge, quality considerations, skill requirements, volume, and timing.

Outsourcing – The process of having suppliers provide goods and services previously provided internally. Outsourcing involves substitution—the replacement of internal capacity and production by that of the supplier. See: subcontracting.

Subcontracting – Sending production work outside to another manufacturer. See: outsourcing.

These definitions do not make a major distinction between the make-or-buy and outsourcing decisions. It appears reasonable to view the make-or-buy decision as belonging to a simpler period when the decision was primarily concerned with manufactured parts and a decision that was easily reversible, or even temporary, because of seasonal, or other peak demand, requirements. It was a tactical decision made by purchasing or, purchasing with some input from operations. The make-or-buy decision had limited effect on the total operations of a company and rarely was of sufficient importance to affect the entire supply chain.

Conversely, outsourcing is a contemporary concept. It involves both products and services, is usually of a permanent repositioning, and is often associated with using a supplier in a country other than where the buying company is located. This is a strategic decision requiring cross-functional teams to perform extensive analysis and arrive at consensus decisions. Some distinguish offshore outsourcing (outsourcing to a foreign supplier) from offshoring (owning and operating an operation in a foreign country). Outsourcing, especially offshore outsourcing, requires a project management approach. (Murray and Crandall 2006).

Saha and De (2008) identify some of the challenges in offshore outsourcing, or low-cost-country sourcing (LCCS) as:
- Low supplier maturity levels for best-in-class global trade practices
- Extremely complex supplier assessment and development efforts
- Inefficient logistics infrastructure
- Low level of IT infrastructure for B2B transactions and collaboration
- Nonstringent protection of an organization's intellectual property
- Understanding country-specific business processes and methodologies

4

- Differences in culture, currency, life style and languages
- Poor information visibility for control and improving supply chain responsiveness
- Massive requirements for bureaucracy management and government regulations
- Cycle time to understand "tricks of the trade" or underlying business dynamics

Offshore outsourcing has intensified the search for a way to determine the total cost of ownership (TCO) of the purchased good or service. The TCO concept is not new, with origins as far back as pre-World War II. However, there is not a universal model accepted by all companies who use the TCO approach. In a survey of the Institute of Supply Management (ISM) members, Ferrin and Plank (2002) found the types of product purchased under TCO valuation methods included capital goods (79% of respondents), manufactured parts (46%), raw materials (38%), services (29%), MRO (26%), subassemblies (25%), and packaging (22%). They also found the various companies used 127 different factors. Consequently, they concluded, while the use of TCO analysis is worthwhile, a standard TCO model does not exist. In fact, even within a firm, about 85% of the respondents reported they found moderate to high variation among the factors they used to make their TCO evaluation. The researchers found the following functions had moderate to heavy involvement in the TCO valuation process: Purchasing (88% of respondents), Manufacturing (69%), Design Engineering (67%), Logistics (58%), Information Technology (52%), Accounting (41%), and Marketing (37%). This heavy, and widespread, cross-functional involvement illustrates the importance companies associate with the outsourcing decision.

Most companies view offshore outsourcing as a way to reduce their product and operating costs. A secondary reason is to gain experience in a foreign country by establishing a manufacturing or retail presence, either by direct investment or through some sort of alliance with an already existing company. While companies may first enter a foreign country to buy, they often stay to sell. For this reason, the market potential is an important consideration, even in the initial offshore outsourcing decision. A survey by the Aberdeen Group found cost savings on procured goods was the primary driver for low-cost country sourcing (LCCS), with penetration of new markets as the second most cited driver. (Fitzgerald 2005)

Purchasing Performance measurement

Under the traditional view of purchasing, with its emphasis on the cost of purchased materials, one of the most popular measures was purchase price variance. This was the difference between the budgeted, or standard, cost of an item versus its actual cost. This usually caused the buyer to purchase large volumes to get price discounts or be less diligent about the quality of the materials in order to buy from a low bidder.

In the contemporary purchasing environment, the performance measures are more global in nature, with the ultimate measure being the level of enhanced value from the supply chain for the consumer. Inasmuch as determining this value for an entire supply chain is difficult, if not impossible, companies are still looking to develop measures that move from cost to value criteria.

In speaking of measuring performance improvement, Petersen, Ragatz and Monczka (2005) suggest the use of such measures as inventory turns, on-time delivery, responsiveness, quality, purchase prices, and total cost. Another measure that is gaining favor is the cash-to-cash cycle time. (Bernstein 2005)

In their ten-year forecast for purchasing and supply, Carter et al. (2000) predicted, "there will be an intellectual fight over designing metrics that are very specific for particular chains." They doubt there will be a standard set of metrics that can be used throughout the supply chain. Monczka and Morgan (2000) advocate the use of economic value added (EVA) as a measure because of its recognition of the contribution of revenue, operating costs and capital investment. In an attempt to illustrate a system for the health care industry, Kumar, Ozdamar, and Ng (2005) suggested a system built on the balanced scorecard concept that included the specific measures in each of the following areas: customer, supplier, process, IT system, learning and growth, and overall.

5

Impact on Organization Structure

What is the impact of these changes on a company's organization structure? Has it changed the relationship between purchasing and other functions? Some of the major changes in the structure of organizations that appear to be taking place include the following. These trends are briefly described in the following section.

From decentralized to centralized to hybrid

Many companies are moving to a more centralized purchasing function (Johnson and Leenders 2003). One driver of this change is the recognition that purchased goods and services represent a major portion of the total costs in a company, well over 50% in most companies and upwards of 80-90% in distribution and retailing companies. Another reason for the centralization movement is the need to recognize the importance of purchasing, and supply management, as a core competency. Technology has made it possible to coordinate the procurement activities over multiple locations. The trend toward faster decision-making and employee empowerment is causing some firms to decentralize purchasing. Consequently, it is likely that most firms will use a form of hybrid organization.

From operational to strategic

Closely related to the movement toward more centralized purchasing is the recognition that purchasing is moving from an operational, or tactical, activity towards a strategic activity. This follows the trend toward the outsourcing of more services that are integral to the operation of the company, such as information technology and product development. The movement toward lean operations means it will be more critical to find fewer, but more reliable, suppliers.

From localized to global

Most companies now have a global perspective. It is imperative that the purchasing function share this perspective, both in procurement of goods and services and in participating in the outsourcing activities. Purchasing knows about dealing with outside businesses.

From vertical to horizontal

Companies are moving from vertical hierarchical organization structures to flatter structures that can communicate and make decisions more rapidly. This suggests more decentralization of decision-making. While there is a movement toward centralization of purchasing, the central function will probably buy commodity items and leave the purchase of unique items to lower levels. In addition, purchasing at the lower levels will have to resolve problems and answer questions.

From transactional to system

Along with other programs to take a systems approach, purchasing will become a part of a process by which companies will obtain goods and services of all description. For example, purchasing will be involved in new product development from the beginning instead of being told what to buy near the end of the process.

From discrete functions to linked

In the past, purchasing has often operated in one of the "silos" so often mentioned in the management literature. They took the purchase request and filled it. In the future, they will become a member of any number of cross-functional teams that will take a holistic approach to problem solving.

From hard copy to electronic

6

Many companies are moving rapidly toward e-procurement systems. Beginning with electronic data interchange (EDI) two decades or so ago, the present trend is to the use of the Internet as a means of replacing hard copy purchasing transaction with electronic.

Trends in purchasing skills

As the position of purchasing in the organization structure changes, the skills required of purchasing employees and managers will also change. Some of the changes anticipated include the following.

From specialized skills to generalist

The most noticeable change will be an expansion of the skills required. Purchasing people, especially at the managerial level, will have to know more about the other functions in a company, and how all of the functions fit together. Some chief purchasing officers (CPO) may not also have a deep purchasing background but they will understand the role of the new purchasing function.

From solo operator to cross-functional team member

As indicated above, members of the purchasing organization will become participants in cross-functional teams that will have responsibilities for designing and managing improvement programs.

From enforcer to facilitator

In the past, buyers placed orders and then followed up to ensure that the order arrived on time. From the supplier's perspective, the customer's purchasing function was demanding and impersonal. The future calls for purchasing to be a facilitator of the procurement function by selecting vendors that always deliver the right quantity of quality products at the right time – the perfect order.

From purchaser of goods to purchaser of services

Historically, purchasing has been primarily concerned with buying materials used in products or supplies. This is changing, as purchasing is assuming a more significant role in buying services. Some examples include engineering services, consulting services, and information technology (IT) services. Purchasing can complement the technical knowledge of specific functions by adding knowledge about vendor selection, and contract negotiation and administration.

From purchase cost to total value

One of the key measures of purchasing performance has been the use of purchase price variance, or the difference between the actual cost of a material and its standard, or budgeted, cost. This focused attention on the direct cost of a material but did not consider a myriad of indirect costs, such as transportation, quality, lead time, and ease of working with the vendor. Some companies are beginning to move to more comprehensive measures of purchasing performance.

From reactive to proactive (three quotes to vendor selection)

In the past, purchasing operated in more of a reactive mode, in that they bought what they were asked to buy. A normal practice was to solicit quotes from a number of vendors and award the purchase to the lowest bidder. Today, purchasing is trying to establish long-term relationships with vendors to optimize the results achieved in total costs and the value of the services received.

From follower to leader

Purchasing has not always been considered a profession, as are accounting, engineering, marketing other functional areas. This is also changing, as the education and skills of purchasing managers

7

continues to increase. As a result, purchasing managers are moving into more leadership positions, such as team leaders, and more relied upon advisors.

Present Status

What is the present status of purchasing? While it is impossible to generalize because of the wide differences among companies, some trends seem to be appearing.

- Companies are making progress in building stronger, and more lasting, relationships with their suppliers. With the active involvement of purchasing, organizations are reducing the number of suppliers as the result of more carefully selecting and working with those suppliers that remain.

- Purchasing is being accepted as a more important member of management, not just because of its direct contribution in the purchasing process, but also as a member of cross-functional decision-making teams, at least at the tactical level.

- With the emergence of supply chains and offshore outsourcing, the purchasing function is becoming a core competency for successful companies. It has a vastly expanded and more critical role, both internally within a company and as a key integrator with suppliers.

- The trend toward global sourcing shows little indication of reversing itself. While there is resistance from some influential areas, there does not seem to be sufficient opposition to prevent companies from establishing a presence in many foreign countries.

- The transition from traditional purchasing to contemporary purchasing is slow. Quinn (2005) reports that, while "procurement excellence" offers competitive advantage, "One of the biggest roadblocks is the built in resistance to change."

Future

What does the future hold for purchasing?   Joyce (2006) believes that purchasing is becoming "increasingly important," because of increased levels of outsourcing, increased use of the Internet, greater emphasis on supply chain management, globalization, and continuing efforts to reduce costs and increase quality.

Andersen and Christensen (2004) call attention to the increasing need for connective links among supply chain members and the role of purchasing in achieving these links. They conclude, "This contribution has – hopefully – spelled out clearly that the transformation of the purchasing function is profound and that there are still major changes to be seen."

Carter et al. (2000) prepared a ten-year forecast of the future of purchasing and supply, consisting of challenges in the following areas: electronic commerce, strategic cost management, strategic sourcing, supply chain partner selection and contribution, tactical purchasing, purchasing strategy development, demand-pull purchasing, relationship management, performance measurement, process uncoupling, global supplier development, third-party purchasing, virtual supply chain source development, competitive bidding and negotiations, strategic supplier alliances, negotiation strategy and complexity management. They conclude, "Purchasing and supply management professionals will require greater "general management" (i.e., interdisciplinary) training than they have had in the past."

Ogden et al. (2005) used a Delphi study of key procurement and supply management executives to identify the procurement and supply management strategies that could lead to significant improvements over the next 5-10 years. They concluded, "Increased integration, information sharing and collaboration

8

among supply chain members are most likely to be implemented and will have the largest impact on organizations."

Handfield and Baumer (2006) studied the issue of ethical behavior, especially as it relates to conflict of interest in supply chains. They concluded, "Companies no longer have the luxury of ignoring the importance of integrating ethical considerations into decision making, with particular focus on supply chain management."

Aberdeen Group (Minahan 2005) found that industry leaders are working to "transform procurement's role from one of cost containment to one of value generation." They recommend:
- Improve supplier development and collaboration
- Enhance and integrate procurement automation infrastructure
- Adopt low-cost country supply initiatives
- Transition to a center-led procurement organization
- Increase amount of spend under procurement management while improving compliance

Reeve and Steinhausen (2007) encourage organizations to recognize the need to use "sustainability purchasing" to enhance their position in the marketplace. They want companies to "carry a wide range of product and services that encourage health and well-being, support healthy and productive jobs, and reward the operations of responsible businesses."

Angeles and Nath (2007) examined current business-to-business e-procurement practices. After a study of success factors and challenges, they concluded, "E-procurement is a very important initiative with significant cost savings potential for firms."

The future for purchasing professionals is an exciting challenge for those who want it. More than ever before, supply chain management and purchasing professionals will have a breadth of experience in a company unmatched by any other functional area. This should prepare them for positions in general management, and even consideration for selection as a chief executive officer (CEO).

9

References

1. Andersen, Poul Houman, Christensen, Poul Rind, Bridges over troubled water: suppliers as connective nodes in global supply networks, *Journal of Business Research*, 2005. Vol. 58, No. 9, p. 1261.

2. Angeles, Rebecca, Nath, Ravi, Business-to-business e-procurement: success factors and challenges to implementation, *Supply Chain Management*, 2007. Vol. 12, No. 2, p. 104.

3. Anonymous, Strategic sourcing, *Strategic Direction*, 2005. Vol. 21, No. 11, p. 29, 4 pgs.

4. Austin, Lynn, CPFIM, C.P.M.   Supply chain consultant, Personal Interview, June 2008.

5. Bernstein, Mark, Raytheon goes from traditional purchasing to an integrated supply chain, *World Trade*, 2005. Vol. 18, No. 11, p. 36, 3 pgs.

6. Blackstone, John H, *APICS Dictionary* (12th Edition), APICS – The Association for Operations Mangement, 2008.

7. Carter, Phillip L, Carter, Joseph R, Monczka, Robert M, Slaight, Thomas H, Swan, Andrew, The future of purchasing and supply: A ten-year forecast, *Journal of Supply Chain Management*, 2000. Vol. 36, No. 1, p. 14.

8. Ellram, Lisa M, Purchasing and supply management's participation in the target costing process, *Journal of Supply Chain Management*, 2000. Vol. 36, No. 2, p. 39,

9. Ferrin, Bruce G, Plank, Richard E, Total cost of ownership models: An exploratory study, *Journal of Supply Chain Management*, 2002. Vol. 38, No. 3, p. 18, 12 pgs.

10. Fitzgerald, Kevin, A step-by-step approach to low-cost sourcing, *EDN*, 2005. Nov, p. 131, 2 pgs.

11. Giunipero, Larry C, Pearcy, Dawn H, World-class purchasing skills: An empirical investigation, *Journal of Supply Chain Management*, 2000. Vol. 36, No. 4, p. 4, 10 pgs.

12. Goebel, Daniel J, Marshall, Greg W, Locander, William B, Enhancing purchasing's strategic reputation: Evidence and recommendations for future research, *Journal of Supply Chain Management,* 2003. Vol. 39, No. 2, p. 4.

13. Gundlach, Gregory T, Bolumole, Yemisi A, Eltantawy, Reham A, Frankel, Robert, The changing landscape of supply chain management, marketing channels of distribution, logistics and purchasing, *The Journal of Business & Industrial Marketing,* 2006. Vol. 21, No. 7, p. 428.

14. Handfield, Robert B, Baumer, David L, Managing conflict of interest issues in purchasing, *Journal of Supply Chain Management*, 2006. Vol. 42, No. 3, p. 41, 10 pgs.

15. Johnson, P. Fraser, Leenders, Michiel R. 2003. Gaining and Losing Pieces of the Supply Chain. Journal of Supply Chain Management. Vol. 39, No. 1, p. 27.

16. Joyce, William B, Accounting, purchasing and supply chain management, *Supply Chain Management*, 2006. Vol. 11, No. 3, p. 202.

17. Kocabasoglu, Canan, Suresh, Nallan C, Strategic sourcing: An empirical investigation of the concept and its practices in U.S. manufacturing firms, *Journal of Supply Chain Management*, 2006. Vol. 42, No. 2, p. 4, 13 pgs.

18. Kumar, Arun, Ozdamar, Linet, Ng, Chai Peng, Procurement performance measurement system in the health care industry, *International Journal of Health Care Quality Assurance*, 2005. Vol. 18, No. 2/3, p. 152, 15 pgs.

10

19. Leenders, Michael R., Fearon, Harold E., Flynn, Anna E., Johnson, P. Fraser, *Purchasing and Supply Management* (Twelfth Edition), McGraw-Hill Irwin, Boston, 2002.

20. Minahan, Tim A, 5 strategies for high-performance procurement, *Supply Chain Management Review*, 2005. Vol. 9, No. 6, p. 46, 9 pgs.

21. Monczka, Robert M., Morgan, James P., Why economic value add needs to be measured, *Purchasing*, 2000. Vol. 129, No. 2, p. 77, 3 pgs.

22. Murray, M. J. & Crandall, R. E., IT Offshore Outsourcing Requires a Project Management Approach. *SAM Advanced Management Journal,* 2006. Vol. 71, No. 1, p. 4.

23. Nelson, Dave, Moody, Patricia E, Stegner, Jonathan R, The 10 procurement pitfalls, *Supply Chain Management Review*, 2005. Vol. 9, No. 3, p. 38, 8 pgs.

24. Ogden, Jeffrey A, Petersen, Kenneth J, Carter, Joseph R, Monczka, Robert M, Supply management strategies for the future: A Delphi study, *Journal of Supply Chain Management*, 2005. Vol. 41, No. 3, p. 29, 20 pgs.

25. Petersen, Kenneth J, Ragatz, Gary L, Monczka, Robert M, An examination of collaborative planning effectiveness and supply chain performance, *Journal of Supply Chain Management*, 2005. Vol. 41, No. 2, p. 14, 12 pgs.

26. Quinn, Francis J, The power of procurement, *Supply Chain Management Review*, 2005. Vol. 9, No. 9, p. 6, 3 pgs.

27. Reeve, Tim, Steinhausen, Jasper, Sustainable suppliers, sustainable markets, *CMA Management,* 2007. Vol. 81, No. 2, p. 30, 4 pgs.

28. Saha, Rajib, De, Sudripto, A blueprint for LCCS start-ups, *Inside Supply Management*, 2008. Vol. 19, No. 5, p. 14.

29. (www.ism.ws/CareerCenter/JobDescriptions, 2008.

11

AN EXAMINATION OF STRATEGIC ORIENTATION AND GROWTH STRATEGIES AMONG CREDIT UNIONS

by

Richard A. Heiens
Professor of Marketing
School of Business Administration
University of South Carolina Aiken
471 University Parkway
Aiken, Sc 29803
(803) 641-3238
RichardH@usca.edu

Larry P. Pleshko
Associate Professor of Marketing
College of Business Administration
Kuwait University
P.O. Box 5486
Safat Code 13055
Kuwait
(tel) +965-4984017
larrypleshko@yahoo.com

INTRODUCTION

Business strategy has been analyzed from many differing perspectives, yet one of the most well-known and most popular conceptualizations was developed by Miles and Snow (1978). Focusing on a firm's strategic adaptation or aggressiveness towards the market, Miles and Snow suggested that firms may be classified into one of four distinct strategic groups, each enacting consistent decisions and activities across a variety of organizational areas. A great deal of research over the years has served to confirm differences among the four strategic types regarding a variety of internal factors, including innovation, management characteristics, and organizational design (Aragon-Sanchez & Sanchez-Marin, 2005; Conant, Mokwa, & Varadarajan, 1990; Doty, Glick &

Huber, 1993; Shortell & Zajac, 1990; Slater & Narver, 1993). Moreover, recent studies have found that the strategic groups differ from each other on a variety of additional factors, including implementation and usage of market research, organizational performance, and environmental perceptions (Bednall & Valos, 2005; Freel, 2005; Moore, 2005).

One particularly interesting proposal of Miles and Snow (1978) is that the four strategic types vary according to their efforts at innovation. Prospector firms are expected to place the most emphasis on growth from innovation, with leadership or first-mover characteristics common in these firms. Alternatively, Reactor firms are late followers, only acting or innovating when the competition or market demands it. Defender firms are suggested to focus more on efficiently serving a focused part of the market, rather than on innovation. They are more likely than Reactors to innovate, but these efforts will be highly focused. Finally, Analyzer firms, while not being first-movers, are oftentimes aggressive in following the lead of Prospectors with new products or into new markets.

Although early research by McDaniel and Kolari (1987), further verified by Slater and Narver (1993), indicates that innovativeness is generally greatest among Prospectors, followed by Analyzers, Defenders, and then Reactors, no previous study has focused on the specific product growth or market growth strategies employed by the four categories of firms. Consequently, the purpose of this study is to determine if firms classified into each of the four distinct strategic types emphasize similar or different product and market growth strategies during innovation efforts. In addition, studies focusing on a wide range of industry groups are essential for the validation of a theory, such as the Miles and Snow classification scheme, that seeks to make broad generalizations concerning business practices. As such, the present study examines

predictions derived from the Miles and Snow model in one unique sector of the financial services industry, the case of credit unions.

PRODUCT-MARKET GROWTH STRATEGIES

When considering possible growth strategies, research has long been dependent on H. Igor Ansoff's (1957) conceptualization of the product-market growth matrix. According to Ansoff's theory, a firm may choose one of four product-market growth strategies, including market penetration, market development, product development, or diversification. Ansoff suggests the safest growth option is to adopt a market penetration strategy whereby a firm gains more usage from existing customers and also seeks to attract new customers in their existing market. A slightly riskier option may be to adopt the market development strategy of attracting new types of customers for the current products of the firm from either new channels of distribution, or new geographic areas. Alternately, a firm may engage in product development by producing entirely new products, different versions of existing products, or different quality levels of existing products to be sold in its current markets. The riskiest strategy overall is suggested to be a diversified approach where new products are developed for new markets.

A great deal of research in recent years has addressed the relationship between a firm's Miles and Snow (1978) strategic classification and firm performance (Brunk, 2003; Desarbo, Di Benedetto, Song, & Sinha, 2005; Garrigos-Simon, Marques, & Narangajavana, 2005; Shoham, Evangelista, & Albaum, 2002). Nevertheless, there has not been a detailed look at the relationship between the various Miles and Snow strategic groups and their chosen product-market growth strategies. Consequently, the authors present and evaluate a set of specific hypotheses related to the product-market growth strategies of credit unions classified into each of the Miles and Snow strategic groups.

HYPOTHESES

The Miles and Snow (1978) typology of strategy types depicts a firm's orientation towards its market environment. The four strategic orientations are (1) Defenders, (2) Prospectors, (3) Analyzers, and (4) Reactors. In general, all four strategy types can be viable in a given situation (Garrigos-Simon et al., 2005). However, previous studies suggest that Prospectors exhibit the highest levels of innovativeness followed by Analyzers, then Defenders, and lastly by Reactor firms (McDaniel & Kolari, 1987; Slater & Narver, 1993). Extending these expectations to the specific product-market growth strategies of credit unions, we present the following sets of hypotheses.

According to Miles and Snow (1978), Prospectors are leaders in product-market development with desires to be first-movers whenever possible. They compete by taking advantage of new market and product opportunities. Consequently, as indicated in the first set of hypotheses, Prospectors are expected to implement the most aggressive product and market growth efforts, focusing not only on current products and markets, but also on new products and market areas.

H1a: Prospector firms are likely to search for growth opportunities by seeking out new market segments.

H1b: Prospector firms are likely to search for growth opportunities by developing new products.

Although, as compared to Prospectors, Analyzers are followers in product-market development, they are not laggards. They may change their tactics slowly and less often than Prospectors, however, they can be aggressive towards innovation once they see opportunities. Thus, Analyzers are expected to be the second most aggressive strategic type with respect to product-market growth. Analyzers are expected to use

current products and markets for growth, but to also develop new products and enter new markets when a good opportunity arises, leading to the second set of hypotheses.

H2a: Analyzer firms are likely to search for growth opportunities by seeking out new market segments.

H2b: Analyzer firms are likely to search for growth opportunities by developing new products.

Defenders are firms engaging in little or no product or market development efforts. They tend to control secure niches within their industry. Thus, as indicated in the third set of hypotheses, Defenders are expected to be conservative in product-market growth efforts, focusing on current products and current markets for growth.

H3a: Defender firms are likely to search for growth opportunities by focusing on current market segments.

H3b: Defender firms are likely to search for growth opportunities by focusing on current products.

Finally, Reactors change tactics only when forced to by the market environment. Their strategic stance is one of passivity and caution, rarely taking the lead in producing change in an industry. Therefore, reactors are expected to be the most conservative firms toward growth, focusing almost entirely on current products and markets, only after most others have already made the move into those areas.

H4a: Reactor firms are likely to search for growth opportunities by focusing on current market segments.

H4b: Reactor firms are likely to search for growth opportunities by focusing on current products.

In terms of performance, the theoretical ordering suggests Prospectors, Analyzers, and Defenders will generally outperform Reactor firms in most cases.

Shoham et al. (2002) suggest that performance of the strategic groups follows the theoretical order, but that each of the groups can be successful if strategy fits with a firm's strengths. In fact, several studies have found contradictory performance orders among the strategic groups or found the typology to be limited, especially when investigating financial performance such as Return on Investment (ROI) or return on Assets (ROA) (Aragon-Sanchez & Sanchez-Marin, 2005; Brunk, 2003; Desarbo et al, 2005; Woodside, Sullivan, & Trappey, 1999). Consequently, the current study will be limited to the investigation of innovation efforts, with no specific hypotheses proposed regarding the financial or market share performance of the various strategic types.

INDUSTRY/SAMPLE DESCRIPTION

In order to empirically examine the strategies and subsequent effects of strategy on market share performance, the authors obtained information from a sample of chief executives from the financial services industry, with an emphasis on credit unions. Credit unions are owned and operated on a non-profit basis by their members, making them a unique sub-category within the broader financial services sector of the economy. Therefore, for the Miles and Snow typology to yield expected results in an industry with such an atypical business model, the robustness of the classification scheme will be convincingly verified.

Data for the study were gathered from a statewide survey in Florida of all the credit unions belonging to the Florida Credit Union League (FCUL). Membership in the FCUL represents nearly 90% of all Florida credit unions and includes 325 firms. A single mailing was directed to the president of each credit union, all of whom were asked by mail in advance to participate. A four-page questionnaire and a cover letter using a summary report as inducement were included in each mailing. Of those responding, 92% were presidents or chief executive officers and 8% were marketing

directors. This approach yielded 125 useable surveys, a 38.5% response rate.

MEASURES

Three constructs were utilized in the current study. These included the responding firm's product growth strategy, their market growth strategy, and their Miles and Snow strategic type. Each of the three constructs was measured using a categorical scale. The measurement of the constructs is described as follows.

Product growth strategy was actually service growth in this study and, as derived from Ansoff (1957), focused on either [1] existing services, [2] new services, or [3] both existing and new services. Firms were self-classified in relation to their attempts at fostering growth by checking the box next to the appropriate descriptor. Respondents could check either of [1] we emphasize services presently offered by the firm, or [2] we emphasize services new to the firm. They could also check both of the boxes, indicating they use both new and current services for growth. Those firms which did not respond to the question were counted as missing and deleted from the analysis. One hundred seventeen respondents answered the question, with 54% (64/117) classified as focusing on existing services, 14% (17/117) classified as emphasizing new services, and 30% (36/117) classified as using both new and existing services in their efforts at product growth.

Market growth strategy, also derived from Ansoff (1957), focused on either [1] existing market segments, [2] new market segments, or [3] both existing and new market segments. Firms were again self-classified by marking the box next to the appropriate descriptor (Pleshko & Souiden, 2003). Respondents could check either of [1] we target market segments presently served by the firm, or [2] we target market segments new to the firm. They could also check both of the boxes, indicating they use both new and current markets for growth. Those firms which did not respond to the question were

counted as missing and deleted from the analysis. One hundred thirteen respondents answered the question, with 65% (74/113) classified as focusing on current segments, 11% (13/113) classified as emphasizing new segments, and 23% (26/113) classified as targeting both new and existing market segments in their efforts at growth.

The Miles and Snow strategy types (M&S) were also measured using self-classification. The respondents were asked to check the box which best describes their firm's strategy. They could choose from the following four descriptions.

[1] *Prospectors*: We typically concentrate on many diverse markets, which we periodically help to redefine. We value being first-in with new services and in new markets even when these efforts are not highly profitable initially. We respond rapidly to most new opportunities.

[2] *Analyzers*: We attempt to maintain a stable and secure position in the market while at the same time moving quickly to follow new developments in our industry. We are seldom first-in with new services or in new markets, but are often second-in with better offerings.

[3] *Defenders*: We attempt to locate and maintain a secure niche in a relatively stable market environment. We try to protect our markets by offering high-quality, well-target services. We are not at the forefront of industry developments.

[4] *Reactors*: We appear to have an inconsistent approach to our markets and services and are often indecisive. We are not aggressive in attacking new opportunities, nor do we act aggressively to defend our current markets. Rather, we take action when we are forced to by outside forces such as the economy, competitors, or market pressures.

One hundred and nineteen respondents answered the question, with 38% classified as Defenders (45/119), 5% as Prospectors (6/119), 44% as Analyzers (53/119), and 13% as Reactors (15/119).

ANALYSIS/RESULTS

Regarding market growth strategies, a cross tabulation analysis was performed to determine if firms with different strategies, as classified by Miles and Snow, emphasized different types of market growth activities. One hundred and ten responding firms were included in this analysis, as they provided answers for both of the required questions. The cross tabulation for strategic type versus market growth is shown in Table 1.

Table 1
Miles & Snow vs. Market Growth

		Market Growth		
		Current	New	Both	Total
	Prospector	0	0	6	6
M&S	Analyzer	29	7	11	47
	Defender	31	3	9	43
	Reactor	12	2	0	14
	Total	72	12	26	110

$X^2= 25.54, p= .001$

The Chi-square statistic supports a significant relationship ($p<.001$) between market growth and strategic type. Nevertheless, Hypothesis 1a suggested that Prospectors would be likely to search for growth opportunities by seeking out new market segments. A look at Table 1 reveals that although Prospector firms were aggressive, in the sense that Prospectors were the only type of firm to never search for growth opportunities in current markets, none of our Prospector firms searched for growth in new markets. Consequently, Hypothesis 1a was not supported by the data.

Similarly, Hypothesis 2a proposed that Analyzer firms would also be likely to search for growth opportunities by seeking out new market segments. Instead, the results indicate that Analyzer firms in our sample are actually more likely to focus on

current market segments for growth opportunities. Consequently, Hypothesis 2a was also not supported by the data.

Hypothesis 3a suggested that Defender firms would be likely to search for growth opportunities by focusing on current market segments, and the evidence does in fact support this assumption (p<.001). Similarly, Reactor firms were more likely than expected by chance alone to focus on current markets when searching for growth opportunities (p<.001), lending support to Hypothesis 4a.

Regarding product growth strategies, a cross tabulation analysis was performed to determine if firms with different strategies, as classified by Miles and Snow, emphasized different types of product growth activities. One hundred and fourteen responding firms were included in this analysis, as they provided answers for both of the required questions. The cross tabulation is shown in Table 2 for strategy type versus product growth.

Table 2
Miles & Snow vs. Product Growth

		Product Growth			
		Current	New	Both	Total
	Prospector	0	0	5	5
M&S	Analyzer	22	9	22	53
	Defender	28	5	9	42
	Reactor	12	2	0	14
	Total	62	16	36	114

X^2= 24.05, p= .001

The Chi-square statistic supports a significant relationship (p<.001) between product growth and strategic type. Hypothesis 1b suggested that Prospector firms would be likely to search for growth opportunities by developing new services. A look at Table 2 reveals that although Prospector firms were aggressive, in the sense that Prospectors were the only type of firm to never search for growth opportunities with current products alone, none of our Prospector firms searched for growth solely through new products.

Instead, they tended to use a combination of both current and new products. Consequently, Hypothesis 1b was not supported by the data.

Similarly, Hypothesis 2b proposed that Analyzer firms would also be likely to search for growth opportunities by emphasizing new services. Instead, the results indicate that Analyzer firms in our sample are actually more likely to focus on either current products or a combination of new and current products for growth opportunities. Consequently, Hypothesis 2b was also not supported by the data.

Hypothesis 3b suggested that Defender firms would be likely to search for growth opportunities by focusing on current products, and the evidence does in fact support this assumption ($p<.001$). Similarly, Reactor firms were more likely than expected by chance alone to focus on current products when searching for growth opportunities ($p<.001$), lending support to Hypothesis 4b.

CONCLUSIONS/LIMITATIONS

The paper involves an investigation in the financial services industry of credit unions classified into each of the Miles and Snow (1978) strategic types (Prospector, Analyzer, Defender, and Reactor). The results indicate that the majority of firms can be classified as either Defenders or Analyzers, which indicates that the industry is comprised of a generally conservative group of firms.

Moreover, we looked at the tendency of these firms to focus on different growth opportunities as related to market segments and products. Once again, the results reveal that most firms in the study are conservative in nature regarding growth strategies, as nearly two-thirds tended to focus on current markets in their growth efforts, and more than half of the firms emphasized only current services as an avenue for pursuing growth.

More specifically, all four types of firms exhibited markedly conservative tendencies with regard to market growth activities. Prospector and Analyzer firms failed to exhibit the aggressive tendencies expected of these strategic types, while the Defender and Reactor firms showed a clear preference for the conservative emphasis on current market segments expected of their strategic groups.

Just as in the case of market growth activities, all four types of firms exhibited conservative tendencies with regard to product growth activities as well. Prospector and Analyzer firms once again failed to exhibit the aggressive tendencies expected of these strategic types, while the Defender and Reactor firms showed a clear preference for the conservative emphasis on current products expected of their strategic groups.

Nevertheless, due to the unique industry sub-group investigated, the study should not be generalized to other firms in the financial services industry outside of credit unions. In addition, a Chi-squared test of the respondents versus the sampling frame indicated that the responding credit unions are significantly different from the overall membership firms based on asset size, suggesting that the smaller asset groups are under-represented in our sample (Chi-sq = 20.73, d.f. = 7, $p < .01$). Consequently, the results may not truly apply to smaller-sized credit unions due to their under-representation in this study.

It is suggested that future studies investigate the strategic classifications and growth activities of other financial institutions, such as banks and savings and loans. In fact, future studies might also apply this framework to industries in both the business-to-business and consumer products areas to further test the findings. Any future studies might also include a variety of control variables, such as a firm's organizational structure or the level of competition in the industry. Finally, an investigation of the relationship between strategic type and firm performance may

provide a more complete picture of the rationale for and outcomes related to the

chosen growth opportunities of the firms in our sample.

REFERENCES

Ansoff, H.I. (1957). Strategies for diversification. *Harvard Business Review, 30*, 113-124.

Aragon-Sanchez, A. & Sanchez-Marin, G. (2005). Strategic orientation, management characteristics, and performance: A study of Spanish SMEs. *Journal of Small Business Management*, *43 (3)*, 287-309

Bednall, D.H. & Valos, M.J. (2005). Marketing research performance and strategy. *International Journal of Productivity and Performance*, *54 (5/6)*, 438-451

Brunk, S.E. (2003). From theory to practice: Applying Miles and Snow's ideas to understand and improve firm performance. *The Academy of Management Executive*, *17 (4)*, 105

Conant, J.S., Mokwa, M.P. & Varadarajan, P.R. (1990). Strategic types, distinctive marketing competencies, and organizational performance: A multiple measures based study. *Strategic Management Journal*, *11 (5)*, 365-383.

Desarbo, W.S., Di Benedetto, A., Song, M. & Sinha, I. (2005). Revisiting the Miles and Snow strategic framework: Uncovering interrelationships between strategic types, capabilities, environmental uncertainties, and firm performance. *Strategic Management Journal*, *26*, 47-74

Doty, D.H., Glick, W.H. & Huber, G.P. (1993). Fit, equifinality, and organizational effectiveness: A test of two configurational theories. *Academy of Management Journal*, *26*, 1196-1250.

Freel, M. (2005). Perceived environmental uncertainty and innovation in small firms. *Small Business Economics*, *25 (1)*, 49

Garrigos-Simon, F., Marques, D.P. & Narangajavana, Y. (2005). Competitive strategies and performance in Spanish hospitality firms. *International Journal of Contemporary Hospitality Management*, *17 (1)*, 22-39

McDaniel, S.W. & Kolari, J.W. (1987). Marketing strategy implications of the Miles and Snow strategic typology. *Journal of Marketing*, *51 (4)*, 19-30

Miles, R.E. & Snow, C.C. (1978). *Organizational Strategy, Structure, and Process,* New York: McGraw-Hill.

Moore, (2005). Towards a confirmatory model of retail strategy types: An empirical test of Miles and Snow. *Journal of Business Research*, *58 (5)*, 696

Pleshko, L.P. & Souiden, N. (2003). The profits effects of product-market growth strategy. *Journal of Financial Services Marketing*, *7 (3)*, 258-266.

Shoham, A., Evangelista, F. & Albaum, G. (2002). Strategic firm type and export performance. *International Marketing Review*, *19 (2/3)*, 236-259.

Shortell, S.M. & Zajac, E.J. (1990). Perceptual and archival measures of Miles and Snow's strategic types: A comprehensive assessment of reliability and validity. *Academy of Management Journal*, *33 (4)*, 817-832.

Slater, S.F. & Narver, J.C. (1993). Product-market strategy and performance: An analysis of the Miles and Snow strategy types. *European Journal of Marketing*, *27*, 33-51.

Woodside, A.G., Sullivan, D.P. & Trappey III, R.J. (1999). Assessing relationships among strategic types, distinctive marketing competencies, and organizational performance. *Journal of Business Research*, *45 (2)*, 135-147.

ORGANIZATIONAL SUPPORT AND PERSONAL TRAIT DETERMINANTS OF SERVICE WORKER PERFORMANCE: AN EMPIRICAL STUDY

Ugur Yavas, East Tennessee State University, College of Business and Technology, Johnson City, TN 37614, 423-439-5382, raxyavas@etsu.edu
Osman M. Karatepe, Eastern Mediterranean University, School of Tourism and Hospitality Management,Gazimagusa, Turkish Republic of Northern Cyprus, 90 392 630 1116, osman.karatepe@emu.edu.tr
Emin Babakus, The University of Memphis, Fogelman College of Business and Economics, Memphis, TN 38152, 901-678-3857, ebabakus@memphis.edu

ABSTRACT

The purpose of this study is to examine the relative efficacies of organizational support mechanisms and personal traits in predicting frontline employees' service recovery and job performances. A sample of 723 frontline hotel employees in Turkey serves as the study setting. The study results and implications are presented.

INTRODUCTION

Frontline employees in service organizations, whether they actually render the service or simply interact with customers face-to-face or voice-to-voice, are the main actors in the delivery of service quality. Also because of their boundary-spanning positions, frontline employees, more so than other employees in an organization, have the capability for returning aggrieved customers to a state of satisfaction after a service failure occurs. Recognizing the critical role of frontline employees in attaining customer satisfaction and other desirable organizational outcomes, service managers take actions at least on two fronts. On one hand, given that a good fit between a person and the job leads to better job outcomes, they try to recruit and retain employees possessing traits relevant for frontline jobs [2][3]. On the other hand, service managers provide their employees with various forms of organizational support that diminish the negative effects of job demands and/or assist employees to achieve their work goals and stimulate their personal growth [1].

Against this background, the purpose of this study is to examine the relative efficacies of a set of organizational support mechanisms and personal traits in predicting frontline employees' service recovery and job performances. The three organizational support mechanisms included in the scope of our study are training, supervisory support, and empowerment. Likewise, we include three personal traits which are relevant for frontline service jobs in our study. These are intrinsic motivation, trait competitiveness, and self-efficacy. We use frontline hotel employees in Ankara, Turkey as our study setting.

METHODOLOGY

Data for the study were collected via self-administered questionnaires from the frontline employees of a total of 37 hotels. Usable responses were obtained from 723 employees. Multiple-item scales obtained from the relevant literature were used to operationalize the study constructs. Specifically, organizational support mechanisms were measured via six (6) training items, five (5) empowerment items and five (5) supervisory support items. Of the personal trait measures, intrinsic motivation was measured via four (4) items, trait competitiveness via four (4) items and self-efficacy via eight (8) items. The two performance measures (service recovery performance and job performance) each consisted of five (5) items. Responses to each of these questionnaire items were elicited on 5-point scales ranging from strongly agree to strongly disagree. Because of the scoring system used in the study, higher scores consistently indicated higher levels of the constructs (e.g., supervisory support, intrinsic motivation, job performance). Descriptive statistics and reliability estimates of the measures are reported in Table 1.

TABLE 1

DESCRIPTIVE STATISTICS AND INTERNAL CONSISTENCY RELIABILITY

Variable	Range	Mean	Std Deviation	Coefficient Alpha
Training	6-30	16.10	4.66	.91
Empowerment	5-25	14.85	3.26	.73
Supervisory Support	5-22	14.52	2.70	.64
Intrinsic Motivation	8-20	17.12	2.11	.82
Trait Competitiveness	4-20	15.21	2.44	.70
Self-efficacy	12-38	27.45	2.95	.40
Service Recovery Performance	9-25	17.53	3.04	.76
Job Performance	10-25	19.50	2.38	.74

RESULTS

During the analysis stage, the two performance measures were dichotomized by arraying the respondents according to their service recovery and job performance scores and assigning them into high (top quartile) and low (bottom quartile) groups. However, because of the relatively small range of discrete scale values, quartiles were not precisely 25%. The high service recovery

performance group included 285 and the low group 201 respondents. The breakdown of the job performance groups were 228 (low performance) and 252 (high performance).

The analysis proceeded in two stages. In the initial stage, the three organizational support and personal trait variables were separately entered into four discriminant analysis models where dichotomized service recovery and job performance measures served as the dependent variables. All four models proved to be significant. The discriminant model consisting of training, supervisory support, and empowerment was able to correctly classify 79% of the low and high service recovery performance groups (Wilk's lambda = .7048; p = .0000) and 62% of the low and high job performance groups (Wilk's lambda = .9136; p = .0000). The models consisting of the three personal traits of intrinsic motivation, self-efficacy, and trait competitiveness were able to predict correctly 71% of the low and high service recovery performance groups (Wilk's lambda = .7971; p = .0000) and 74% of the low and high job performance groups (Wilk's lambda = .7401; p = .0000).

In the second stage of the analysis, all six predictor variables were submitted to stepwise discriminant analysis. The results are presented in Table 2 for the service recovery performance and in Table 3 for the job performance cases. Four variables entered the final solution as predictors of service recovery performance (Table 2).   Three of these variables were organizational support mechanisms and the other one, intrinsic motivation, a personal trait. Collectively the variables were able to classify 81% of the respondents correctly. By using the signs of the variables for directional reference, it can be concluded that training, empowerment, and supervisory support as well as intrinsic motivation enhance frontline employees' service recovery performance.

TABLE 2

SERVICE RECOVERY PERFORMANCE: STEPWISE DISCRIMINANT ANALYSIS

Discriminant Function	Eigen Value	Canonical Correlation	Wilk's Lambda	Chi-square Significance
1	.7279	.6940	.5787	0.0000

Variables in Solution		Group Centroid	
Variable	Standardized Discriminant Coefficient	High	Low
Training	.36362	.715	-1.013
Empowerment	.56094		
Supervisory Support	.14275	Classification Accuracy	
Intrinsic Motivation	.60517	80.86%	

The final solution in the model where job performance served as the dependent variable consisted of two organizational support mechanisms (training and empowerment) and all three personal traits (intrinsic motivation, trait competitiveness, and self-efficacy). Collectively these variables accurately classified 78% of the respondents. It appeared that training, empowerment, intrinsic motivation, trait competitiveness, and self-efficacy enhanced frontline employees' job performance (Table 3).

TABLE 3

JOB PERFORMANCE: STEPWISE DISCRIMINANT ANALYSIS

Discriminant Function	Eigen Value	Canonical Correlation	Wilk's Lambda	Chi-square Significance
1	.4515	.5577	.6890	0.0000

Variables in Solution		Group Centroid	
Variable	Standardized Discriminant Coefficient	High	Low
Training	.50544	.63779	-.70493
Empowerment	.37093		
Intrinsic Motivation	.37241	Classification Accuracy	
Trait Competitiveness	.49634	77.92%	
Self-efficacy	.48509		

CONCLUSIONS

In today's competitive service environment, having high-performing frontline employees is a managerial imperative for success and survival. This study examined the relative efficacies of organizational support mechanisms and personal traits in predicting frontline employees' service recovery and job performances. The study results show that organizational support is more effective in differentiating between high- and low-performing frontline employees with regard to service recovery. However, overall job performance is more susceptible to the influences of personal traits. While these findings may not necessarily reflect employees' actual performances as assessed by other parties, such as employees' service recovery performance as judged by their customers or their overall job performance as evaluated by their supervisors, they nevertheless reaffirm that performance can be enhanced via selection and support provision.

Perhaps more importantly, our results show that when both strategies are used in tandem, the likelihood of having high-performing employees increases. Thus, while providing necessary

organizational support to their employees, management must make sure that they recruit individuals possessing the relevant personal traits for frontline service jobs in the first place. This is particularly so as employees who have the requisite personal traits would be more receptive to and appreciative of various forms of support provided by their organization.

REFERENCES

[1]   Babakus, E., Yavas, U., Karatepe, O., and Avci, T. (2003), "The Effect of Management Commitment to Service Quality on Employees' Affective and Performance Outcomes," *Journal of the Academy of Marketing Science,* 31 (3), 272-286.

[2]   Brown, T.J., Mowen, J.C., Donavan, T., and Licata, J.W. (2002), "The Customer Orientation of Service Workers: Personality Trait Determinants and Effects on Self- and Supervisor Performance Ratings," *Journal of Marketing Research*, 39 (February), 110-119.

[3]   Licata, J.W., Mowen, J.C., Harris, E.G., and Brown, T.J. (2003), "On the Trait Antecedents and Outcomes of Service Worker Job Resourcefulness: A Hierarchical Model Approach," *Journal of the Academy of Marketing Science*, 31 (3), 256-271.

The *k*-Factor in Service Analysis

Harry Katzan, Jr., Savannah State University, USA

ABSTRACT

The **k-Factor** is the ratio of the value of intangible service to the value of tangible service. The ratio changes as a function of time and is an important cornerstone of modern business, because of our propensity for measurement and analysis. The concept applies to the traditional forms of service (people processing, possession processing, and information processing), as well as to Internet services and service-oriented architecture. This is a *working paper* on the k-Factor with the express purpose of extending the discipline of service science and providing a basis for further research.

KEYWORDS: Service science, service ratio, tangible service, intangible service, facilitating service, primary service, secondary service, auxiliary service.

INTRODUCTION

Shoppers patronize some brick-and-mortar stores to get a good price. Usually, it is for everyday essential items, and the service doesn't actually matter. In other instances, a bit of service is helpful, and the customer is willing to pay for a higher level of service. It is built into the price. In yet other cases, the purchasing process is paramount and approaches the product itself in terms of importance. Clearly, the product is a tangible phenomena, and the feelings and emotions associated with the purchase thereof are intangible. In the former case, the assessment of the product is a left-brain function, and the affective considerations are right-brain functions. Each of the elements has a utility to the consumer, and the associated values are called the "tangible value" and the "intangible value," respectively. The ratio of the two is the *k*-Factor, given as follows:

$$k\text{-Factor} = (\text{intangible service}) / (\text{tangible service})$$

The *k*-Factor would appear to apply to most, if not all, economic transactions.

This is a *working paper* on the k-Factor with the express purpose of extending the discipline of service science and providing a basis for further research.

BASIC CONCEPTS

The subject of *k*-Factor analysis is based on several concepts generally considered basic to service theory. The first is that some economists feel that all products are essentially services. The second is that a pure service event[1] is usually supplemented by one or more support services. The third is that many tangible services require facilitating services that persist for the lifetime of the core service. Lastly, some services, such as information services and some forms of possession processing services, are associated with certain attributes, such as convenience and accessibility, that serve as determinants of intangible services. This section summarizes the various concepts as they relate to *k*-Factor analysis.

Product as a Service

The basis of "product as a service" is the fact that most, if not all, products are purchased for one or more reasons that are reflected in the utility of that product. Often, factors of production, such as quality of assembly, modern design, and the selection of appropriate technology, determine the corresponding level of service. Table 1 lists several product attributes related to product service. The characteristics, given in the table, can be uncovered

---

[1] A pure service event is a service not associated with a product.

Table 1. Attributes Related to Product Service

_____

    Overall quality of assembly
    Good design
    Modern technology
    Use of appropriate technology
    Avoidance of implementation determined by factors of production
    Excellence of presentation
    Availability of unique features
    Reliability
    Performance

_____

through measurement, surveys, analysis, focus groups, and so forth. The notions apply to apparel, appliances, electronics, and automobiles – to name only a few instances. When a product is purchased for the service it renders, rather than the physical artifact per se, then the above attributes contribute to its value as a tangible service.

To sum up, a product is essentially a service in the sense that its tangible value is derived from the service it provides. A product also has an intangible value determined by product characteristics, price, and reputation of the manufacturer. In some cases, the intangible value of a product is greater than its tangible value.

Service as a Service

The tangible value of a pure service is determined by the training, experience, and infrastructure provided by the service provider. Supporting services – referred to here as *secondary services* – are frequently needed and the nature of those additional services contribute to the intangible value of the primary service. From a client perspective in a medical example, the utility of the service to the client determines the significance of the intangible service. In other words, if you are sick enough, how you are treated by the nurse does not matter all that much.

Information as a Service

The tangible value of information is determined by its completeness, accuracy, and relevance, as well as by a whole host of other well-known factors. The convenience of accessing the information and the reputation of the service provider are the intangible factors. In the case of "information as a service," information can be properly regarded as a product, and its usefulness is determined by the characteristics given above.

DEFINITIONS

A *service* is a provider/client relationship (Katzan [2008]) that captures value for both participants that can be individuals, organizations, or a complex arrangement of either one. Service operations are customarily grouped into three classes: people processing, possession processing, and information processing. Within each domain, it is therefore important to view the client/provider relationship along the following dimensions:

    Tangible vs. intangible
    Primary vs. secondary
    Facilitating vs. auxiliary

This approach focuses on the fact that a service event is a process consisting of primary and secondary services.

Tangible Service

A *tangible service* is a provider/client event that results in demonstrable values to the service participants. With an individual service participant, this is a left-brain function (LBF). In retailing, it is the acquisition of a product including attendant activities that change the ownership attribute of the associated product. However, the value proposition for a product may be determined from the service it provides, rather than from the intrinsic value of its specific components. In most people or possession processing services, value is created through the work performed on behalf of the client by the provider. With information services, the service's value is derived from the transfer of information from service provider to the client.

Intangible Service

An *intangible service* provides value for a service participant through the perspective of a right-brain function (RBF). Certain products, such as premium automobiles (Rosengarten and Stuermer [2006]), special jewelry, and elegant real estate, for example, are typically associated with a high-level of intangible services. As mentioned previously, the intangible value of a product may exceed its tangible value – both from a service perspective.

Primary Service

A *primary service* is the core service for which the provider and the client interact to produce demonstrable value. Simple examples are a dental appointment of a lawn care service.

Secondary Service

A *secondary service* is a service that does not exist separately as a primary service and plays a supportive role to a primary service. Common examples are the weigh in and blood pressure checks associated with a doctor's visit and the acceptance and delivery of garments at a dry cleaning establishment.

Facilitating Service

A *facilitating service* is disjoint from a primary or secondary service and enables a client to obtain utility from a tangible service. Usability services, commonly associated with automobiles and computers are common examples of facilitating services. Another common example of a facilitating service is the purchase of an event ticket. In this instance, the event – be it to the theatre, sporting match, or an amusement park – is the tangible service and the ticket is the intangible service.

Auxiliary Service

An *auxiliary service* is independent from a core service and may be experienced before or after the primary service. A blood test taken prior to a doctor's appointment and a medical referral are examples of auxiliary services.

Discussion

In product retailing, product attributes determine the level of tangible service that is supplied by the use of that product. Obvious examples are design, technology, quality of assembly, technological invocation, and reliability. With pure services, the level of tangible service relates to training, reputation, dependability, and performance.

The level of intangible service is normally a function of the feelings that one derives from ownership of a premium product or the participation in a services event with a particular service provider. The demonstrability that one is successful, that "one has arrived," or that "one can't do any better" are paramount to intangible service levels.

Service Relationships

The service dimensions, mentioned above, namely tangible, intangible, primary, secondary, facilitating, and auxiliary, are associated through two concepts: coupling and cohesion. Both concepts describe the inter-relationship between dimensions.

Coupling is a measure of the interrelatedness of two services and reflects the degree to which changes in one service process require adjustment in the other. In a medical practice, for example, the coupling between a primary and an associated secondary service is high, whereas the coupling between primary and auxiliary services is low. Thus, a change in the primary service practice would necessitate changes to a secondary process. Interesting situations arise in analyses related to coupling. In automotive retailing, the three tangible service processes are the "sales" primary service, the "user service" secondary service, and the "maintenance service" auxiliary service. There is a tight coupling between sales and user service and a loose coupling between sales and maintenance service.

Cohesion is a measure of the strength of the relationship between two or more services – sometimes known as a measure of similarity. Thus, the service processes and participants share the same characteristics, when the cohesion is high, and are attributionally diverse, when the cohesion is low. The practice of two orthopedic surgeons would have a high cohesion, and the practices of an internist and a chiropractor would be low.

SERVICE MODELS

Figures 1-3 give service models for the types of services covered previously. Clearly, the roles of tangible and intangible services are evident from the diagrams.
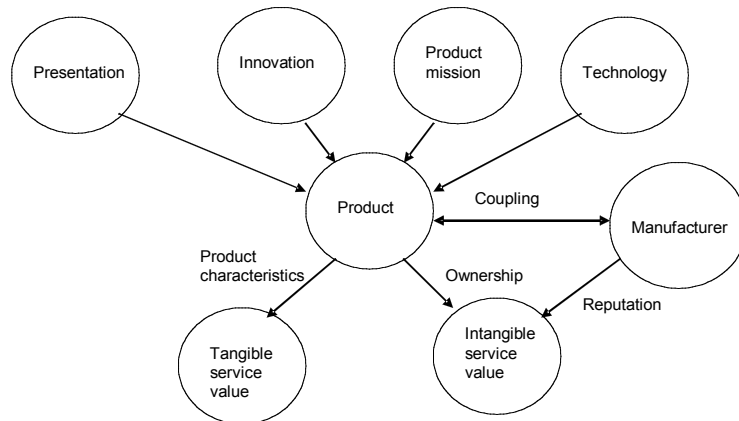
Figure 1. Product as a Service.
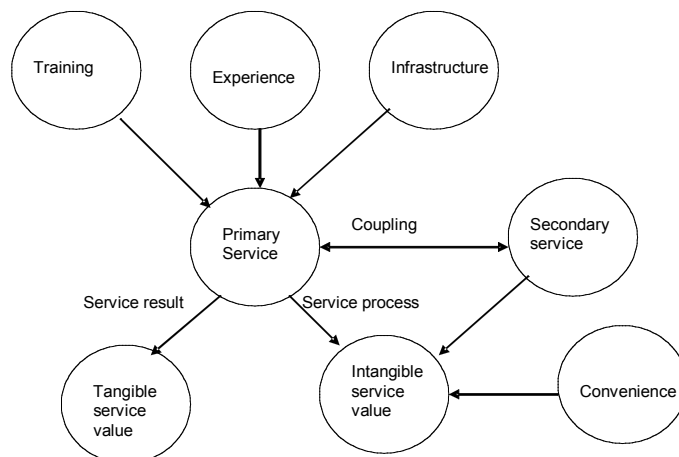
Figure 2. Service as a Service.
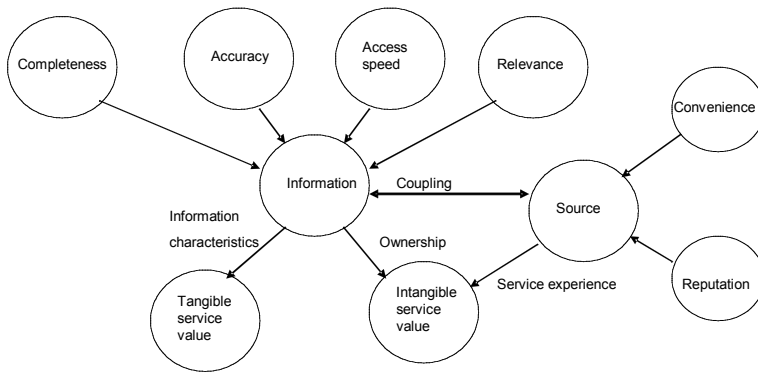
Figure 3. Information as a Service.

Accordingly, the relationships are established, as follows:

$$TS = PS_t + SS_t + FS_t + AS_t$$
$$IS = PS_i + SS_i + FS_i + AS_i$$

where the symbology , such as TS denotes Tangible Service, is evident from the context. Table 2 gives a conceptual view of the relevance of the *k*-Factor as it would be applied to several problem domains.

Table 2. Analysis Matrix (Premium Automobile example with a
Modified Likert Scale.)

	Tangible	*Intangible*
Primary Service	4	5
Secondary Service	4	4
Auxiliary Service	4	4

Figure 4 gives a time line for a hypothetical example of premium automobiles. What does the crossover point at 3 ½ years suggest? Perhaps it is trade-in time where the intangible value begins to exceed the tangible value.
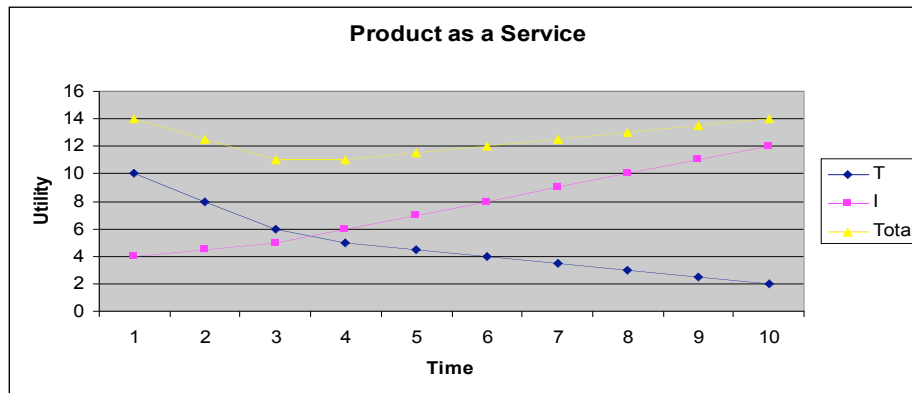
Figure 4. Time Line for Product as a Service for Hypothetical Premium Automobiles.

Table 3 gives a set of **k-Factor** values for several product/service categories.

CONCLUSION AND FUTURE RESEARCH

As noted in the abstract, this is a working paper intended to advance the science of services. Clearly, the *k*-Factor, as presented above, is a phenomenon that warrants further study. For example, consider the *a*-Factor defined as:

a-Factor = (expected service)/(actual service)

Is the *k*-Factor a predictor of the *a*-Factor? Another interesting question is whether there a relationship between the relative price of a product and the magnitude its *k*-Factor.

ACKNOWLEDGEMENT

Thanks to Margaret Katzan for reading the paper.

REFERENCES

Katzan, H., Event Differentiation in Service Science, *Journal of Business & Economics Research*, Volume 6, Number 5` (2008), pp. 141-152.

Katzan, H., Foundations of Service Science: Concepts and Facilities, *Journal of Service Science*, Volume 1, Number 1 (2008), pp. 1-22.

Katzan, H., *Service Science: Concepts, Technology, Management,* Bloomington, IL: iUniverse, Inc., 2008, ISBN 0-595-52519-9.

Lusch, R., Vargo, S, and G. Wessels, Toward a conceptual foundation for service science: Contributions from service-dominant logic, *IBM Systems Journal*, Volume 47, Number 1 (2008), pp. 5-14.

Rosengarten, P. and C. Stuermer, *Premium Power: The Secret of Success of Mercedes-Benz, BMW, Porsche, and Audi*, New York: Palgrave Macmillan, 2006.

Spohrer, J., Vargo, S., Caswell, N. and P. Maglio (2007). *The Service System as the Basic Abstraction of Service Science,* IBM Research, Almaden Research Center, San Jose, CA, www.almaden.ibm.com.

Table 3. *k*-Factor Analysis

Product/Service	Primary Service	Secondary Service	Auxiliary Service
Premium automobile	$k \gg 1$	$k > 1$	$k \approx 1$
Luxury automobile	$0.75 < k < 1$	$0.75 < k < 1$	$0.5 < k < 1$
Volume automobile	$0 < k < 0.75$	$0 < k < 0.5$	$0 < k < 0.5$
Medical service			
– Physician	$k > 1$	$k \approx 1$	$0.5 < k < 1$
– Dentist	$0.5 < k < 1$	$0 < k < 0.5$	--
– Chiropractor	$0.5 < k < 0.75$	$k \approx 0.5$	--
Maintenance:			
– Yard	$0 < k < 0.5$	$0 < k < 0.25$	--
– Cleaning	$0 < k < 0.25$	$0 < k < 0.25$	--
Personal care:			
– Hair	$0 < k < 0.25$	--	--
– Fitness	$0 < k < 0.25$	--	--
Information:			
– Browser	$k \approx 1$	--	--
– Search engine	$k \gg 1$	--	--
– Portal	$k \approx 1$	--	--

SEGMENTATION ANALYSIS OF GROCERY SHOPPERS IN ALABAMA

James O. Bukenya and Michael Mukiibi

James O. Bukenya, Associate Professor

Department of Agribusiness
Alabama A& M University
P. O. Box 1042 Normal, AL 35762
Tel: 256-372-5729; Email: james.bukenya@aamu.edu

Michael Mukiibi, Graduate Research Assistant

Department of Agribusiness
Alabama A& M University
P. O. Box 1042 Normal, AL 35762
Tel: 256-372-5729; Email: michael.mukiibi@mailserver.aamu.edu

Abstract

This paper employs cluster analysis and multivariate statistical procedures to identify distinct segments of grocery store shoppers in Alabama and to investigate how shoppers' demographic and behavior characteristics influence household grocery expenditures across the identified market segments. The analysis draws on data from a telephone survey conducted in Jefferson County, Alabama. Cluster analysis results suggest three distinct market segments which are identified as Back to Natural, Convenience Driven and Typical shoppers. On the other hand, the maximum-likelihood estimate results reveal that presence of children less than 18 years in the household, having some college education, and household size are the most important positive factors, while travel time is the most important negative factor, in influencing consumers' grocery spending patterns across segments.

INTRODUCTION

The retail food industry sector has seen dramatic changes in the past fifteen years driven in part by demographic and lifestyle changes (Kinsey and Senauer, 1996; Morganosky and Cude, 1999; Mangaraj and Senuer, 2001). As a result, understanding customers is more important than ever in today's competitive economy, where declining customer loyalty and high customer turnover continue to erode profit margins (Michel, 2003). Opportunities in marketing increase when segmented groups of clients and customers with varying needs and wants are recognized. A key factor to success is finding slight differences to give a business the marketing edge; since a business that target specialty markets will promote its products and services more effectively than a business aiming at the "average" customer (Lake, 2007). Fundamentally, market segmentation is concerned with individual or group differences in response to specific market variables.

Although there has been limited attention to market segmentation in the retail food marketing literature, agribusinesses use segmentation to develop marketing strategies for domestic consumers. As quoted in Asp (1992), the few such examples include Pillsbury's "What's Cookin" lifestyle segmentation that divides the U.S. population into five segments based on eating behavior and Coca-Cola's segmentation of food shoppers into six groups (Asp, 1992). Most recently, Mangaraj and Senuer (2001) employ cluster analysis to segment US supermarket shoppers while Baltas and Papastathopoulou (2003) examine the relationship between consumer profile and brand and store choice behavior in the Greek grocery market. This paper contributes to the literature by segmenting grocery shoppers in Alabama based on selected demographic and behavior characteristics. The focus here is on individual differences in response to specific market variables (e.g. preferences, lifestyles, shopping habits, etc.). The strategic presumption is that if these response differences exist, can be identified, and are reasonably stable over time, and if the segments can be efficiently reached, grocery store managers in Alabama may increase their market share beyond that obtained by assuming market homogeneity.

1

The paper starts off by addressing three fundamental questions. First, which factors are considered important to Alabama grocery shoppers when choosing a grocery store? Second, which of these factors are universal and which ones are only important to certain consumers? Third, how many distinct segments of grocery store shoppers exit and what are their distinguishing preferences? The answers to these questions form the basis for the empirical analysis, which uses the identified distinct segments to investigate how respondent's demographic and behavior characteristics influence household grocery expenditures across segments. For retail food managers in Alabama, recognizing which segments of shoppers frequent their stores and their spending patterns can enable them to serve these segments better or to attract more shoppers in a particular segment by targeting their preferences (FMI, 1999). The remainder of the paper is organized in five additional sections. Section2 presents a description of the survey data followed by a description of segmentation analysis and cluster results in Section 3. Section 4 presents the empirical model for the multivariate analysis followed by the empirical results in Section 5. The last section presents the concluding remarks.

DATA

Data were obtained through a telephone survey of Alabama grocery shoppers. The survey was conducted by the Center for Governmental Services Survey Research Laboratory (CGSSRL) at Auburn University between July 6 and July 21, 2006. A sample of households in Jefferson County was selected through random digit dialing, a procedure that allows each household that has a telephone to have an equal chance of being selected for the sample. The household member who was the primary grocery shopper for the household was selected to answer the survey questions. Calls were made in evening from 5:00 to 9:00 pm, and during the day on weekends (typically from 11:00am to 5:00pm on Saturdays and 1:00pm to 6:00pm on Sundays). A total of 4,069 call attempts were made resulting in 502 or 12% completed interviews. The average number of call attempts per telephone number was 2.26.

2

Survey Responses

The survey instrument contained questions related to respondents' socio-demographic characteristics, shopping habits, behaviors and attitudes. First, the socio-demographic characteristics show that 53 percent of the respondents were Caucasian/White and 42 percent African-American/Black. Another 5 percent was classified as other races. In terms of marital status, 53 percent of the respondents were married while 47 percent were single, divorced or widowed. About 49 percent of the respondents lived in households with only one or two people. Another 24 percent lived in three-person households, while 27 percent lived in households with four or more people.

The majority (61 percent) of the sample indicated having no children under 18 living in the household. As for age, approximately 55 percent of the respondents were between the ages of 26 to 55. The respondents were highly educated with 68 percent of the total sample having at least some college education. Approximately 33 percent of those who responded to the income question reported household income of $50,000 or more. Compared with state averages from U.S. Census Bureau statistics (U.S. Census Bureau 2000), the sample demographics are fairly different from the state's demographics (Table 1). For instance, 68 percent of the survey sample had some college level education or above versus 45 percent in the state; 33 percent of the survey sample reported annual income above $50,000 versus 42 percent in the state; and 53 percent of the survey sample was White versus 71 percent in the state.

-------------Table 1 about here ----------------

For consumer behaviors, habits and attitudes, a set of questions asked respondents about the time of day and portion of the week during which they do most of their grocery shopping. About 56 percent indicated shopping evenly between weekdays and weekends, with another 23 percent favoring weekdays. The most popular time of day was the mornings (before 11:30 am), with about 28 percent selecting this time period. Another 28 percent favored the afternoons (1:30 to 5 pm) for their most typical food shopping

3

time period, and another 26 percent favored the early evening hours (5 pm to 8 pm). A small percent of respondents (6 percent) stated that lunchtime was the most favored shopping time of the day (11:30 am to 1:30 pm). In terms of the most popular/first-choice grocery store among respondents (i.e. where they "do most of their shopping"), Wal-Mart attracted 27 percent of the responses. The next most popular grocery store was Publix, garnering 19 percent of the responses, followed by Piggly Wiggly with 13 percent of the responses. Other popular grocery store destinations included Food World (11 percent), Winn Dixie (9 percent), and Bruno's (7 percent).

Two reasons for selecting the first-choice store were accepted from each respondent and tabulated in combination as well as separately. When looking at the combined frequency of answers, "selection" accounted for the most popular reason with 25 percent of responses. Selection of produce, organic products, and meat were important among those who chose their primary grocery store based on selection. "Convenient to home" accounted for the next most popular reason with 24 percent of responses. "Prices" accounted for the third most-popular reason, with a combined 16 percent of responses selecting this factor. "Quality of merchandise" was the fourth most-frequently mentioned reason, with a combined count of eleven percent of all responses.

SEGMENTATION ANALYSIS

Marketing literature provides many examples of market segmentation research and numerous techniques and bases for segmentation have been proposed (Vriens, Wedel and Wilms, 1996; Mangaraj and Senuer, 2001; Lake, 2007; Green and Krieger, 1991; Wedel and Kamakura, 2000 Brusco, Cradit and Stahl, 2002; Brusco, Cradit, and Tashchian, 2003). One of such technique commonly used in domestic market segmentation and adopted in this paper is cluster analysis. Cluster analysis groups objects by minimizing the within group differences and maximizing between group differences. Cluster analysis is often based on consumer attitude towards the products, perceived benefits, purchase propensities, lifestyle, or demographics.

As a first step, twenty questions (requiring respondents to indicate the level of importance on preferred characteristics while shopping in their primary grocery store) were pulled from the survey questionnaire and used as the basis variables for the segmentation process[1]. The questions were based on 1-3 likert scales with 1 being "very important" to 3 being "not important". Following Mangaraj and Senauer, response bias due to "yes saying" was corrected by subtracting each respondent's average response across the twenty basis questions from their response to each question (Mangaraj and Senauer, 2001). Then, a three-step K-means clustering was implemented using Statistical Package for Social Sciences (SPSS) software.

Cluster Results

Three clusters (segments) were identified and analyzed by initially looking at the distance and mean responses for each cluster across the twenty basis questions. Table 2 shows the Euclidean distances between the final clusters where greater distances between clusters corresponded to greater dissimilarities. For example, clusters 1 and 2 are most different. Cluster 2 is approximately equally similar to clusters 1 and 3. As for the distribution of the sample, Figure 1 shows how the cases were assigned to each cluster with the majority (40%) of the respondents falling in cluster 3 followed by cluster 1 (35%) and Cluster 2 (25%), respectively.

--------- Table 2 about here ------------------

------------Figure 1 about here ----------------

Table 3 shows the mean responses (cluster center) for each of the segment on the twenty preference questions[2]. Based on the population means, "open in the evenings on weekdays" is the most important attribute in all three clusters. However, the magnitude of the importance is different across

---

[1] These preferred characteristics are presented in Table 3.
[2] It is important to note that the mean scores are deviation from each respondent's average response across all the twenty questions.

clusters. For instance, cluster 1 respondents rate "open in the evenings on weekdays" as the most important attribute with a mean of 0.45, slightly lower than the population average for this question estimated at 0.51. Cluster 2 respondents rate the importance of this attribute ("open in the evenings on weekdays") higher than the population average with a mean of 0.69, while cluster 3 respondents rate this attribute with a mean of 0.57, lower than cluster 2, but higher than cluster 1 (Table 3).

-------------------------Table 3 about here --------------

The identified clusters (segments) are labeled based on the observed preferred characteristics by consumers in each cluster and also based on the available marketing literature (FMI, 2001; Mangaraj and Senauer, 2001). First, because cluster 1 is comprised of consumers who score on or near the population average on most health and quality attributes (Figure 2), it is labeled as "*Back to Natural Shoppers*" segment. Certainly, consumers in this segment are quality and health minded, as indicated by their tendency to buy foods and fruits produced without hormones, pesticides and other related substances. Members of this segment would most probably shop in an upscale grocery store. A close examination of the demographics in Table 4 indicates that respondents in this cluster tend to be older, better educated and falling in lower and middle-income categories. In addition, this segment has a higher proportion of married people and the largest representation of whites. This segment also spends the most amount of money on grocery and has large household size of 3 or more people on average.

-----------------Figure 2 about here --------------

------------------Table 4 about here -------------

6

The next segment (Cluster 2) is identified as "*Convenience Driven Shoppers*" because convenience and price related attributes are important for this segment of shoppers (Figure 3). Distance and safety are also important to this group of consumers. It is the quality of the shopping experience that is important to this segment of grocery shoppers. As for demographic (Table 4), the segment consists of middle aged, low income, educated, and has the largest representation of minorities. The average number of a typical household in this segment is also 3 or more people. Finally, cluster 3 is identified as "*Typical Shoppers*" because convenience, price and quality rule in this segment (Figure 4). Open in the evenings on weekdays, competitive prices, produced without pesticides, and distance from home to grocery store are also important for this segment. Looking at demographics (Table 4), this segment consists of middle aged, higher income, old and mostly whites. This segment has the highest proportion of singles and also the highest number of children less than 18 years. The presence of largest proportion of singles may indicate that there may be a fair number of single-parent families.

-------------------Figure 3 about here ------------------

-----------------Figure 4 about here ------------------

Empirical Model

To investigate how demographic and behavior factors influence the spending patterns within the identified segments, we specify and estimate logit models, one for each identified segment (cluster). The logit model was selected because its asymptotic characteristic constrains the predicted probabilities to a range of zero to one. Also, since the survey provided individual rather than aggregate observations maximum likelihood estimation (Gujarati, 1992) was used to obtain consistent and asymptotically efficient

7

parameters (Pindyck and Rubinfeld, 1991). By adopting the logit regression, the following model was specified to predict consumer spending patterns within each of the three identified market segments:

$$\text{Prob}(\text{EXPEND} = 1) = \frac{e^{X\beta}}{1 + e^{X\beta}}$$

(1)

where EXPEND is coded as "1" for respondents who spent $75 or more on grocery shopping in a typical week and "0" otherwise, X is a vector of explanatory variables that may influence how much money a given respondent will spend on groceries in a typical week, and β is a vector of coefficients to be estimated. The model was tested under the following specification:

$$\text{EXPEND} = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{MARRIED} + \beta_3 \text{WHITE} + \beta_4 \text{HHSIZE} + \beta_5 \text{CHILDREN}$$
$$+ \beta_6 \text{EDUCATION} + \beta_7 \text{INCOME} + \beta_8 \text{FREQSHOP} + \beta_9 \text{TRAVTIME} + \varepsilon$$

(2)

Where HHSIZE represents the number of people in respondent's household, CHILDREN represents the presence of children under 18 years living in the respondent's household, FREQSHOP represents the frequency or number of times a respondent goes to the grocery store in a typical week, TRAVTIME represents the number of minutes it takes to get to the grocery store, and ε is an error term with zero mean and constant variance. The other variables are as stated or as previously defined. Equation 2 was estimated in LIMDEP 7.0 statistical software (Greene, 2000).

From equation 2, the parameter estimates (β_i) do not directly represent the effect of the independent variables. Therefore, to obtain the estimator for qualitative discrete variables in the logit model, we estimated the change in probability brought about by a change in the independent variable as:

$$\Delta P_i = \beta_k P_i (1 - P_i)$$

(3)

Where P_i is the estimated probability of an individual spending $75 or more on grocery shopping in a typical week evaluated at the mean, and β_k is the estimated coefficient of the kth variable. The change in

8

probability (ΔP_i) is a function of the probability, and when multiplied by 100 gives the percentage change in the probability of the event occurring given a change in the variable, all things being equal.

Empirical Results

Because the three models are not independent of each other and the comparison of the results enhances their interpretation, we report them together in Table 3. The table also reports the change in probability coefficients of the explanatory variables, the log likelihood coefficients, the chi-square statistics and the models' prediction success. The measures of goodness of fit indicate that the models fit the data fairly well. The logit model chi-square statistics are significant at the 0.005 levels, in all three models, clearly rejecting the null hypothesis that the set of explanatory variables are together insignificant in predicting variations in the dependent variables. Their predictive power is 68 percent (model1), 73 percent (model 2) and 69 percent (model 3), respectively.

In the case of the explanatory variables, the maximum-likelihood estimates of the model are interpreted using the change in probability. As shown in Table 3, Model 1 has six coefficient estimates that are statistically significant, including the constant (-), Married (+), children (+), education (+), income (+) and travel time (-). Model 2 has five coefficient estimates that are statistically significant, including the constant (-), married (+), education (+), income (-) and travel time (-); while Model 3 has eight coefficient estimates that are statistically significant, including the constant (-), white (-), household size (+), children (+), education (+), income (+), Frequency of shopping (-), and travel time (-), most consistent with expectations.

The marital status variable (MARRIED) is statistically significant at the five-percent level in Model 1 and at the ten-percent level in Model 2, implying that ceteris paribus, married respondents in the "Back to Natural Shoppers" and "Convenience Driven Shoppers" segments are more likely to spend $75 or more on groceries in a typical week than non-married respondents. The estimated change in probability coefficients

9

(0.071 and 0.001, respectively) suggests that the effect of being married on grocery expenditure is stronger among respondents in the "Back to Natural Shoppers" segment than in the "Convenience Driven Shoppers" segment. On the other hand, the lack of significance of this variable (MARRIED) in Models 3 suggests that there is no significant statistical difference in spending patterns with respect to grocery shopping between married and non-married respondents among consumers in the "Typical Shoppers" segment.

The race variable (WHITE) is statistically significant only in Model 3 at the one-percent level, suggesting the probability of White consumers in the "Typical shoppers" segment spending less money at the grocery stores in a typical week than non-White respondents. Comparable results are reported by the Food Marketing Institute (FMI, 2000), indicating that not only do White consumers make less trips to the grocery store than the average shopper, they spend less per week as well ($85 vs. $94). The estimated change in probability coefficient suggests that White respondents in the "Typical Shoppers" segment are 4-percent less likely to spend more money on groceries than non-White respondents. As for the back to natural and convenience driven shoppers, the results for the race variable show no statistically significant differences in grocery expenditures between White and non-White respondents.

Family as a consuming and decision making unit is a central phenomenon in marketing and consumer behavior (Commuri and Gentry, 2000). A priori, we would expect larger households (HHSIZE) and households with children under 18 (CHILDREN) to spend more, because they have more members. We find that this is true for all segments, as evidenced by all positive coefficients, but only statistically significant at the one-percent level in Model 3 for household size; and statistically significant at the five-and ten-percent levels of significance in Models 1 and 3, respectively for presence of children under 18. The estimated change in probability coefficient of 0.216 (Model 3, "Typical Shoppers" segment) suggests that respondents with 3 or more people in the household are 22-percent more likely to spend more money on groceries in a typical week than respondents with less than three people. On the other hand, the change in probability estimates of 0.143 (Model 1, "Back to Natural Shoppers" segment) and 0.184 (Model 3, "Typical

10

Shoppers" segment), respectively suggests that respondents with children under 18 are approximately 14-percent and 18-percent, respectively more likely to spend more money on groceries than their counterparts.

The results for EDUCATION and INCOME variables are statistically significant in all models. As expected, respondents with some college education are more likely to spend more money than less educated respondents with estimated change in probability coefficients ranging from 0.082 to 0.121. To the contrary, while we observe the expected positive coefficients for income in Models 1 and 3, the coefficient in Model 2 is negative, implying that high-income respondents in the "Convenience Driven Shoppers" segment are less likely to spend more money on groceries than low-income respondents with a change in probability coefficient estimated at -0.021. Overall, education is shown to have a greater impact on consumer spending patterns than income across the three market segments.

Travel time (TRAVTIME) has a consistent negative effect and statistically significant across all models, implying that as travel time to grocery stores increases, expenditures on groceries in a typical week decrease. The effect of travel time on consumer spending pattern is stronger among respondents in the "Typical Shoppers" segment (Model 3) with a change in probability coefficient estimated at -0.044, implying that "Typical Shoppers" are approximately 4-percent less likely to spend more money at the grocery stores in a typical week as travel time to the grocery store increases. The lower change in probability estimate for "Back to Natural Shopper" suggests that consumers in this segment are less sensitive to travel times. Again, this is likely because health conscious consumers are willing to make trips to more distant, but high quality and health grocery stores. Their desire for health and safe food offsets the reduced probability of visiting more distant stores.

As expected, the estimated coefficient for the FREQSHOP (frequency of shopping) variable is negative in all models, but statistically significant at the five-percent level only in Model 3. The effect of shopping frequency on consumer spending pattern is stronger among respondents in the "Typical Shoppers" segment (Model 3) with a change in probability coefficient estimated at 0.028, implying that as

11

shopping trips increases, there is a 3-percent probability that expenditures on groceries in this segment will decrease. Finally, the estimated coefficient for AGE is not statistically significant in all models. The fact that this variable is statistically insignificant suggests that there is no significant statistical difference in spending patterns with respect to grocery shopping between young and old consumers in all segments.

Conclusion

By employing cluster analysis technique, three basic questions were addressed to identify the factors considered important to Alabama grocery shoppers when choosing a grocery store; to isolate which of these factors are considered universal and which ones are only important to certain consumers; and to identify the number of distinct segments of grocery store shoppers exit and their distinguishing preferences. The results showed that the majority of grocery shoppers in the sample agree that open in the evenings on weekends is the single most important consideration in choosing a store for their grocery needs. Competitive prices and produced without hormones came next in order of importance. Three segments were identified: Back to Natural, Convenience Driven and Typical shoppers. The largest segment, "Typical Shoppers", comprised of about 40 percent of the entire sample and indicated a desire to spend little time as possible shopping. The shopping experience is of minimal importance to them, what they look for is convenience, safety, low prices and fast service. The second largest segment, "Back to Natural Shoppers", comprised of 35 percent of the sample. They are drawn by selection of natural and organic foods and environmentally friendly products. They also emphasize safety from danger and crimes and selection of quality fresh products. Finally, "Convenience Driven Shopper", which was the smallest segment, was made up of 25 percent of the entire sample. They place a high value on shopping experience. They look forward to running into friends at grocery stores and to enjoy an atmosphere where they can shop freely.

The logit model's maximum-likelihood estimates highlighted a number of important results with significant implications. They revealed that different factors (marital status, race, household size, income, presence of children under 18, education, shopping frequency and travel time) significantly influence

12

consumers' spending patterns, depending on the segment. Overall, the presence of children less than 18 years in the household, having some college education and household size were the most important positive factors, while travel time was the most important negative factor in influencing grocery shoppers' spending patterns across segments. The implication here is that when selecting between segments, retail managers should focus on segments that have a high proportion of households with some college education, having more than 3 people and with children less than 18 years.

Reference

Asp, E. H. 1992. "Consumer Lifestyles Are a Key to Food Marketing." *Cereal Foods World*, 37(4):311-318.

Baltas, G., and P. Papastathopoulou. 2003. "Shopper Characteristics, Product and Store Choice Criteria: A Survey in the Greek Grocery Sector." *International Journal of Retail and Distribution Management*, 31: 498-507.

Berlage, L., and D. Terweduwe. 1988. "The Classification of Countries by Cluster and Factor Analysis." *World Development*, 16(12):1527-45.

Brusco, M. J., J. D. Cradit and S. Stahl. 2002 "A Simulated Annealing Heuristic for a Bicriterion Partitioning Problem in Market Segmentation," *Journal of Marketing Research*, 34: 99-109.

Brusco, M. J., J. D. Cradit and A. Tashchian 2003. "Multicriterion Clusterwise Regression for Joint Segmentation Settings: An Application to Customer Value," *Journal of Marketing Research*, 40: 225-234.

Commuri, S., and W. J. Gentry. 2000. "Opportunities for Family Research in Marketing." *Academy of Marketing Science Review*, 2000 (8). Available at: http://www.amsreview.org/articles/commuri08-2000.pdf

Day, E., J. F. Richard and S. M. Huszagh. 1988. "Segmenting the Global Market for Industrial Goods: Issues and Implications." *International Marketing Review*, 5(3):14-27.

Dickson, P. R., and J. L. Ginter. 1987. "Market Segmentation, Product Differentiation, and Marketing Strategy." *The Journal of Marketing*, 51(2):1-10.

Dillon, W. R., and N. Mulani. 1989. "LADI: A Latent Discriminant Model of Analyzing Marketing Research Data." *Journal of Marketing Research*, 26:15-29.

FMI. 1999. "Grocery Shoppers: Four Types of Shoppers." Super Market Research, Vol. 2, No. 2. Food Marketing Institute, http://www.fmi.org/newsletters/super_research/moreissues/dec99.pdf

FMI. 2001. "Check This Out - statistics on black grocery shoppers - Brief Article". *American Demographics*. (May 1). Available at: http://findarticles.com/p/articles/mi_m4021/is_2001_May_1

Green, P. E., and A. M. Krieger. 1991. "Segmenting Markets with Conjoint Analysis." *The Journal of Marketing*, 55(4):20-31.

Greene, W. LIMDEP, Version 7.0, Econometric Software, New York: Plainview, 2000.

Kinsey, J., and Senauer, B. 1996. Consumer trends and changing food retailing formats. *American Journal of Agricultural Economics*, *78*(5): 1187-1191.

Michel, L. 2003. "Using Customer Insight to Build Competitive Advantage." White Paper, Peppers and Rogers Group. Available at: http://www.rite.us/docs/CustomerInsights.pdf.

Morganosky, M. A., and J. B. Cude. 1999. "Expansion of Non-Traditional Food Retail Outlets: Effect on Consumer Welfare." ERS Commissioned Paper for the January 1999 Meeting of the Food and Agricultural Marketing Consortium. Available at: http://www.ag.uiuc.edu/famc/Jan99conf/ PDFdocs/morganosky.pdf

Lake, L. 2007. "Market Segmentation for the Small Business". Accessed Dec. 16, 2007 at: http://marketing.about.com/cs/sbmarketing/a/smbizmrktseg.htm

Mangaraj, S., and B. Senauer. 2001. "A Segmentation Analysis of U.S. Grocery Store Shoppers." Department of Applied Economics, University of Minnesota, St. Paul, MN.

Punj, G., and D. W. Stewart. 1983. "Cluster Analysis in Marketing Research: Review and Suggestions for Application." *Journal of Marketing Research*, 20:134 -48.

Wedel, M., and W. Kamakura. 2000. Market Segmentation Conceptual and Methodological Foundations, 2nd ed. Norwell, Massachusetts: Kluwer Academic Publishers.

Vriens, M., M. Wedel and T. Wilms. 1996. "Metric Conjoint Segmentation methods: A Monte Carlo Comparison." *Journal of Marketing Research*, 33: 73-85.

Table 1: Demographic Comparisons

Variable Name	Survey Sample Statistics	State Statistics (Census 2000)
Age	55% between 26 and 55 years	42% between 25 and 54 years
Race	53% White	71% White
Marital Status	53% married	52% married
Education	68% some college and above	45% some college and above
Household Income	33% $50,000 or more	42% $50,000 or more
Average Household size	2.2 persons	2.35 persons
Children under 18 years	39% with children under 18	23% with children under 18

16

Table 2. Distance between Cluster Centers

Cluster	1	2	3
1		2.684	1.843
2	2.684		2.511
3	1.843	2.511	

Figure 1. Distribution of respondents within clusters
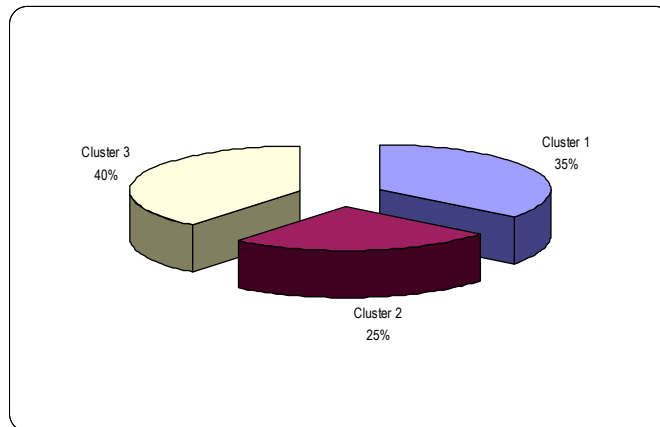
Table 3. Cluster Centers

Preferred Characteristics*	Cluster 1	Cluster 2	Cluster 3
Distance from work place	-0.93	-0.15	-0.19
Dried flowers	-0.53	-0.49	-0.78
Alabama wines	-0.45	-0.38	-0.64
Halal or kosher meats	-0.43	-0.58	-0.96
Distance from home	-0.38	0.64	0.55
Take out foods	-0.17	0.11	-0.65
Accessibility from my home	-0.16	0.62	0.51
Selection of organic foods	-0.09	-0.33	-0.51
Selection of frozen foods	-0.09	-0.07	-0.38
Fresh bread and other bakery items	0.07	0.2	-0.31
Security guard	0.09	0.44	0.48
Open in the evenings on weekends	0.24	0.3	0.17
Fresh fish	0.25	0.2	-0.07
Fresh meats	0.29	0.52	0.02
Competitive prices	0.29	0.69	0.57
Produced without hormones (Other foods)	0.5	-0.77	0.44
Produced without pesticides	0.4	-0.03	0.55
Produced without hormones (Dairy products)	0.43	-0.6	0.54
Raised without hormones	0.44	-0.75	0.49
Open in the evenings on weekdays	0.45	0.69	0.57

* How important are the following characteristics while shopping in your selected primary grocery store?

Figure 2. Back to Natural Shoppers
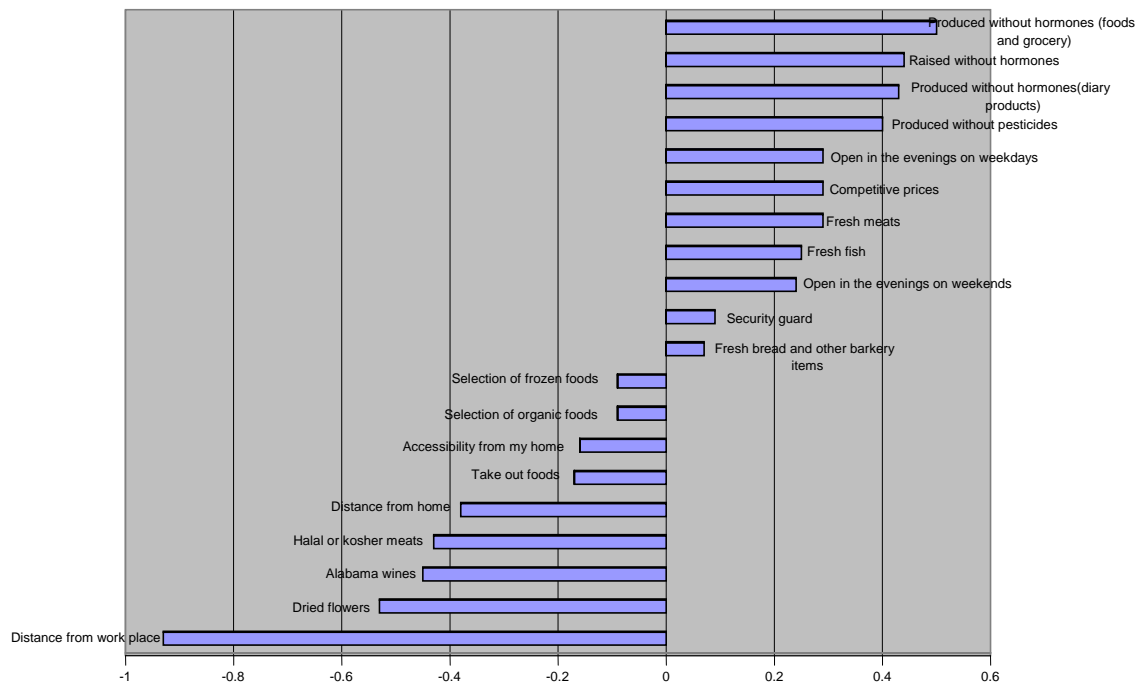
Table 4. Demographic Characteristics

	Segment 1	Segment 2	Segment 3
Age	= 1 if age is 40 and over; 0 otherwise		
<40	23%	25.8%	21.7%
40+	77%	74.2%	78.3%
Education	= 1 if some college; 0 otherwise		
Less than college	32%	27.3%	31.3%
Some college	68%	72.7%	68.7%
Income	= 1 if $35,000 and above; 0 otherwise		
< $34,999	20.2%	18.4%	17.3%
$35,000+	79.8%	81.6%	82.7%
Martial Status	= 1 if married; 0 otherwise		
Not married	44.7%	43.7%	56.6%
Married	55.3%	56.3%	43.4%
Children under 18	= 1 if there children under 18 living in the household; 0 otherwise		
No	56.3%	64.8%	33.9%
Yes	43.6%	35.1%	64.3%
Race	= 1 if white; 0 otherwise		
Caucasian/ White	58.5%	51.9%	52.2%
Minorities	41.5%	48.1%	47.8%
Grocery Spending	= 1 if spends $75 and above on grocery in a typical week; 0 otherwise		
<$74	33%	33.8%	35.6%
75+	67%	66.2%	64.4%
Household Size	= 1 if more than 3 people in the household; 0 otherwise		
<3 people	46.4%	48.8%	52.1%
3+ people	53.6%	51.2%	47.9%
Shopping Frequency	=1 if makes 2 or more trips to the grocery store in a typical week; 0 otherwise		
Less than 2 times a week	56.7%	47.7%	58.7%
2+ times a week	43.3%	52.3%	41.3%
Travel Time	=1 if drives 10 or more minutes to the grocery store; 0 otherwise		
Less than 10 minutes	59.0%	58.6%	50.0%
10+ minutes	41.0%	41.4%	50.0%

21

Figure 3. Convenience Driven Shoppers

Open in the evenings on weekdays
Competitive prices
Distance from home
Accessibility from my home
Fresh meats
Security guard
Open in the evenings on weekends
Fresh bread and other barkery items
Fresh fish
Take out foods
Produced without pesticides
Selection of frozen foods
Distance from work place
Selection of organic foods
Alabama wines
Dried flowers
Halal or kosher meats
Produced without hormones(cheese and other diary products)
Raised without hormones
Produced without hormones(foods and grocery)

-0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8

Figure 4. Typical Shoppers

Open in the evenings on weekdays
Competitive prices
Produced without pesticides
Distance from home
Produced without hormones(foods and grocery)
Accessibility from my home
Raised without hormones
Security guard
Produced without hormones(cheese and other diary products)
Open in the evenings on weekends
Fresh meats
Fresh fish
Distance from work place
Fresh bread and other barkery items
Selection of frozen foods
Selection of organic foods
Alabama wines
Take out foods
Dried flowers
Halal or kosher meats

-1   -0.8   -0.6   -0.4   -0.2   0   0.2   0.4   0.6

Table 3. Logistic Regression Results for Market Segments of Grocery Shoppers in Alabama

| Variable Name | MODEL I | | | | MODEL II | | | | MODEL III | | | |
| | Segment I: Back to Natural Shoppers | | | | Segment II: Convenience Driven Shoppers | | | | Segment II: Typical Shoppers | | | |
	Coefficient	SE	Δ Prob	P-value	Coefficient	SE	Δ Prob	P-value	Coefficient	SE	Δ Prob	P-value
CONSTANT	-1.741**	0.723	---	0.016	-2.276**	1.127	---	0.043	-2.026**	0.874	---	0.020
AGE	-0.143	0.094	-0.016	0.129	-0.012	0.013	-0.001	0.385	-0.018	0.013	-0.002	0.165
MARRIED	0.427**	0.197	0.071	0.030	0.015**	0.008	0.001	0.039	-0.088	0.205	-0.008	0.669
WHITE	0.024	0.267	0.003	0.929	-0.785	0.494	-0.034	0.112	-1.615***	0.613	-0.040	0.008
HOUSEHOLD SIZE	0.290	0.243	0.045	0.234	0.140	0.422	0.013	0.740	1.074***	0.300	0.216	0.000
CHILDREN	0.732**	0.333	0.143	0.028	1.498	0.944	0.323	0.113	0.964*	0.535	0.184	0.072
EDUCATION	0.646**	0.321	0.121	0.044	0.610**	0.312	0.082	0.050	0.558*	0.341	0.085	0.101
INCOME	0.346**	0.171	0.055	0.043	-0.317*	0.179	-0.021	0.076	0.2708***	0.0876	0.034	0.002
FREQSHOP	-0.070	0.203	-0.008	0.730	-0.359	0.290	-0.022	0.216	-0.359**	0.168	-0.028	0.032
TRAVTIME	-0.015**	0.008	-0.002	0.039	-0.023**	0.010	-0.002	0.015	-0.935*	0.530	-0.044	0.078
Log-L	-107.70				-67.44				-113.81			
Chi-Square	31.16				37.24				33.27			
Prediction	67.9				72.7				69.4			
Sample Size	178				128				196			

** indicates parameter significant at 0.05 level or better
* indicates parameter significant at 0.10 level
Dependent variable (EXPEND): Responses to question "About how much does your household spend on groceries in a typical week?" are coded as "1" for $75 or more and "0" otherwise.

CONSUMER ACCEPTANCE OF RFID: A TEST OF COMPETING MODELS

Jeffery S. Smith, College of Business, Florida State University, Tallahassee, FL 32306,
(850) 645-0166, jssmith@cob.fsu.edu
Mark Gleim, College of Business, Florida State University, Tallahassee, FL 32306,
(850) 645-7388, mrg07@fsu.edu
Sunny Park Business Department, Kettering University, Flint, MI 48504,
(810) 762-7956, spark@kettering.edu

ABSTRACT

Interest in radio frequency identification (RFID) has seen a marked increase of late. Most of the work in this area has focused on how the technology can enhance efficiencies in the materials management process. However, little work has been identified that investigates the factors that affect the willingness of consumers to actually accept the technology. This is especially poignant as companies want to move toward tagging individual items that can be purchased by general customers. Therefore, the goal of this study is to test competing models (TAM and the decomposed TPB) on the antecedents to RFID adoption. To accomplish this goal, data were gathered from 381 consumers with results indicating that the main influential factor is the attitude toward the company. Additionally, it appears as if TAM is the more appropriate model as it provides greater explanatory power while being more parsimonious in nature.

INTRODUCTION

Recently, radio frequency identification (RFID) has seen a marked increase in interest as many organizations are investigating the possibility of implementing it in some form. Notably, the technology has been recognized for its potential to increase material visibility up and down the supply chain [6]. The increase is also demonstrated by the growing revenues and subsequent projections associated with the growth of the technology. Gartner Research reported that RFID revenues now exceed $900 million with expectations of increases to $1.2 billion for 2008 and $3.5 billion for 2012 while IDTech EX reported that the market could increase to up to $25 billion by 2017. The reason for such an increase is noted by A.T.Kearney who has cited that retailers alone could benefit in the form of a 5% cash savings due to reduced inventory, an annual benefit of a 7.5% reduction in store and warehouse labor expenses, and an approximate reduction in out-of-stock items of $700,000 per $1 billion in sales. Benefits such as these are why companies like Wal-Mart, Tesco, Metro, and the Department of Defense are actively pursuing RFID implementation projects.

Accordingly, the majority of the research on RFID has focused on the impact of implementation as it affects materials management and the associated impact on organizational costs (e.g., [23], [25]). This focus on efficiency, a back-office orientation, has resulted in mostly 'slap and ship' applications where the organizations involved are seeking to improve material tracking capabilities to get products in the right place at the right time [16]. An area where less research has been conducted is the impact that RFID implementation can have on front office interactions

1

(i.e., those that focus on customer interactions). Applications such as these include using the technology in gas pumps and toll booths to increase the speed of processing customers in the delivery process. RFID applications also improve control over inventory as security measures can be put in place to prevent inventory damage or customer/employee theft. It is only logical to expect an increase in front-office applications as companies recognize the performance increases that can accrue from tagging individual items that are available to general consumers.

A noted problem with an increase in front-office applications is the potential adoption by consumers. Specifically, little research has been found that investigates the factors that lead customers to actually accept the fact that each item they buy would be equipped with a RFID tag. Therefore, the goal of this research is to provide an initial look at the antecedents of the intentions to accept RFID. To accomplish this goal, data were collected from 381 general consumers in order to test two competing models aimed at explaining the acceptance. The models under investigation are the decomposed theory of planned behavior (TPB) and the technology acceptance model (TAM).

LITERATURE REVIEW

The utilization of new technologies in service organizations has been shown to have a significant effect on both operational and organizational performance. In reviewing the literature on technology utilization, it can be seen that the performance implications are tied to the strategic intent of the implementation. By that, the goal could be to enhance either efficiency or effectiveness [32]. On the efficiency front, technologies have been used to increase the role of the customer in the form of self-service technologies [28]. Additionally, they have been used to reduce the need for transactions at physical locations via web-enabled activities [27] or to find ways to more effectively match the organizations resources to the needs of customers in the form of revenue management systems [22]. The performance effects that result from an efficiency focus are lower transaction costs, higher employee productivity, and increased encounter consistency (a quality dimension) which can all result in enhanced financial performance.

In contrast, an organization can opt to focus on improving effectiveness in the form of using technology to enrich the relationship with its customer base. This focus can take the form of using technology to track customers tastes and habits via customer relationship management systems [31] or employing it in order to provide a higher degree of customization of the experience [30]. The performance benefit that can result is more customer-centric in that it is hoped customers will perceive a higher value proposition from which financial performance will ensue.

As can be seen, the use of technology in the provision of services can have a significant impact on organizational performance. A particularly interesting service sector where technology is being increasingly used is the retail industry. In this case, retailers are trying to simultaneously maximize both efficiency and effectiveness in order to address the heightened competition in this sector. Accordingly, retailers are actively trying to find methods to increase operating efficiency so as to free human capital to more effectively service customers. It is along this line that RFID can offer benefits in the service delivery system whereby certain tasks can be automated, or at

2

least streamlined, which enables the organization to re-shape its offering to better serve customers.

The emerging focus is interesting since RFID is by no means a new technology as it has been in existence since the 1940s. A main reason for the increased interest is that component costs (e.g. RFID tags and readers) are decreasing, while the potential business applications are expanding. Research, too, is increasing as to how RFID is being (or can be) used to enhance organizational performance. Most notably, research is being conducted as to how the technology can improve operational efficiencies through more effective materials management processes (e.g., [33], [7]). Specifically, it has been posited that RFID utilization can result in reduced labor costs, smaller item inventories, and fewer out-of-stock conditions [25]. For example, RFID has been used as a remedy to the problem retailers of the discrepancy between inventory records and the actual amount of a product available for order [18]. Other works have also noted the impact in terms of records management [13], security [21], and even in the effective management of perishable goods [20].

It has been suggested that the objective of operations management research in the RFID context should be to help industry understand the process and methods by which benefits can be realized [25]. However, much of the recent academic literature has focused on the benefits of RFID in supply chain management. For example, [12] identify three areas of RFID benefits – 1) labor cost savings; 2) reduction in inventory shrinkage; and 3) higher visibility of the supply chain. [36] develop and validate a theoretical model for the business value of the technology in supply chains. At a more micro level of analysis, [11] examine the benefits of RFID at a specific link in the supply chain – the link between a distribution center and a retail store.

As can be seen, the majority of studies have focused on operations that typically occur in the back office of an organization (such as inter-organizational transactions) while highlighting the ways in which RFID can reduce costs through increased efficiency. It is our belief that the potential performance impact can also occur in the front-office interactions between a service provider and consumers. Research along this line is less frequent but has begun to appear in some form. For instance, [19] outlined how the technology can enhance the museum experience, while [35] denote the manner in which hospitals can improve the service through the utilization of RFID. Additionally, [25] presented an alternate diffusion model that highlights how implementation can result in altered service offerings aimed at increasing customer-perceived value. It is from these customer-centric studies that this research posits a significant relationship between RFID implementation and enhanced organizational performance in terms of customer-perceived metrics.

THEORETICAL BACKGROUND

For any new technology to succeed, it needs to be accepted by the individuals who will be using it. However, in light of the relative 'newness' of RFID, the research models are based on a behavioral intention since few applications exist where actual behaviors can be measured. The fundamental intention-based theory is the Theory of Reasoned Action (TRA) [14]. In essence, this theory states that beliefs influence attitudes which shape intentions from which a behaviors ensue. As this theory is grounded in the psychological aspect of intentions, alternate theories

3

have been generated to more effectively explain intentions to use specific technologies (i.e., to explain adoption of the technology). Namely, the Technology Acceptance Model (TAM) and the decomposed Theory of Planned Behavior (TPB) have been frequently utilized to predict adoption behaviors.

The TAM model (see Figure 1) was originally adapted from TRA with the goal of explaining individual acceptance of computer technology [9], [10]. The model broadly posits that an individual's intention to use a technology is explained by the perception of the usefulness of the technology and the attitude toward it. As shown, it can be seen that both usefulness and attitude are influenced by the perceived ease of use of the technology. This model has proven to be a relatively powerful, yet parsimonious method from which behaviors can be predicted (e.g., [35]).

The other predominant model, the decomposed TPB (see Figure 2), also originates from TRA [34]. Although [34] introduced the decomposed TPB model directly based upon the original TPB [2] which is an extension of TRA. In essence, the decomposed TPB model posits that behavioral intentions originate from three main constructs; perceived behavioral control, attitude, and subjective norms. In this case, perceived behavioral control addresses the availability of skills, resources, and opportunities necessary to use the technology. In other words, control is affected by an individual's ability to control the situation (control structure) and the inherent trust in the situation (organizational trust in the RFID context). Similar to the TAM model, attitude is established by one's perception of usefulness and the ease of use. However, the TPB model also includes a compatibility dimension which addresses the fit of the new technology with existing conditions. The final factor that influences behavior, subjective norms, is a measure of the influential factors affecting a person's adoption decision. Namely, these originate from the individual, the organization, and the general media.

We use TAM and the decomposed TPB instead of TRA and TPB because not only are they the dominant models in the technology acceptance research area, but also they have advantages over TRA and TPB. Both TAM and the decomposed TPB identify specific salient beliefs that may affect customers' acceptance of new technology. In other words, they have simpler procedures than TRA and TPB through the elimination of the steps of identifying salient beliefs. Consequently, they are easier to administrate.

METHODOLOGY AND RESULTS

To effectively test the proposed models, data needed to be collected given the constructs under investigation are operationalized per the specific context. To ensure the validity of the analysis, existing measures were amended from the literature. Items for behavioral intention, attitude, subjective norms, and perceived behavioral control were amended from [4] and [2] while ease of use, perceived usefulness, and compatibility originate from works by [9] and [29]. Personal, organizational, and media norms were all amended from [34] whereas organizational trust came from [27] and control structure was modified from scales offered by [8]. Each of the aforementioned scales was measured using a seven-point Lickert scale with the end points of strongly disagree (=1) to strongly agree (=7).

To gather data, a survey was administered to an online pool at a large Southeastern university from which 381 usable responses were collected. Prior to answering any questions, each respondent was presented an Associated Press article outlining the technology, how it can be used, and the potential risks associated with organizational implementation. The survey was pretested using a sample of undergraduate students from which no significant problems arose. The final sample consisted of 54% females and 46% males with respondent ages ranging from 18 to 84 years of age (average age was 39 years old).

The relevant psychometric properties of the scales were assessed via the utilization of confirmatory factor analysis. In this case, all constructs were entered into a confirmatory model to check for unidimensionality and validity (both convergent and discrimminent) as recommended in prior research [24]. The results of the analysis provided support for both unidimensionality and convergent validity in that the data fit the model well (χ^2=1335.5, df=599, RFI=0.92, CFI=0.96, TLI=0.96). Discriminant validity was assessed through the comparison of the average variance extracted (AVE) of each construct to the shared variance between each possible pair of constructs [15]. As shown in the table in Appendix A, each AVE exceeds the shared variance so the overall conclusion is that the constructs are unidimensional and valid.

Reliability was also assessed to ensure each construct was internally consistent. A composite reliability score was calculated for each scale as per the procedure outlined by [17]. As a rule of thumb, a scale is reliable if the composite reliability exceeds 0.70. As is shown in the Appendix A table, all constructs exhibit good levels of reliability. From here, we can conclude that our measures are psychometrically sound so the testing of the TAM and TPB models can now be justified.

Each model was tested separately through the utilization of a structural equation model. The TAM model exhibited a good fit as evidenced by the relevant fit statistics (χ^2=166.3, df=72, RFI=0.97, CFI=0.99, TLI=0.98). The standardized path loading for each proposed linkage is shown in Figure 1. As can be seen, ease of use significantly affects perceived usefulness but not attitude. The attitude, however, is affected by the perceived usefulness. The ultimate dependent variable, behavioral intentions, is significantly affected by both perceived usefulness and attitude with attitude having a much stronger influence. Additionally, the overall variance explained of behavioral intentions is 75% which indicates that the model provides good explanatory power in terms of predicting the potential adoption of the technology from an individual's viewpoint.

Figure 1: Technology Acceptance Model (TAM)
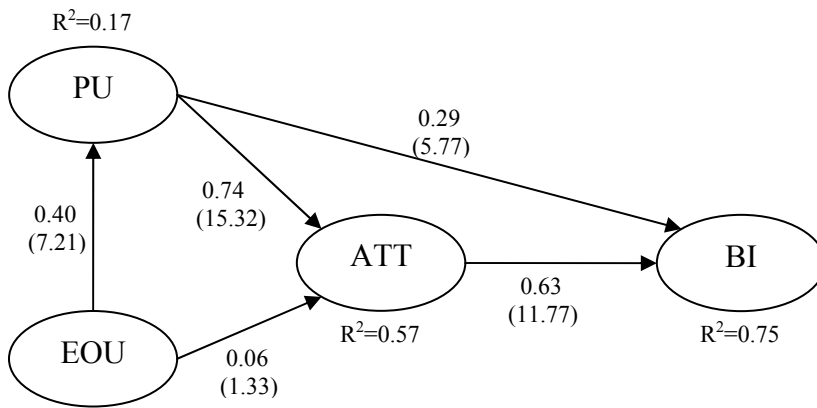
PU=Perceived Usefulness; EOU=Ease of Use; ATT=Attitude Toward the
Company; BI=Behavioral Intention; The top number is the standardized path
loading and the bottom number is the associated t-statistic

The contrasting model, the decomposed TPB (see Figure 2), was also tested via a structural equation model where the fit was good (χ^2=1536.6, df=626, RFI=0.92, CFI=0.96, TLI=0.95). For the decomposed TPB model, subjective norms were significantly impacted by both personal norms and media norms but not by organizational norms. The data indicated that attitude was positively influenced by perceived usefulness and compatibility but not by ease of use which is consistent with the TAM model result. Furthermore, perceived behavioral control was only affected by an individual's control structure whereas organizational trust was not significant. In terms of the predictors of behavioral intentions, subjective norms, attitude, and perceived behavioral control all were significant with attitude being the most influential factor. This finding is also consistent with the TAM model in that an individual's attitude is a strong predictor of future intentions. Finally, the decomposed TPB model effectively explains 73% of the variance of the intention which is also seen as a good predictor of the willingness to use RFID-tagged products.

Figure 2: The Decomposed Theory of Planned Behavior (TPB)
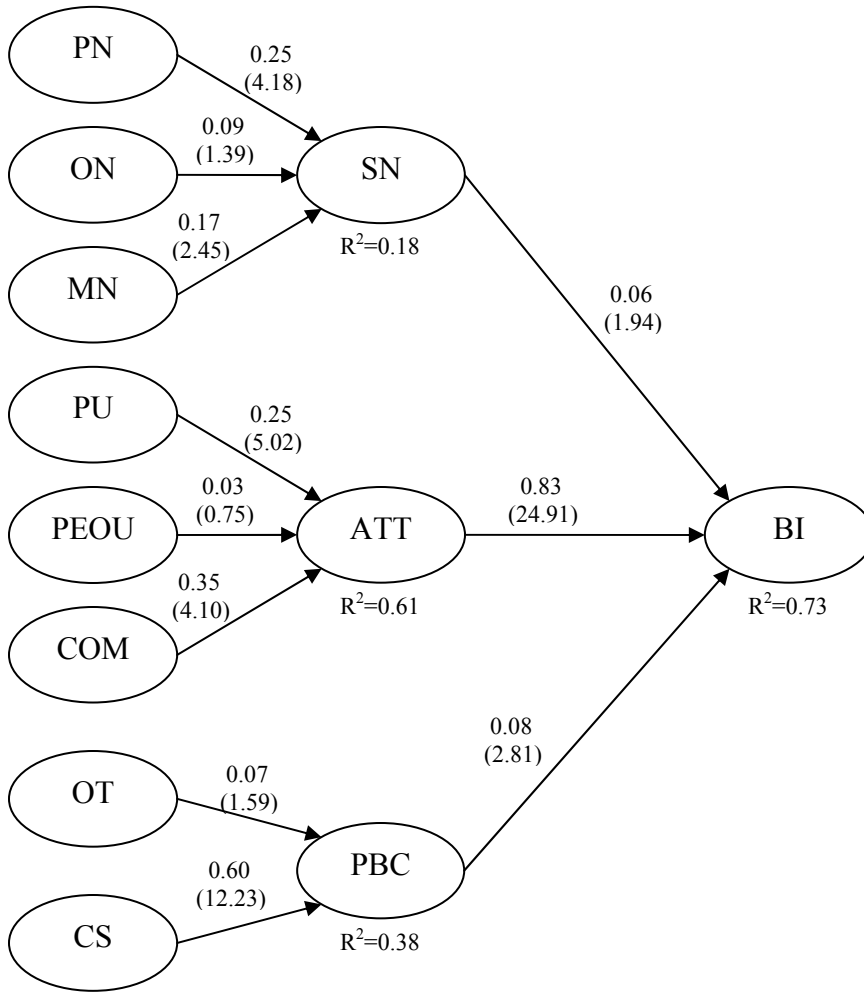
PN=Personal Norm; ON=Organizational Norm; MN=Media Norm; PU=Perceived Usefulness; PEOU=Perceived Ease of Use; COM=Compatibility; OT=Organizational Trust; CS=Control Structure; SN=Subjective Norm; ATT=Attitude Toward the Company; PBC=Perceived Behavioral Control; BI=Behavioral Intention; The top number is the standardized path loading and the bottom number is the associated t-statistic

DISCUSSION AND CONCLUSION

This goal of this research was to more fully understand the factors that can potentially affect an individual's decision to utilize RFID as a viable technology. In doing so, two commonly-accepted models (TAM and the decomposed TPB) were tested to determine which was more effective at explaining the future intentions of individuals. In reviewing the results, it can be seen that the TAM model was more appropriate at doing so since it explained more of the variance of the behavioral intentions construct (75% versus 73%) while also being more parsimonious in nature. In looking at both models, it appears as if the biggest potential impact comes from an individual's attitude toward the organization who is implementing the technology. This result is not surprising as attitude it tied to the ways in which RFID can help an

individual. This is the main implication that arises from the TAM model as it is effective at demonstrating this fact.

However, other interesting implications arise when looking at the decomposed TPB model. Firstly, it does agree with the TAM results in that attitude is highly influential on the behavioral intentions construct. Beyond that, it can be seen that the intention is also influence by the perceived behavioral control and subjective norm dimensions. What this denotes is that intentions are also influenced by factors that are not as directly applicable to adoption. For instance, subjective norms deal more with the influential belief structures beyond what the technology can do for the individual while behavioral control address an individual's ability and the trust that s/he has in the organization. In sum, the TAM model represents a more parsimonious way to potentially predict adoption but the decomposed TPB may give deeper insights into other driving factors.

As with all research, this study is not without limitations of which the most glaring is utilization of the survey methodology to assess the phenomenon in a cross-sectional manner. This resulted in us using the intention to use as the dependent variable as opposed to testing for actual behaviors. The study was also constrained along that line due to there being very few actual implementations where individuals could be exposed to the technology. A valuable extension of this research would be to test the proposed models in an actual usage context to verify the validity of the initial results presented herein.

Another limitation was the utilization of a single respondent to answer questions associated with both independent and dependent constructs. From this, there is potential for a common method bias to be introduced into the data. However, steps were taken in both the survey design and the analytical procedures to account for the potential effect. Namely, the survey was designed to spatially separate the independent and dependent variables, and we utilized the Harman single factor test to check for any method bias. The results of this test revealed that no single factor emerged from the analysis which supports the conclusion that there is not a common method effect. It is hoped that future research can employ alternate designs and/or methodologies to address this shortcoming.

REFERENCES

[1] Ajzen, I., 1985. From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behavior*. Heidelberg: Springer.

[2] Ajzen, I., 1985. From intentions to actions: A theory of planned behavior. in *Action Control: From Cognition to Behavior*, eds. J. Kuhl and J. Beckmann, New York: Springer Verlag.

[3] Ajzen, I., 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

[4] Ajzen, I. and Fishbein, 1980. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall.

[5] Anderson, E.W., Fornell, C., and Lehmann, D.R., 1994. Customer satisfaction, market share, and profitability. *Journal of Marketing* 58 (3), 53-66.

[6] Angeles, R., 2005. RFID technologies: Supply-chain applications and implementation issues. *Information Systems Management*, 22 (1), 51–65.

[7] Attaran, M., 2007. RFID: An enabler of supply chain operations. *Supply Chain Management: An International Journal*, 12 (4), 249-257.

[8] Compeau, D. and Higgins, C., 1991. The Development of a measure of computer self-efficacy. *ASAC Conference*, Niagara Falls, NY, 34-48.

[9] Davis, F. D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13 (3), 319-339.

[10] Davis, F.D., Bagozzi, R.P., and Warshaw, P.R., 1989. User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, 35 (8), 982-1003.

[11] Delen, D., Hardgrave, B.C., and Sharda, R., 2007. RFID for better supply-chain management through enhanced information visibility. *Production and Operations Management*, 16 (5), 613-624.

[12] Dutta, A., Lee, H.L., and Whang, S., 2007. RFID and operations management: Technology, value and incentives. *Production and Operations Management*, 16 (5), 646-655.

[13] Faber, M.J., 2002. RFID: The next tool for managing records. *Information Management Journal*, 36 (6), 60-62.

[14] Fishbein, M. and Ajzen, I., 1975. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Reading, MA: Addison-Wesley.

[15] Fornell, C., and Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement errors. *Journal of Marketing Research*, 18 (3), 39-50.

[16] Gaukler, G.M., Seifert, R.W., and Hausman, W.H., 2007. Item-level RFID in the retail supply chain. *Production and Operations Management*, 16 (1), 65-76.

[17] Hatcher, L., 1994. *A Step-by-Step Approach to using the SAS System for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute.

[18] Heese, H.S., 2007. Inventory record inaccuracy, double marginalization, and RFID adoption. *Production and Operations Management*, 16 (5), 542-553.

9

[19] Hsi, S. and Fait, H., 2005. RFID enhances visitors' museum experience at the Exploratorium. *Communication of the ACM*, 48 (9), 60-65.

[20] Kärkkäinen, M., 2003. Increasing the efficiency in the supply chain for short shelf life goods using RFID tagging. *International Journal of Retail and Distribution Management*, 31 (10), 529-536.

[21] Kelly, E.P. and Erickson, G.S., 2005. RFID tags: Commercial applications vs. privacy rights. *Industrial Management & Data Systems*, 105 (5/6), 703-713.

[22] Kimes, S.E., 1989. The basics of yield management. *Cornell Hotel and Restaurant Administration Quarterly*, 30 (3), 14-19.

[23] Kök, A.G. and Shang, K.H., 2007.   Inspection and replenishment policies for systems with inventory record inaccuracy. *Manufacturing and Service Operations Management*, 9 (2), 185-205.

[24] Koufteros, X.A., 1999. Testing a model of pull production: A paradigm for manufacturing research using structural equation modeling. *Journal of Operations Management* 17 (4), 467-488.

[25] Lee, H. and Özer, Ö., 2007. Unlocking the value of RFID. *Production and Operations Management*, 16 (1), 40-64.

[26] Lee, L.S., Fiedler, K.D. and Smith, J.S., 2008.   Radio frequency identification (RFID) implementation in the service sector: A customer facing diffusion model. *International Journal of Production Economics*, 112 (2), 587-600.

[27] Malhotra, N. K., Kim, S.S. and Agarwal, J., 2004. Internet users' information privacy concerns (IUIPC): The construct, the scale, and a causal model," *Information Systems Research*, 15 (4), 336-355.

[28] Meuter, M.L., Ostrom, A.L., Roundtree, R.I., and Bitner, M.J., 2000. Self-service technologies: Understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*, 64 (3), 50-64.

[29] Moore, G. C. and Benbasat, I., 1991.   Development of an instrument to measure the perceptions of adoption an information technology innovation," *Information Systems Research*, 2 (3), 192-222.

[30] Murthi, B.P.S. and Sarkar, S., 2003.   The role of management sciences in research on personalization. *Management Science*, 49 (10), 1344-1362.

[31] Rigby, D.K., 2004. "CRM done right. *Harvard Business Review*, 82 (11), 118-129.

[32] Sandstrom, S., Edvardsson, B., Kristensson, P., and Magnuson, P., 2008. Value in use through service experience. *Managing Service Quality*, 18 (2), 112-126.

[33] Spekman, R.E. and Sweeney II, P.J., 2006. RFID: From concept to implementation. *International Journal of Physical Distribution and Logistics Management*, 36 (10), 736-754.

[34] Taylor, S. and Todd, P.A., 1995. Understanding information technology usage: A test of competing models. *Information Systems Research*, 6 (2), 144-176.

[35] Venkatesh, V. and Davis, F.D., 1996. A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, 27 (3), 451-481.

[36] Whitaker, J., Mithas, S., and Krishnan, M.S., 2007. A field study of RFID deployment and return expectations. *Production and Operations Management*, 16 (5), 599-612.

[37] Zinkhan, G.M., 2002. Promoting services via the Internet: New opportunities and challenges. *Journal of Services Marketing*, 16 (5), 412-431.

11

Appendix A

Construct Properties and Relationships

	CS	PBC	OT	PU	Comp	EOU	Att	PN	ON	MN	SN	BI	C.R.
CS	**0.839**	0.373	0.036	0.084	0.116	0.235	0.100	0.069	0.076	0.035	0.049	0.135	0.940
PBC	0.611	**0.887**	0.033	0.104	0.097	0.171	0.096	0.029	0.034	0.011	0.103	0.121	0.959
OT	0.191	0.182	**0.803**	0.287	0.287	0.054	0.426	0.180	0.037	0.060	0.057	0.345	0.924
PU	0.289	0.323	0.536	**0.910**	0.815	0.162	0.569	0.225	0.083	0.108	0.111	0.572	0.976
Comp	0.340	0.312	0.536	0.903	**0.941**	0.165	0.554	0.255	0.081	0.096	0.113	0.591	0.979
EOU	0.485	0.413	0.232	0.403	0.406	**0.933**	0.116	0.027	0.087	0.038	0.048	0.156	0.977
Att	0.317	0.310	0.653	0.754	0.744	0.341	**0.902**	0.276	0.060	0.099	0.102	0.721	0.973
PN	0.262	0.169	0.424	0.474	0.505	0.164	0.525	**0.786**	0.194	0.243	0.132	0.297	0.916
ON	0.275	0.185	0.193	0.288	0.285	0.295	0.245	0.441	**0.852**	0.413	0.095	0.062	0.945
MN	0.187	0.103	0.244	0.328	0.310	0.194	0.314	0.493	0.643	**0.851**	0.122	0.101	0.945
SN	0.222	0.321	0.239	0.333	0.336	0.220	0.319	0.364	0.308	0.349	**0.938**	0.115	0.979
BI	0.368	0.348	0.587	0.756	0.769	0.395	0.849	0.545	0.248	0.318	0.339	**0.915**	0.970

The numbers on the diagonal represent the average variance extracted (AVE) of each construct. The lower triangle denotes the construct correlations while the upper triangle has the shared variance between each pair of constructs. The final column is the composite reliability of each construct.

The Currency Denomination of External European Union Imports after European Union Expansion

Mark David Witte

College of Charleston

Abstract

If a country's imports are invoiced in a foreign currency then import prices paid by consumers, and the importing country's inflation rate, are vulnerable to exchange rate movements. Using a unique multiple market model I examine optimal currency denomination. The simulation studies the impact of EU expansion on the currency denomination of imports from outside the EU. Results suggest that similar preferences or similar industry prices across the EU could decrease the likelihood of price discrimination and euro use as an invoicing currency in the EU's external imports. However, euro denomination of external imports in expansion countries increases dramatically post-expansion.

Mark David Witte, 5 Liberty Street, Department of Economics and Finance, Charleston, SC 29401. Email: wittem@cofc.edu Phone: (843)953-3986

The Currency Denomination of External European Union Imports after European Union Expansion

Abstract

If a country's imports are invoiced in a foreign currency then import prices paid by consumers, and the importing country's inflation rate, are vulnerable to exchange rate movements. Using a unique multiple market model I examine optimal currency denomination. The simulation studies the impact of EU expansion on the currency denomination of imports from outside the EU. Results suggest that similar preferences or similar industry prices across the EU could decrease the likelihood of price discrimination and euro use as an invoicing currency in the EU's external imports. However, euro denomination of external imports in expansion countries increases dramatically post-expansion.

Introduction

Previous research on the currency denomination of trade has studied a representative firm's choice of invoicing currency when the firm sells to *only* one foreign market without any domestic buyers[1]. As trading firms tend to have multiple export markets its necessary to develop a model in which a representative firm sells to buyers in multiple countries. With a multiple market structure it's possible to examine the consequences of EU expansion on the currency denomination decision of an individual representative firm who sells to buyers in multiple countries: a non-EU country, a potential EU-expansion country and an original EU country. The simulation herein estimates the optimal currency denomination decision for a firm located outside the EU before and after the EU-expansion country adopts the euro.

In each simulation, various exogenous parameters are randomly assigned to each of the 5,000 representative firms simulated. These randomly assigned parameters determine the firm's market, cost and demand. No particular simulation is designed to typify any particular industry or any particular firm; instead, the randomly assigned parameters are designed to depict all potential trading firms to determine how those various exogenous parameters may affect the firm's optimal currency of denomination.

Why does the currency denomination of trade matter? If a country's imports are priced in a foreign currency then any movements in the volatile exchange rate will instantly be reflected in the sticky prices of the imports. In addition, if a country is *highly*

---

[1] Excellent works include Bachetta and van Wincoop (2005), Friberg (1998) and Goldberg and Tille (2006).

dependent on imports denominated in a foreign currency then the import prices (and the volatile exchange rate) will have a greater effect on the importing country's inflation rate. Recent research by Gopinath, Itskhoki and Rigobon (2007) has found persistent, heightened price sensitivity to exchange rates when trade isn't denominated in the importing country's currency. Goldberg and Tille (2007) has shown that an importing country is more vulnerable to the macroeconomic shocks of other countries if their imported goods are denominated in a foreign currency.

What currency denomination patterns are found in the EU and EU expansion countries? Figure 1 shows the percentage of imports denominated in euros for 8 countries that used the euro as of 2001 and 10 EU expansion countries. Of the 8 countries that used the euro as of 2001 there are 6 countries that appear to be receiving some proportion of their imports from the European Union (EU) denominated in some currency *other* than the euro. Yet, of the 10 countries that had not yet adopted the euro by 2003 there are 9 that appear to have all of their imports from the EU denominated in the euro *as well as some percentage of external EU imports denominated in the Euro*.

[Figure 1]

The most important finding in this paper is that the expansion of the European Union may decrease the likelihood of price discrimination across countries; and thus decrease the use of the euro as an invoicing currency in the EU's imports. Pre-expansion, when the three countries have three different currencies, the representative firm may invoice their prices in different currencies for different countries in order to minimize exchange rate risk. The various currencies provide a ready-made incentive for the exporting firm to price discriminate. However, post-expansion, when there are only two currencies (and one exchange rate), there is less reason for the representative firm to price discriminate across countries. If the representative firm does not price discriminate post-expansion then they must choose either their own currency or the euro to denominate their single price in all markets; decreasing the likelihood that any individual country will see their imports from outside the EU denominated in their own currency.

Yet, because there are fewer invoicing currency choices in the EU-expansion country (two currencies instead of three), there is a considerable increase in euro use in the EU-expansion country. Because this paper includes a novel multiple market structure

it is possible for the representative firm to price discriminate and thus the result herein is unique to the literature on the currency denomination of trade.

Simulation

The simulation in this paper borrows heavily from concepts and results found in previous literature. This includes the importance of elasticity of demand and marginal cost from Bachetta and van Wincoop (2005), the impact of forward currency contracts and exchange rate volatility from Friberg (1998), the effect of exchange rate transaction costs outlined in Black (1991), the inflation effects given in Taylor (2000) and the impact of the competition's price outlined by Goldberg and Tille (2006).

In this simulation, a representative firm must choose its currency invoicing strategy in three separate countries: a non-EU country which is home to the representative firm, a potential EU-expansion country and an original EU country. In addition, the firm must also choose the degree of price discrimination. The firm can elect to set one price for all three countries or one price for two countries and a second price for the third country or three prices with each country having a different price. Finally, the firm must choose how often to adjust their price(s). Because the euro is often used as a vehicle currency, the euro is a potential currency of denomination for all countries. The exporting firm's currency is also a potential currency of denomination for all markets. However, the currency of the EU-expansion country may only be used in the EU-expansion country and the representative firm's home country as it is unlikely to be used as a vehicle currency in the euro zone. The representative firm's choices regarding currency of denomination and price discrimination are outlined in Table 1.

[Table 1]

5,000 simulations will be run each with its own independent representative firm. Various exogenous characteristics of the firm's market, cost and demand are randomly assigned in the simulation. The firm then optimizes its price, currency of denomination, degree of price discrimination and frequency of price adjustment based on those randomly assigned exogenous variables so that we can study how those exogenous variables may affect the firm's currency invoicing decision. The simulations are not intended to characterize any particular industry; instead, the simulations are designed to

provide a realistic depiction of all potential firms that may be engaged in international trade.

For each country, *noEU* (the non-EU country), *EUex* (the potential expansion country) and *EU* (the original EU country), the firm's product has the following demand that determines the quantity (*Q*) sold by the firm in each respective market at time *t*:

$$Q_{noEU,t} = M_{noEU}\left(100 - b_{noEU}\left(\frac{p_{noEU,t}^{noEU}}{P_{noEU,t}}\right)\right) \qquad Q_{EUex,t} = M_{EUex}\left(100 - b_{EUex}\left(\frac{p_{EUex,t}^{EUex}}{P_{exEU,t}}\right)\right)$$

$$Q_{EU,t} = M_{EU}\left(100 - b_{EU}\left(\frac{p_{EU,t}^{EU}}{P_{EU,t}}\right)\right) \qquad\qquad (1)$$

M denotes the size of the firm's market in each respective country and *b* denotes a parameter that helps determine the elasticity of demand for the firm's product in each respective country. The elasticity parameter (*b*) varies in the three different countries; however, if *b* is similar across countries then consumers in the three countries share similar preferences. The potential degree of difference in demand elasticity or preferences across countries is randomly assigned in the simulation and will be highlighted as an important factor in the next section.

The reference price for the representative firm is *P*; this denotes the aggregate price set by the firm's potential competitors[2]. The reference prices follow a random walk and are allowed to be different across countries but are constrained by a weak law of one price.

The representative firm could choose to invoice their price in any of the three currencies as denoted by the superscript of $p_{noEU,t}^{noEU}$ in which the subscript denotes the country in which the price is set. For example, $p_{EUex,t}^{EU}$ denotes that the firm's price in the EU-expansion country is denominated in the euro. If the firm were to decide to set its price in some currency other than the importing country's currency then buyers in the importing country would have to pay a transaction cost of τ_{EU}, if the buyers are exchanging euros, or τ_{noEU}, if the buyers are exchanging the EU-expansion country's currency for the non-EU country's currency. Thus for buyers in the EU-expansion

---

[2] This is similar to the relative price setup in Goldberg and Tille (2006).

country their effective price in their own currency is given by $p_{EUex,t}^{EU}(1+\tau_{EU})e_{\frac{EUex}{EU},t}$: in

which the exchange rate between the EU-expansion country and the EU is $e_{\frac{EUex}{EU},t}$.

The firm's marginal cost is given by a sticky wage, w_t, which grows at a random inflation rate adjusting only after cumulative inflation reaches a threshold level. The representative firm's total cost at time t given below:

$$TotalCost_t = w_t\left(Q_{noEU,t} + Q_{EUex,t} + Q_{EU,t}\right) \tag{2}$$

The representative firm must choose between the various currency denomination and price discrimination scenarios outlined in Table 1. For example, if the firm were to choose Scenario 8 and uses the buyer's currency in all three countries then the firm's risk-discounted profit at time t would be as follows:

$$\pi_{8,t} = \left(p_{noEU,t}^{noEU}Q_{noEU,t} + p_{EUex,t}^{EUex}f_{\frac{noEU}{EUex},t-1}(1-\tau_{noEU})Q_{EUex,t} + p_{EU,t}^{EU}f_{\frac{noEU}{EU},t-1}(1-\tau_{EU})Q_{EU,t} - TotalCost_t \right)^{\alpha} \tag{3}$$

The firm is risk averse with the degree of risk aversion given by the parameter α. In this simulation the forward rate is efficient, with the expected exchange rate in the next period equal to the current period's forward rate. As shown in Friberg (1998), a risk averse firm will always choose to hedge their revenue flow by using an efficient forward rate.

The representative firm must also choose how often to change its prices with K denominating the number of months in which the firm's prices are fixed. If the firm elects to change its price then the profit of that period is reduced by $(1-F)$ for each different price, in which F denotes the firm's menu cost. For example, if the firm elects Scenario 8 then the sum of the firm's profits for all time periods in which the firm's prices are fixed is given below.

$$Sum\pi_{8,t+1} = (1-F)^3 E_t\pi_{8,t+1} + E_t\sum_{s=t+2}^{K+t}\pi_{8,s} \tag{4}$$

Because the representative firm is setting three different prices the firm must pay the menu cost three times in the period that the firm adjusts its prices.

In the simulation, which is further detailed in the Appendix, the firm simultaneously optimizes when choosing their currency of denomination/price discrimination scenario and their frequency of price adjustment, *K*. The respective firm chooses the combination of currency of denomination, price discrimination and frequency of price adjustment that gives the firm the highest risk-discounted profit in the simulation. The simulation will be run for 5,000 different representative firms to create a large number of observations to study.

In order to determine the potential currency invoicing changes brought on by expansion of the EU, two different simulations will be run. In the first simulation the three countries each have their own currency; in the second simulation the EU-expansion country joins the European Union and adopts the euro. Between the first and second simulation, all exogenous parameters regarding the firm's market, cost and demand are unchanged, the only change is the EU-expansion country's currency.

Results

Table 2 reports the currency denomination shares of the 5,000 representative firms simulated in the three countries both pre-expansion and post-expansion. In both the non-EU country and the EU-expansion country the share of representative firms invoicing in the importing country increases. Because there are only two currencies instead of three (and one exchange rate instead of three), there are fewer currency denomination choices in the non-EU country and the EU-expansion country. As such there is a large increase in the percentage of representative firms using the euro in these countries.

[Table 2]

Meanwhile in the original EU country, invoicing in the euro drops from 58.8% of simulated firms to 53.2%. What accounts for the drop in euro invoicing in the original EU country's imports? Do the exogenous factors of the model affect the representative firm's currency invoicing decision differently post-expansion?

To answer these questions, I make use of a two-stage probit least squares estimation method with corrected standard errors for simultaneous equations models in which one of the endogenous variables is continuous and the other endogenous variable

is dichotomous[3]. In this case, the dichotomous decision is whether or not the firm will invoice their price in the importing country's currency and the continuous decision is the frequency of price adjustment. Because the firm makes these two decisions simultaneously the following pair of regression equations takes simultaneity into account by creating instruments for the two dependent variables.

$$K_i = X_{1i}\beta_1 + \gamma_1 I_{CurrDen,i} + \varepsilon_{K,i}$$
$$I_{CurrDen,i} = X_{2i}\beta_2 + \gamma_2 K_i + \varepsilon_{CD,i}$$

(5)

K_i is the representative firm's optimal frequency of price adjustment. $I_{CurrDen,i}$ is a dummy variable which is equal to 1 when the representative firm invoices in the currency of the importing country. X_{1i} and X_{2i} represent the various exogenous variables that are randomly determined in the simulation for each representative firm. This estimation is conducted four times: one, for the original EU country pre-expansion, two, for the original EU country post-Expansion, three, for the EU-expansion country pre-expansion and four, for the EU-expansion country post-expansion. Results are reported in Table 3.

[Table 3]

As shown the sign and significance of the RHS exogenous variables differ pre-expansion and post-expansion. *None of the exogenous variables have changed after EU-expansion, only their effect on the representative firm's currency invoicing decision has changed.*

The change in the coefficient on the potential difference in demand elasticity between countries is similar for both the EU country and the EU-expansion country. *The potential difference in demand elasticity between countries is an exogenously assigned parameter from the simulation that determines the variance of the elasticity of demand between countries; a small number means that the elasticity of demand will vary less across countries reflecting the similar preferences of buyers across countries.* Pre-expansion, the coefficient is insignificant and negative for both countries; post-expansion the coefficient is significant and positive. This suggests that before the expansion, the difference in preferences across countries had little impact on the firm's

---

[3] Technical details are described in Maddala (1983).

currency denomination decision. After the expansion, however, if buyer's preferences are similar in different countries then the firm is much less likely to denominate their price in the currency of the importing country.

Why would a representative firm not use the importing country's currency if the preferences are similar across countries? The answer lies in price discrimination. *When preferences are similar across countries there's little incentive to price discriminate across countries.* This is reflected in Figure 2.

[Figure 2]

When the potential difference in demand elasticity across countries is small, the representative firms are less likely to price discriminate post-expansion relative to pre-expansion. Before the EU expansion, the use of different currencies in the three countries provided the representative firm a ready-made reason to price discriminate as price discrimination would allow the firm to better accommodate three different currencies and exchange rates. After the EU expansion, with only two currencies, and one exchange rate, there's less need to price discriminate between the countries when preferences in those countries are so similar.

Table 3 also notes the importance in the exogenous failure in the law of one price for the industry. *The greater the failure in the law of one price the greater the incentive for the representative firm to price discriminate across countries.* Figure 3 shows how failure in the law of one price impacts the decision to price discriminate.

[Figure 3]

With no price discrimination the representative firm must choose to invoice their single price in either their own currency or the euro; this choice is highlighted in Table 4. *When the representative firms choose not to price discriminate they are almost equally divided when choosing to invoice in their own currency or the euro.* If the representative firm finds it optimal to price discriminate then they are much more likely to invoice their different prices in the buyer's currency.

[Table 4]

To summarize, if there are similar preferences across countries or similar industry prices then post-expansion the representative firms are much less likely to price discriminate between the three countries (as shown in Figure 2 and Figure 3). With no

price discrimination the representative firm is less likely to invoice in the price in the buyer's currency (as shown in Table 4).

Conclusion

This paper includes a novel multiple market structure to determine the impact of EU expansion on the currency denomination of external imports to the European Union and the recently admitted EU expansion country. Because of the multiple market structure herein I find a unique result in the currency denomination literature. Specifically, when preferences are similar across countries firms are less likely to price discriminate across countries post-expansion than they were pre-expansion. With no price discrimination it is less likely that import prices in the consumer's country are denominated in their own currency. However, post-expansion there are fewer currency denomination options for the EU-expansion country – leading to a large increase in external imports of the EU-expansion country being denominated in their own currency.

As shown in Goldberg and Tille (2007) and Gopinath, Itskhoki and Rigobon (2007), countries are more vulnerable to external shocks and inflation when their imports are denominated in a foreign currency. Thus, the results herein suggest that EU-expansion countries, with large import/GDP ratios, can gain a great deal of macroeconomic stability by adoption of the euro or by speeding their de facto euro adoption via a banded exchange rate regime or maintaining a fixed exchange rate with the euro.

References

Bachetta, P., van Wincoop, E., 2005. A Theory of the Currency Denomination of Trade. Journal of International Economics 67, 295-319.

Black, S. W., 1991. Transaction Costs and Vehicle Currencies. Journal of International Money and Finance 10, 512-526.

2005. Review of the International Role of the Euro. European Central Bank

Gopinath, G., Itskhoki, O., Rigobon, R., 2007. Currency Choice and Exchange Rate Pass-through. NBER Working Paper Series. http://www.nber.org/papers/w13432

Goldberg, L., Tille, C., Jan. 2005 (rev. March 2006). Vehicle Currency Use in International Trade. Federal Reserve Bank of New York Staff Report 200, http://www.ny.frb.org/research/economists/goldberg/GoldbergTilleJune7.pdf

Goldberg, L., Tille, C., 2007. Macroeconomic Interdependence and the International Role of the Dollar. Exchange Rates — IMF Eighth Jacques Polak Annual Research Conference http://www.imf.org/external/np/res/seminars/2007/arc/pdf/lg.pdf

Goldberg, L., 2007. Trade Invoicing in the Accession Countries: Are They Suited to the Euro? International Seminar on Macroeconomics, ed. Jeffrey Frankel and Christopher Pissarides, NBER and MIT Press

Friberg, R., 1998. In which currency should exporters set their prices? Journal of International Economics 45, 59-76.

Maddala, G. S., 1983. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge, MA: Cambridge University Press.

Taylor, J., 2000. Low Inflation, Pass-through, and the Pricing Power of Firms." European Economic Review 44, 1389-1408.

Appendix

The numerical simulation optimizes for each discrete choice of frequency of price adjustment (23 discrete choices for the 1-23 months the firm is allowed to maintain its sticky price), invoicing currency/price discrimination strategy (15 discrete choices as outlined by the scenarios in Table 1). The firm then chooses among those discrete options by selecting the highest profit over the course of the simulation (15 x 23 = 345 potential profit functions).

In order to create the demand functions for each representative firm the simulation randomly assigns a market size (M) and elasticity parameter (b). The market size for each of the three countries is uniformly distributed from 0 to 1. The elasticity parameter (b) for all three countries hovers around an average which is uniformly distributed from 4 to 10. The variance of the elasticity parameter (b) is uniformly distributed from 0 to 2. If this variance is large then the randomly assigned elasticity parameter for each country is more likely to differ widely from those in other countries. The reference price in each

country (P) follows a random walk but is constrained by a law of one price parameter which allows the law of one price to fail in a uniformly distributed window of 2% to 32% for each representative firm. The volatility of the reference prices is also randomly distributed.

The transaction cost of obtaining the euro (τ_{EU}) is uniformly distributed from 0% to .8% and the transaction cost to obtain foreign currency (τ_{noEU}) is uniformly distributed from 0 to 1%.

The firm's wage, (w_t) is given a random starting point uniformly distributed from 4 to 10. The wage is sticky and moves based upon a randomly determined rate of wage inflation. The increase in the sticky wage must be more than 5%; otherwise, the wage will not be adjusted. The annualized wage inflation rate is uniformly distributed from .5% to 8.5%.

The firm's menu cost (F) is uniformly distributed from 1% to 7% while the firm's risk aversion parameter (α) is uniformly distributed from .9 to 1.

The exchange rates follow a random walk with a randomly assigned variance taken from the distribution of nominal exchange rate variances. The exchange rates are limited by a no triangular arbitrage constraint. Forward rates are efficient; in this case, they are equal to the current period's exchange rate. In the post-expansion simulations, the only parameter to change is the exchange rate between the original EU country and the EU expansion country.

Figure 1
Euro use in Europe for 2002 or 2003.
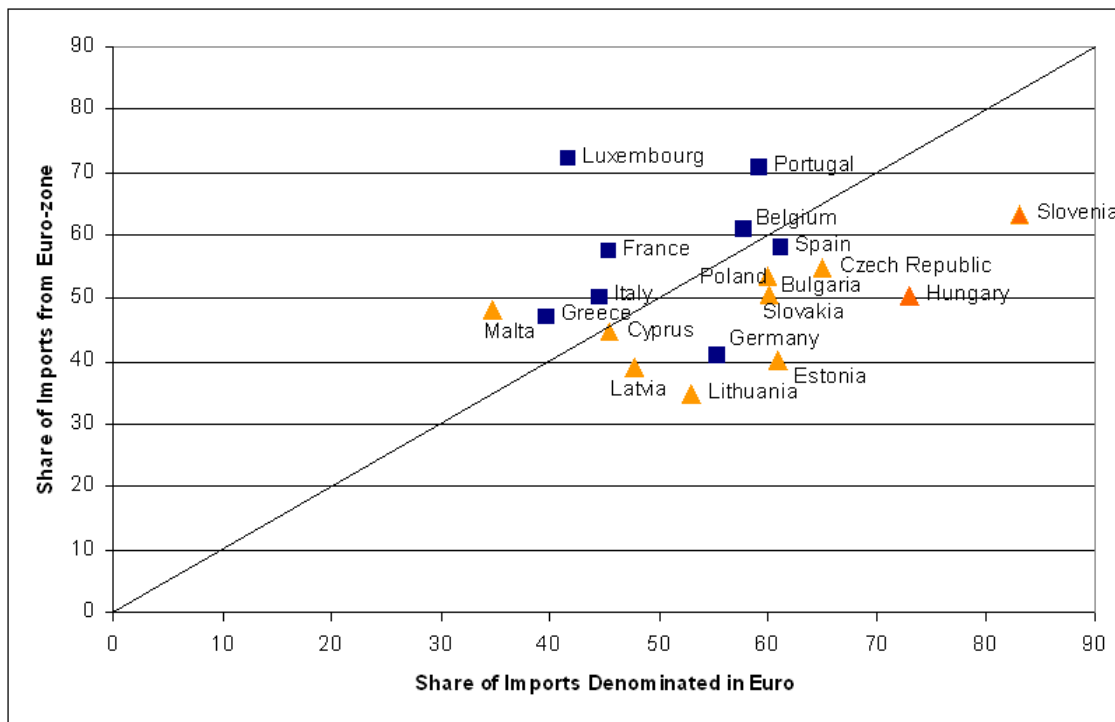
Source: Goldberg (2007), ECB (2005)

Figure 2
Percentage of representative firms using price discrimination
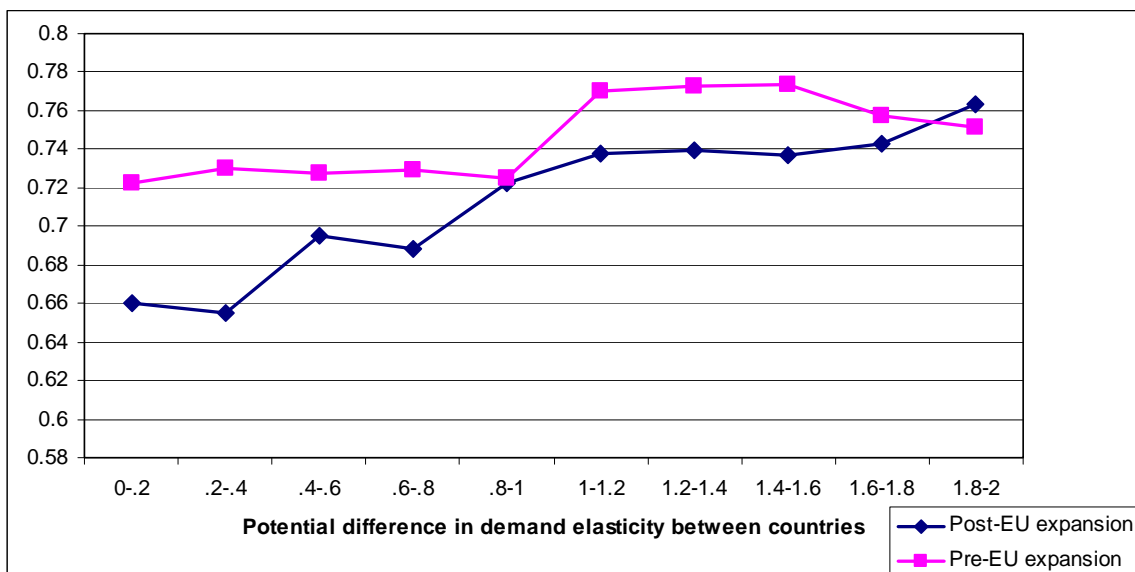
Figure 3
Percentage of representative firms using price discrimination
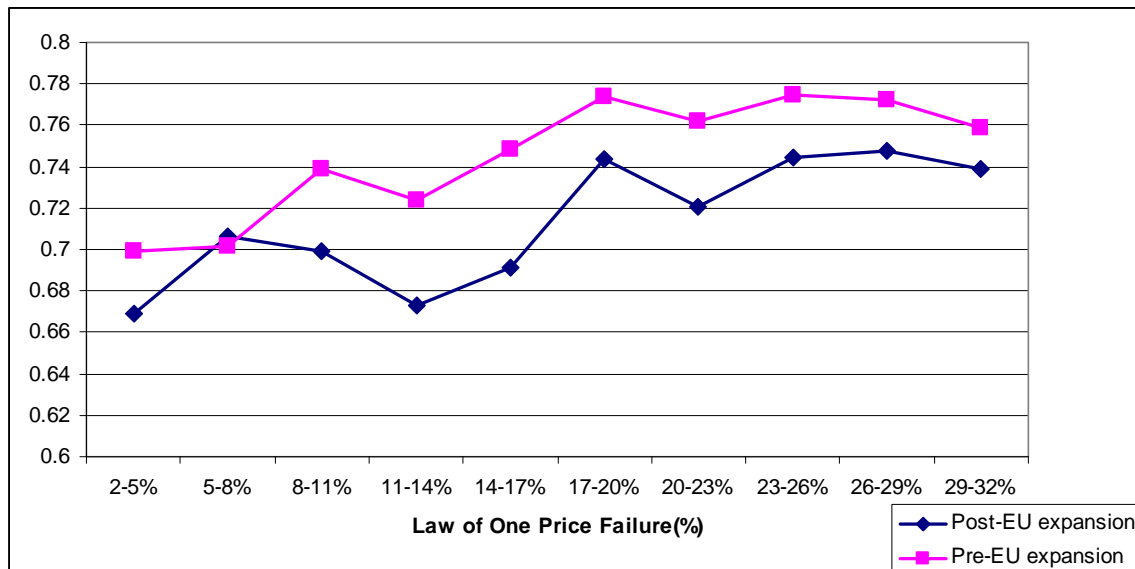
Table 1
Currency denomination strategies of the representative firm

	Currency Denomination in non-EU country	Currency Denomination in EU-expansion country	Currency Denomination in EU country	Degree of Price Discrimination
Scenario 1	euro	euro	Euro	none
Scenario 2	non-EU currency	non-EU currency	non-EU currency	none
Scenario 3	non-EU currency	non-EU currency	Euro	2 unique prices
Scenario 4	non-EU currency	euro	Euro	2 unique prices
Scenario 5	EU-expansion currency	EU-expansion currency	Euro	2 unique prices
Scenario 6	non-EU currency	euro	non-EU currency	2 unique prices
Scenario 7	euro	EU-expansion currency	Euro	2 unique prices
Scenario 8	non-EU currency	EU-expansion currency	Euro	3 unique prices
Scenario 9	euro	euro	Euro	3 unique prices
Scenario 10	non-EU currency	non-EU currency	non-EU currency	3 unique prices
Scenario 11	non-EU currency	non-EU currency	Euro	3 unique prices
Scenario 12	non-EU currency	euro	Euro	3 unique prices
Scenario 13	EU-expansion currency	EU-expansion currency	Euro	3 unique prices
Scenario 14	non-EU currency	euro	non-EU currency	3 unique prices
Scenario 15	euro	EU-expansion currency	Euro	3 unique prices

Table 2
Currency denomination shares

		Pre-EU expansion	Post-EU expansion
Non-EU country	Non-EU country's currency	67.0%	72.0%
	EU-expansion country's currency	15.9%	-
	Euro	17.1%	28.0%
EU-expansion country	Non-EU country's currency	26.4%	29.5%
	EU-expansion country's currency	40.0%	-
	Euro	33.6%	70.5%
Original EU country	Non-EU country's currency	41.2%	46.8%
	EU-expansion country's currency	-	-
	Euro	58.8%	53.2%

Table 3
Results from Eq. 5

Independent Variable	Original EU country		EU-expansion country	
	Pre-Expansion	Post-Expansion	Pre-Expansion	Post-Expansion
	Invoice in Euro	Invoice in Euro	Invoice in EU-expansion country's currency	Invoice in Euro
Transaction cost of exchanging euro	-4.172	-24.57**	24.75**	-16.55**
	(8.382)	(7.817)	(8.007)	(8.336)
Transaction cost of exchanging EU-expansion currency	16.03**		-69.41**	
	(6.846)		(6.624)	
Average wage inflation of exporting firm	-4.252	-11.48	22.42**	0.031
	(10.70)	(9.621)	(10.25)	(10.21)
Menu cost of exporting firm	3.848*	-1.000	-1.228	1.943
	(2.122)	(1.877)	(2.071)	(1.987)
Percentage of firm's market in EU-expansion country	-1.234**	-0.629	1.653**	1.540**
	(0.426)	(0.394)	(0.418)	(0.416)
Percentage of firm's market in original EU country	-0.838	0.240	1.492**	0.151
	(0.537)	(0.478)	(0.526)	(0.504)
Size of all markets	0.605**	0.343**	-0.207	0.274**
	(0.138)	(0.125)	(0.135)	(0.131)
Elasticity Parameter b_{EU} OR b_{EUex}	0.007	0.038**	0.033**	0.055**
	(0.011)	(0.011)	(0.011)	(0.012)
Potential difference in demand elasticity between countries	**-0.025**	**0.089****	**-0.013**	**0.075****
	(0.034)	**(0.032)**	**(0.033)**	**(0.033)**
Average reference price volatility	-3.684	4.219	-4.960	-3.100
	(3.624)	(3.496)	(3.486)	(3.700)
Risk aversion of exporting firm	-1.128*	0.046	-0.851	1.440**
	(0.669)	(0.618)	(0.640)	(0.657)
Original marginal cost of exporting firm	0.000	-0.001	0.025**	-0.014
	(0.011)	(0.011)	(0.011)	(0.011)
Failure of the law of one price (%)	**1.285****	**1.017****	**-0.108**	**0.722****
	(0.223)	**(0.206)**	**(0.213)**	**(0.219)**
Instrument for frequency of price adjustment	-0.0446	0.0191	-0.0893**	-0.0683**
	(0.0328)	(0.0276)	(0.0322)	(0.0291)
Constant	1.428	-1.008	1.145	-1.119
	(0.930)	(0.829)	(0.906)	(0.879)

Note: Corrected standard errors are given in parenthesis. Significance at the 5% and 10% level is denoted by ** and * respectively.

Table 4

Currency denomination shares with or without price discrimination

		Post-EU expansion	
		No Price Discrimination	**Price Discrimination**
Non-EU country	Non-EU country's currency	53.1%	79.6%
	Euro	46.9%	20.4%
EU-expansion country	Non-EU country's currency	53.1%	20.0%
	Euro	46.9%	80.0%
Original EU country	Non-EU country's currency	53.1%	41.4%
	Euro	46.9%	58.6%

IMAGES OF WOMEN IN ADVERTISEMENTS: A REVISIT

P. Krishnakumar, School of Business, Slippery Rock University, Slippery Rock,
PA 16057, (724) 794-2758, pxk1974@yahoo.com
Sunita Peacock, English Department, Slippery Rock University, Slippery Rock
PA 16057, (724) 738-2354, sunita.peacok@sru.edu
Lathika Krishnakumar, Independent Scholar, Slippery Rock, PA 16057
(724) 794-2758, pxk1974@yahoo.com

ABSTRACT

This study utilized a comparative approach to explore the nature of the "image of women in advertisements" as well as the "ideal portrayal of women in advertisements". Both the image profiles are developed at two different points in time separated by a span of fifteen years. Significant variations between these image profiles are delineated and discussed.

INTRODUCTION

It is possible that the Indian identity as a whole and the identity of Indian women in particular remain conflicted because of the encroachment of the British culture into the Indian society. Despite a strong national consciousness among Indian intellectuals, there was also a tug of war between Indian/Eastern ideals and Western thought. The nationalist consciousness in India had its fledgling roots in the state of Bengal during the 1920s and 1930s. Some of the early Indian writers like Bhudev Mukopadhyaya, Ram Mohan Roy and others shaped the coinage of the word "bhadramahila" or respectable woman and this had a great impact on the role of women in India as well as their image in Indian society. The "bhadramahila" was a woman who had a western style education, which was supported by both the colonial and indigenous male, but her location within the nationalist agenda was a restrictive one. According to these Indian writers "the home had to be a sanctified area because the very institutions of home and family were threatened under the peculiar conditions of the colonial rule and the only way a home would be sanctified would be if the woman despite her education retained her status as a respectable person" [1, p.626]. "To create a deliberate schism between that which was Indian and that which was not, the new patriarchy" which came about through the nationalist agenda demanded that women protect Hindu spirituality by blocking external influences or westernization, from entering her home [1, p.627]. She would use the home's walls to keep out social and cultural promiscuity that would lead to unwanted syncretism, hermetically sealing in sanctity and purity. This placement of women into clearly defined roles came to be known as the "bhadramahila" or respectable woman. It is indeed possible that this notion of "bhadramahila" makes "abstractions" out of women which give way to a "callous indifference" for their condition in society [2, p.82].Thus the "bhadramahila" concept came into being in Bengal and indigenized across India in various guises. The researchers in this study are hoping to examine whether these historic antecedents are still influencing the identity of the modern Indian women. More specifically, the study uses a comparative framework to explore the nature of the "image

of women in advertisements" as well as the "ideal portrayal of women in advertisements." Furthermore, both of these image profiles are to be examined at two different points in time separated by a span of fifteen years so that the evolutionary nature of these images can be delineated and discussed.

METHODOLOGY

The research instrument consisted of a questionnaire divided into three sections. The first section used a modified form of semantic differential scales to explore the image profiles of women as seen through advertisements as well as the ideal portrayal of women in advertisements. This was accomplished by a simultaneous presentation of the relevant concepts on fifteen bi-polar scales. The fifteen bi-polar scales are: 1) unreliable-reliable, 2) unintelligent-intelligent, 3) inferior-superior, 4) submissive-aggressive, 5) diffident-confident, 6) unattractive-attractive, 7) follower-leader, 8) dependent-independent, 9) homely-glamorous , 10) uneducated-educated, 11) traditional-modern, 12) insensitive-sensitive, 13) unsophisticated-sophisticated, 14) irrational-rational, and 15) always seductive-rarely seductive. The design was intended to permit maximum opportunity for comparison and discrimination between the two concepts, image of women in advertisements and the ideal portrayal of women in advertisements. The second section of the research instrument used a Likert scaling technique to examine the perception of the respondents concerning some general aspects of portrayal of women in advertisements. The third section of the instrument used a structured format to gather demographic data concerning the respondents. The integrated research instrument was pre-tested for validity and reliability. The final form of the instrument was personally administered to a small a sample of respondents in India during the year 1993. The same research instrument was utilized again to gather relevant data from another sample of Indian respondents during early part of the year 2008. The data was gathered from four locations in India and the total sample size was one hundred and ten.

ANALYSIS

Image profiles of the women in advertisements and the ideal portrayal of women in advertisements were derived from the semantic differential data. Profile or image is defined as a vector on a multidimensional space with fifteen elements. Each element is an arithmetic mean derived out of ratings obtained from the semantic differential scales. Preliminary analysis of the semantic differential scale data utilizing paired't' tests indicates that the images of women in advertisements and the ideal portrayal of women are significantly different. This is true for the responses obtained in 1993 as well as for the data gathered in 2008. The respondents from the sample in 1993 have given significantly higher mean ratings on ten dimensions to the ideal portrayal of women compared to the image of women in advertisements. These dimensions are: unreliable-reliable, unintelligent-intelligent, inferior-superior, diffident-confident, follower-leader, dependent-independent, uneducated-educated, insensitive-sensitive, irrational-rational, and always seductive-rarely seductive. On two of these dimensions, homely-glamorous and traditional-modern, portrayal of women in advertisements have significantly higher ratings than the ideal image of women. There were no significant differences between the

two concepts on the following three characteristics: submissive-aggressive, unattractive-attractive, and unsophisticated-sophisticated. The profiles created from the data gathered in 2008 are similar to the images developed from the responses in 1993. In fact, the ideal portrayal of women have been given significantly higher mean ratings compared to the image of women in advertisements on exactly the same ten characteristics as was the case in 1993. The paired't' tests found no significant differences between the two concepts on the following five dimensions: submissive-aggressive, unattractive-attractive, homely-glamorous, traditional-modern, and unsophisticated-sophisticated.

TABLE 1

**Profile Dimensions of Women in Advertisements (Women in Ad) and Ideal
Portrayal of Women in Advertisements (Ideal Women)
Results of Paired't' Tests (Significance at Alpha = .05 Level)
1993**

Dimensions	Women in Ad	Ideal Women	t Value	Significance
Unreliable/Reliable	3.431	5.646	-5.992	Yes
Unintelligent/Intelligent	4.062	5.662	-5.442	Yes
Inferior/Superior	4.215	4.879	-3.004	Yes
Submissive/Aggressive	4.231	3.908	1.016	No
Diffident/Confident	4.446	6.046	-6.154	Yes
Unattractive/Attractive	5.492	5.969	-1.908	No
Follower/Leader	3.338	4.815	-5.838	Yes
Dependent/Independent	3.569	5.262	-5.515	Yes
Homely/Glamorous	5.092	3.369	5.068	Yes
Uneducated/Educated	4.754	5.969	-5.448	Yes
Traditional/Modern	5.523	4.323	3.913	Yes
Insensitive/Sensitive	4.185	5.231	-4.086	Yes
Unsophist. /Sophisticated	5.108	5.159	-0.214	No
Irrational/Rational	3.954	5.446	-5.630	Yes
Always Sed. /Rarely Sed.	3.846	5.369	-4.351	Yes

TABLE 2

**Profile Dimensions of Women in Advertisements (Women in Ad) and Ideal
Portrayal of Women in Advertisements (Ideal Women)
Results of Paired 't' Tests (Significance at Alpha = .05 level)
2008**

Dimensions	Women in Ad	Ideal Women	t Value	Significance
Unreliable/Reliable	4.048	5.452	-3.757	Yes
Unintelligent/Intelligent	3.762	5.881	-7.218	Yes
Inferior/Superior	4.000	5.452	-6.560	Yes
Submissive/Aggressive	4.167	4.762	-1.872	No
Diffident/Confident	4.690	5.952	-4.859	Yes
Unattractive/Attractive	5.952	5.714	0.952	No
Follower/Leader	4.190	5.476	-5.074	Yes
Dependent/Independent	4.476	5.643	-3.806	Yes
Homely/Glamorous	4.857	5.143	-0.841	No
Uneducated/Educated	5.048	6.048	-4.475	Yes
Traditional/Modern	4.405	4.905	-1.553	No
Insensitive/Sensitive	4.524	5.452	-3.628	Yes
Unsophist. /Sophisticated	5.119	5.309	-0.797	No
Irrational/Rational	4.333	5.548	-4.579	Yes
Always Sed. /Rarely Sed.	3.381	5.095	-4.902	Yes

A cursory examination of the data from Likert scale responses indicates some interesting perceptions among Indian respondents concerning women in advertisements. Agreement to the statement "women are rarely portrayed in advertisements as equal to men" has increased from thirty seven percent in 1993 to sixty percent in 2008. Disagreement to the statement "women are not usually shown in advertisements in seductive roles" has increased from fifty two percent (1993) to sixty nine percent (2008). The percentage of participants who disagreed with the statement "women are usually portrayed in advertisements as decision makers" has increased from forty five in 1993 to fifty seven in 2008. Similarly the percentage of respondents who perceived that women are usually shown in advertisements as house wives increased from forty five (1993) to fifty five (2008). There seems to be a strong agreement among respondents from both the samples, separated by a time span of fifteen years, that pretty women are shown in advertisements to attract attention. Only forty six percent of the participants in 1993 were of the opinion that there should be more advertisements portraying women as top level managers where as this opinion was expressed by eighty six percent of the respondents in 2008. It is also interesting to note that fifty five percent of the participants in 1993 and seventy nine percent of the respondents in 2008 have indicated that advertisements ignore important contributions of women to the society.

DISCUSSION

The image of women as seen through advertisements in 1993 seems to be much less favorable than the profile of the ideal portrayal of women. Specifically, the respondents in 1993 have perceived that the ideal image of women was significantly more reliable, intelligent, confident, independent, educated, sensitive and rational than the portrayal of women in advertisements. Furthermore, the ideal women were perceived to be superior to the women seen in advertisements, they were considered as leaders as opposed to followers, and finally there was a perception in 1993 that the ideal women were rarely seductive. But this group of respondents also held the perception that the ideal women were less glamorous and less modern than the women seen in advertisements The analysis of the data gathered from the respondents in 2008 illustrates that these images of the women in advertisements and the ideal portrayal of women have remained fairly stable over a period spanning fifteen years. No evolutionary changes seem to have taken place during this long period of time. This is clearly indicated by the fact that the profile of women in advertisements and the ideal portrayal of women significantly differ along ten identical dimensions in 1993 and 2008. In both the instances the women in advertisements are perceived to be less reliable, less intelligent, less sensitive, less rational, inferior, less confident, a follower, less independent, less educated, and more seductive than the ideal portrayal of women. The fifteen year time span has created only two variations amidst the above pattern of consistency in responses. It is now seen that there are no significant variations between the image of women in advertisements and the ideal portrayal of women in terms of glamour and modernity. It seems reasonably safe to arrive at a conclusion that there are some negative perceptions in India concerning the portrayal of women in advertisements. Furthermore, these negative perceptions seem to persist even after a long time span of fifteen years. Preliminary analysis of the Likert scale responses tends to provide further support for this conclusion.

It is within the realm of possibility that historical antecedents, colonial rule, cultural environment, and myriad of other factors may continue to influence the image of women in advertisements as well as the ideal portrayal of women among the respondents from India. There may even be an element of truth in the post colonial/post-modern notion that the presence of " plurality of gazes" in contemporary India may create a situation where the woman in advertisements is considered as an "other", a " subaltern" where as her "ideal sister" fares much better in the eyes of the beholder. The results of this analysis also provide some indication that some aspects of the image of the ideal portrayal of women may still be affected by the presence of the "bhadramahila" concept. For example, the ideal portrayal of women has a significantly higher average rating than the women in advertisements on the semantic differential scale: always seductive- rarely seductive. Is it possible that this is an indication of an attempt to create a deliberate schism between that which is Indian (rarely seductive) and that which is not (always seductive)?

The researchers are carrying out further statistical analysis to examine the linkages between the demographic factors and the responses to semantic differential scale data as well as the Likert scale responses. In addition there are clear indications that the

responses to semantic differential questions are strongly correlated. This structure of dependency may necessitate the use of multivariate techniques for further analysis. The authors would also like to point out that the study was based on small convenience samples and as such problems of external validity may exist and this in turn may impose restraints on generalizations to be drawn from the results of this research.

REFERENCES

[1] Chatterjee, Partha. Colonialism, Nationalism, and Colonized Women: The Contest in India, *American Ethnologist*, November 1989, 622-633.

[2] Mani, Lata. *Contentious Traditions: The Debate on Sati in Colonial India*, Berkeley, California, University of California Press, 1998.

THE NURSING SHORTAGE IN THE USA AND ABROAD: UNDERLYING CAUSES AND RECOMMENDATIONS TO RESOLVE

Robert T. Barrett, College of Business and Applied Professional Sciences, South Carolina State University, Orangeburg, SC, 803-536-8186, rbarret1@scsu.edu
Bobbie Perdue, Program of Nursing, South Carolina State University, Orangeburg, SC, 803-516-4727, bperdue@scsu.edu

ABSTRACT

There is currently a nursing shortage that many authorities estimate will only get worse. The United States, and indeed the world, is facing this crisis that will impact quality of life for many years. The health care system relies heavily on well trained nurses. Emphasis needs to be placed on expanding the education of quality nurses, especially at the BS level. This paper looks at the severity of the crisis and makes recommendations for addressing the problem.

INTRODUCTION

A major issue in the 2008 Presidential election was health care and the candidates' philosophies on funding and managing the health care systems in the U.S. Health care costs seem to be spiraling out of control. There is increasing demand for health care from an aging population. Questions of how to insure the citizens across the country bring in controversial strategies.

With these issues at the forefront of the populous, we also face the increasing problem of the nursing shortage. The American Association of Colleges of Nursing (AACN) regularly publishes information related to health care and specifically issues relating to the nursing profession. One publication of AACN is entitled, "Nursing Shortage Fact Sheet" [2]. Facts and estimates presented here are from an issue updated on September 29, 2008. AACN references a number of published documents in reporting on the nursing shortage. Web references are available in the Fact Sheet. Another prominent source is Nurses for a Healthier Tomorrow (NHT). The NHT publication "Facts on Nursing Shortage in North America," provides excellent information on the issue [3].

According to the AACN Fact Sheet, there is a wide range of estimates relating to the nursing shortage [2].
- Shortage could reach 500,000 by 2025
- Demand for RNs is expected to grow by 2% to 3% each year
- 30,000 additional nurses need to be graduated each year to meet the expected need, a 30% increase over the current number of nursing graduates today
- More than 1,000,000 new and replacement nurses will be needed by 2016
- 55% of nurses surveyed intend to retire between 2011 and 2020

UNDERLYING CAUSES AND DRIVING FORCES

The AACN Fact Sheet lists six specific reasons for the nursing shortage [2]:
- A shortage of nursing school faculty is restricting nursing program enrollments.
- The total population of registered nurses is growing at a slow rate.

In South Carolina, the increase in nurses increased by 4.88 percent from 2003 to 2005. Table 1 shows the number of nurses in the state broken down by region. Note that, although all regions experienced growth, the Low Country experienced the largest growth. Charleston, with the Medical University of South Carolina, likely contributes primarily to this growth, even though the counties in the Low Country are some of the poorest in the state [4].

Table 1. Number of Nurses in South Carolina by Region, 2003 and 2005.

	2003	2005	Net Change	Percent Change
Region				
Upstate	8,760	9,166	406	0.046347032
Midlands	10,034	10,489	455	0.045345824
Pee Dee	5,759	5,993	234	0.040632054
Low Country	7,717	8,197	480	0.062200337
Total	32,270	33,845	1,575	0.048806941

- With fewer new nurses entering the profession, the average age of the RN is climbing.
- Changing demographics signal a need for more nurses to care for our aging population.

Table 2 shows populations in South Carolina listed by sex and selected age groups for the 2000 Census and estimates for the years 2001, 2003, 2005, and 2007. As seen, while the state's population increased 9.88 percent from 2000 to 2007, changes in the various age groups varied widely. The number of males 85 and over increased 7 percent. Females 85 and over increased 35 percent. Males and females in the 80 to 84 age group increased 35 percent. This rapid growth of late-life individuals further taxes the already stretched nursing professionals. Note also that the median age increased 1.3 years (5 percent) for males and 2.2 years (6 percent) for females from 2000 to 2007. Recall from Table 1 that the number of nurses in South Carolina increased 4.88 percent from 2003 to 2005. During this same time period the top age groups grew substantially: males 80-84 up 9 percent; females 80-84 up 6 percent; males 85 and over up 17 percent; females 85 and over up 10 percent.

- Insufficient staffing is raising the stress level of nurses, impacting job satisfaction, and driving many nurses to leave the profession.
- High nurse turnover and vacancy rates are affecting access to health care.

Chawla et al [1] look at nurse perceptions of job issues and conclude that extrinsic factors play a more major role in job satisfaction than intrinsic factors. This result was based on a small sample, with the promise that more extensive results would be forthcoming.

Table 2. SC Population by Sex and Age, 2000 Census; 2001, 2003, 2005, 2007 Estimates.

Sex and Age	April 1, 2000 Census	July 1, 2001 Pop Estimate	July 1, 2003 Pop Estimate	July 1, 2005 Pop Estimate	July 1, 2007 Pop Estimate	Percent Increase 2000 to 2007	Percent Increase 2003 to 2005
Males							
60-64 years	78,318	81,284	90,109	99,100	112,854	1.440971	1.099779
65-69 years	66,892	67,821	69,563	73,654	81,347	1.216095	1.05881
70-74 years	53,921	54,457	55,527	58,241	60,860	1.128688	1.048877
75-79 years	40,392	41,078	42,089	43,550	45,586	1.12859	1.034712
80-84 years	22,393	23,933	26,395	28,805	30,325	1.354218	1.091305
85 up	13,136	14,242	16,286	19,050	22,455	1.709424	1.169716
Median age (years)	34	34.3	34.8	35.3	35.7	1.05	1.014368
Females							
60-64 years	87,831	90,663	100,050	109,696	125,532	1.429245	1.096412
65-69 years	78,707	80,178	81,903	85,506	93,183	1.183923	1.043991
70-74 years	70,528	69,893	70,427	72,910	75,802	1.074779	1.035256
75-79 years	61,053	61,721	62,180	61,970	63,028	1.032349	0.996623
80-84 years	41,178	43,024	46,262	49,034	50,468	1.225606	1.05992
85 up	37,133	38,766	41,018	45,165	50,044	1.347696	1.101102
Median age (years)	36.7	37.2	37.8	38.4	38.9	1.059946	1.015873
SC	4,011,816	4,062,933	4,146,770	4,254,989	4,407,709	1.098682	1.026097

STRATEGIES FOR ADDRESSING THE NURSING SHORTAGE

A number of strategies have been proposed by interested parties to approach the nursing shortage. There will need to be strong collaborative efforts immediately and ongoing to reduce the serious impact of the nursing shortage. Some of the approaches mentioned in the literature and observed by the authors include [2]:

Legislative approaches
- States raise funds for scholarships
- The Illinois Center for Nursing is developing strategies to ensure Illinois can educate, recruit and retain nurses

Public-private partnerships
- Hospitals
  - donate funds for nursing scholarships
  - partner with schools of nursing
  - subsidize nurse faculty salaries
  - reimburse nurses for advancing their education in exchange for a work commitment
  - provide scheduling flexibility to enable staff to attend classes
- Foundations help to fund scholarships and capital needs such as building projects and operating funds
- State and Federal agencies are providing grants to increase capacity of programs

Hewlett and Tyrell [3] discuss some South Carolina initiatives. The SC Legislature passed the Critical Needs Nursing Initiative Act of 2007 (CNNI). CNNI calls for increases in nursing faculty salaries, encourages new faculty positions, encourages nurses to seek advanced degrees that will allow them to teach by providing scholarships and stipends, and provides funding for purchasing simulation technology and equipment for teaching. CNNI will support a study to develop a model to predict nursing shortages in the state.

CLOSING THOUGHT

Much attention needs to be paid to the nursing shortage. Primary focus should be on increasing funding for nursing programs to help them be better prepared to train highly skilled nurses.

REFERENCES

[1] Chawla, Sudhir K., Dave, Dinesh S., Dotson, Michael J., Cazier, Joseph A., Badgett, Thomas F., "Examining Nurses Perceptions of Rewards Structure," *Southeastern Chapter of the Institute For Operations Research and the Management Sciences Proceedings*, October 2008. [CD 765-767].

[3] "Facts on Nursing Shortage in North America,"
http://www.nursingsociety.org/Media/Pages/shortage.aspx
South Carolina Statistical Abstract

Hewlett, Peggy O., and Tyrell, Mary D., "Nursing Workforce Continues to Expand," *South Carolina Workforce Trends.* September 2008, 1-2.

[2] "Nursing Shortage Fact Sheet,"
http://www.aacn.nche.edu/Media/FactSheets/NursingShortage.htm

[5] South Carolina Statistical Abstract.

[6] U.S. Census Bureau, Population Division.

CREDIT UNIONS AND THEIR DIRECTORS

Dalton E. Brannen, Augusta State University, Augusta, GA 30904 dbrannen@aug.edu
Nabil A. Ibrahim, Augusta State University, Augusta, GA 30904 nibrahim@aug.edu

ABSTRACT

Credit unions are a growing and important part of our financial system. Credit unions are full-service financial institutions as are traditional banks. However, credit unions are very different in organizational form, philosophy and mission, ownership, management and operation.

This paper includes a brief presentation of the creation and history of the credit union movement in Europe and, later, in the U.S. The special characteristics of credit unions compared to other financial institutions are discussed.

Boards of directors of these organizations are member-owners and typically serve gratis. Understanding this group, their background, and involvement as they relate to the health and future of credit unions is important, particularly in light of the current instability and difficulty in the financial services industry. A review of studies examining directors' involvement in strategic matters is presented, with special attention to credit union board members. Finally, a number of research questions that require empirical investigation are proposed.

CREDIT UNION MOVEMENT

A credit union today is a cooperative form of business which provides financial services and products as would a traditional bank. Various kinds of cooperatives first developed in Western Europe in the early nineteenth century. These developments were in response to the changing economic system and related societal changes. With the decline of feudalism farmers in the countryside then became land owners who no longer had the economic obligations to, and protections of, their feudal lords. As the industrial revolution took hold in towns and villages, shopkeepers and skilled craftsmen began to also face changes in the evolving economic system. The protections that the guild system offered from competition began to diminish with the advent of factory produced goods. In response to these changes and pressures farmers, shopkeepers, skilled craftsmen, and small producers began to engage in cooperative economic endeavors and organizations to adjust to the changes brought on by an evolving competitive capitalistic economy and society (Moody and Fite, p. 1)

In a capitalistic economy capital can come from inheritance, savings, or borrowing. To fill the needs of borrowers money lenders and banking have been in existence since ancient times. Today, and as in times past, lenders favor borrowers with more resources and ability to repay. Hence small merchants, craftsmen, and farmers could get working capital only from money lenders at a very high interest rate (Moody and Fite, p. 3). There were many and varied efforts at providing for the credit needs of these underserved common folk through people's banks. However, the first practical people's bank or cooperative credit society or loan union, as they were variously called, was created in Germany by Herman Schulze–Delitzsck. As a result of a great crop failure in 1846 he formed a group to purchase grain at wholesale to sell to the hungry

at lower cost and he also created a cooperative for shoemakers to purchase leather at wholesale. From this experience he learned that small merchants, craftsmen, and others similarly situated had a great need for a means to borrow modest amounts. With $140 Schulze–Delitzsck created a cooperative credit society in 1850. Participation was by a membership fee of $2.50 and the installment purchase of one share at $12.00. Members were also required to deposit their savings in the credit society, upon which small dividends were paid (Cahill, p. 5; Moody, Fite, p. 4). Loans were made for business rather than consumer purposes, and were made on the basis of the person's character rather than their collateral. The membership democratically controlled the society with each member having one vote, regardless of the number of shares they owned. The other prominent figure in the peoples' bank movement was Friedrick Wilhem Raaffeisen. He created people's banks for farmers to help them buy seed, livestock, farm machinery, and land. (Moody and Fite, p. 7). By the 1880's these cooperative credit societies had spread throughout Europe.

The credit union movement was begun in the U.S. by Edward Albert Filene, a Boston Massachusetts department store owner. Filene was a well traveled well read self educated intellectual who was also a quite progressive employer for the early 1900's. His interest in cooperative endeavors increased when on a world tour in 1907 he observed the operation of cooperative agriculture banks in India. In 1909 the first state law defining and enabling credit unions was passed in New Hampshire and the second with Filene's support, was passed nine days later in Massachusetts. In 1910 each state had its first credit union (Moody and Fite, p. 27). Filene also founded a credit union and later an agency which would go on to support the entire credit union movement.

The credit union movement grew such that by 1932 there were 1700 credit unions and most states had passed enabling legislation for state chartered credit unions. Even so, some of the state laws were weak and some state governments were not friendly to the cooperative credit union concept. As a result the Federal Credit Union Act was enacted in 1934 which would allow for federally charted credit unions. Later that year the Credit Union National Association (CUNA) was established to support credit unions and promote the movement in the U.S. as their umbrella trade association. In 1970 the World Council of Credit Unions (WOCCU) was formed to provide guidance and support to credit unions around the globe.

CREDIT UNIONS AS FINANCIAL INSTITUTIONS

Credit unions are different in many important aspects from banks and depository institutions. First and foremost, a credit union is a business voluntarily owned and controlled by its member patrons, and operated for them and by them on a non-profit or cost basis. It is owned by the people who use it. It is organized and incorporated to engage in economic activities with certain ideals of democracy, social consciousness, and human relations included. A cooperative provides services and benefits for its members in proportion to the use they make of their organization rather than earning profits for the share holders as investors (Cahill, 1984; Schoars, 1971).

These characteristics of non-profit, service, democratic control, and social responsibility are the operating principles of credit unions today. Those who use credit unions (CU) are not customers

as with a traditional bank, rather one becomes a member usually by making a small deposit which purchases at least one share. CUs offer a full range of financial products and services including checking and savings accounts, IRAs, CDs, ATMs, credit cards, mortgages, automobile loans, Christmas Clubs, college savings and personal loans. These services are typically offered at a lower cost than for profit financial institutions. This is the result of operating surpluses being returned in the form of lower costs for services and financial products and/or dividends on savings. The objective or philosophy is to serve the members financial services needs rather than provide a return on invested capital for stockholders as do traditional banks. Another difference is a focus on education. For example, common education programs offered by CUs include identity theft, car buying, home purchasing, fraud and credit protecting, and personal budgeting. Often CUs are involved in charitable and socially responsible activities in their communities.

Beyond the basic difference in the purpose of a CU to provide service rather than profit, ownership and governance is fundamentally different from other financial institutions. The members are the owners and the control is democratically based on a one member one vote basis. The members elect a board of directors from among the membership (Hautaluoma, et al., p.1) The boards of directors also serve without pay, where as bank boards are compensated. The CU board in turn hires and directs a CEO who manages the day to day operation.

Today there are about 9,000 credit unions, 3,600 of which are state-chartered and 5,400 of which are federal credit unions (Credit Union National Association, 2006). They hold approximately $700 billion in assets. In comparison, there are 8,800 banks, savings and loans, and savings banks, holding $10.9 trillion in assets. Several banks, individually, have assets that exceed the total combined assets of all credit unions. Nevertheless, with over 80 million members, credit unions are important competitors in the market for consumer loans and deposits. Their assets have steadily grown from $217 billion to $655 billion between 1990 and 2004.

BOARD INVOLVEMENT

In spite of these impressive growth rates, a number of writers have expressed great concern regarding credit union governance. Of particular interest is the extent of board involvement in the strategic management of these institutions. There is general agreement among organizational researchers, governance experts, and business executives that, traditionally, boards across all industries have engaged in the strategic process only to the extent that they legitimized proposals from corporate executives (Iacocca, 1984; Shanklin and Ryans, 1981). However, in recent years, the extent to which board members are involved in the corporate strategic decision making process has become of major concern. To date, the board's multiple roles and duties have been the most-studied aspect among all board investigations. These studies identified several major responsibilities that capture directors' most significant functions. A list is presented in Table 1.

There is ample empirical evidence from organizations of many different kinds that there are levels of board involvement, which can be represented as continua (McNulty and Pettigrew, 1999; Zahra and Pearce, 1989). One particularly useful framework for evaluating the role of the board of directors in corporate strategic management was developed by Wheelen and Hunger (2004).

A board can be characterized as being at a specific point on a continuum depending upon its degree of involvement in strategic affairs. Accordingly, "boards can range from phantom boards with no real involvement to catalyst boards with a very high degree of involvement" (p. 28). Table 2 shows these scales and the areas they purport to measure.

Table 1. Responsibilities of Boards of Directors

Author(s)	Year	Responsibilities
Pfeffer and Salancik	1978	Advice and counsel
		Oversight and control.
Ong and Lee	2000	Monitoring the actions of executives on behalf of shareholders
Hillman and Dalziel	2003	Providing input, resources, and advice in formulating strategies
Johnson et al.	1996	Establishing links with stakeholders
		Participating in strategic planning
Boulton	1978	Reviewing overall board role and responsibilities
		Reviewing operating variances and problem areas
		Reviewing objectives and setting standards of performance
		Reviewing business structure
		Evaluating strategic and operating plans
		Reviewing standards for compensation and rewarding performance
		Ensuring the organization's human resource development
		Reviewing external trends
		Setting policies for corporate action

A sizable amount of study has been devoted to board involvement. Unfortunately, when viewed as a whole, the results are mixed and inconclusive, thus limiting the number of definitive conclusions that can be drawn. Some have found that executives are resisting increased board involvement in the strategic process. Other evidence suggests that board members are reacting to various external pressures with active participation. Table 3 shows a list of the key studies.

CREDIT UNION DIRECTORS

A number of writers have focused their efforts on the boards of credit unions and their role in strategic management. Not surprisingly, there is general agreement among them that, in a credit union as in any other business, strategic management is a significant contributor to high performance. James McComb reflects this view. He asserts that "more than just a concept or a theory, strategic management converts planning into progress." He further argues that the organization's mission, vision, and values should be used "as a basis for every aspect of day-to-day life... Strategic planning becomes strategic management when the plan becomes an integral part of (a) credit union's culture." (2001, pp. 24, 26).

Table 2. Scales Measuring Board Involvement

Author(s)	Year	Purpose of Scale
Judge and Zeithmal	1992	To measure board involvement in the formulation and evaluation phases of the strategic decision-making process
Westphal Blake	1999 1999	To measure the degree to which directors: monitor top management's strategic decision making formally evaluate the performance of top executives defer to the judgment of top managers on final strategic decisions develop performance objectives require information showing progress against corporate objectives analyze financial information for important issues and trends analyze budget allocation against performance review company performance against the strategic plan.
Westphal Dulewicz et al.	1999 1995	To measure the extent to which : top executives solicit board assistance in strategy formulation outside directors serve as a sounding board on strategic issues directors provide advice and counsel outside of board and committee meetings the board takes into account stakeholders' legitimate interests the board ensures that communications with stakeholders are effective the board promotes the goodwill and support of relevant stakeholders
Zahra Blake	1990 1999	To measure the degree to which the board: articulates a company mission analyzes the internal and external environments identifies a strategic plan develops strategic options and selects a final strategy is involved in the strategic planning process communicates the company's strategic direction throughout the company receives plans for the implementation of strategy from the CEO benchmarks the strategic plan with industry comparative data.

In this area as in many others the board's role is of paramount importance. Unfortunately, there is evidence that strategic management has not been of major concern to many directors of credit unions. "Strategic thinking should be part of every credit union board's behavior ("Strategic Thinking Challenges", 2006, p. 15). Well-informed and active directors are critical to the continuing success of credit unions. Indeed, one CFO of a credit union states unequivocally that

Table 3. Board Participation in Strategic Decisions

Author(s)	Year	Findings

A. Studies Showing Minimal Board Participation

Author(s)	Year	Findings
Whisler	1984	"Rules of the game" is to minimize participation in setting strategy
Mace	1986	Boards do not participate in strategic decisions unless faced with a crisis
Patton and Baker	1987	Members are reluctant to "rock the boat" and get involved
Lorsch	1989	Directors want to increase their involvement but are reluctant to do so.
Judge and Zeithaml	1992	The great majority of boards are not actively working with management to develop strategic action.
Daily and Dalton	1995	Norms of reciprocity: Board appointments confer prestige and status, financial rewards and various perquisites. Members feel socially obligated to support the CEO and minimize any meaningful participation
Wall Street Journal	1996	Social ties between top managers and outside directors tend to be be "chummy" or even "collusive" thus diminishing board effectiveness

B. Studies Showing Active Board Participation

Author(s)	Year	Findings
Worthy and Neuschel	1984	A major increase has taken place in the duties, power, and responsibilities of corporate boards
Westphal	1999	Social ties between the CEO and the board encourage collaboration between top managers and outside directors in strategic decision making
Heidrick and Struggles	1990	Board members are increasingly involved in determining and monitoring the strategic directions of the organization.
Dobrzynski	1989	"Quietly, many boards are asserting themselves - redirecting strategy here, vetoing an investment there" (p. 66).

"The credit union only can be as good as its board" ("Anatomy of a Merger", 2007, p. 12). A credit union CEO specifically states that "directors should define strategic goals and objectives" (Brown, 2007, p. 12). An effective board "must ask the tough (strategic) questions and hold the

CEO responsible and act as a sounding board for management. When it's not doing so, the governance team is out of balance." (quoted in Gilpatrick, 2007, p. 35). Another writer expresses his disappointment that even when strategic plans are formulated, they are rarely implemented. McComb (2001) contends that "The credit union industry is awash in strategic plans. Far too many of these thick binders with pretty covers sit on shelves and gather dust. And far too many credit union executives ... resent the fact that planning 'takes so much time and gives back so little.'" Even having a long-term plan is only a small part of the solution. "What ultimately determines an organization's long-term success is not simply the plan but how well it is implemented (McClelland, 1998, p. 4).

Scholars and practitioners have specifically discussed the importance of several strategic matters and expressed great concern for the minimal interest or lack of involvement of credit union directors. They suggest that the board pay particular attention to:

Member competence:

There is a vital need for competent and knowledgeable board members. Umholtz (2001) argues that "many credit union CEOs clearly are uncomfortable discussing the subject because of their doubts about their own credit union board... Instead of calling their own boards atrophied and incompetent, many CEOs instead say today's credit unions require a 'new breed' of directors. They're right" (p. 28). The board chair of a large credit union explains that "The whole dynamic of being a credit union board member is changing... In the past, you could be happy to sit on the board and go on the trips. It's a lot more than that today. You have to bring skills and abilities to the table to be part of a high-performing board" (quoted in Molvig, 2007, p. 52).

Minutes of board meetings:

While it is evident that minutes of directors' meetings should be recorded and clearly state board decisions requiring implementation, in many credit unions board meeting minutes typically are drafted, reviewed, adopted, and forgotten (Pippett, 2008). There is an absence of accountability because the board neglects to follow-up and ensure that board decisions are implemented.

Orientation of new members:

It is essential that new board members quickly become contributing and effective participants in the work of the board. Therefore, "each board needs to consider whether its board member orientation is sufficient and effective. To become an effective board member... the new person needs to learn about the organization as well as about the board" ("Board Orientation Basics", 2006, p. 66).

Training:

A successful credit union must invest heavily in board education. According to one expert, "One of the key issues on a nonprofit board is that you are really committed to the mission of the organization. Part of that commitment means a willingness to seek out some training, attend conferences and improve your skills" (Courter, 2006, p. 63).

Poor training of new board and committee members also sparks discord and warring factions within a board. The CEO's responsibility is this area is to train and counsel new members: "Encouraging open and honest communication among board members, even when conflicting opinions exist, often helps solve issues and fosters trust" (Merrick, 1991, p. 30). Training sessions that address emerging issues impacting future strategic policy are provided by many State and national credit union associations.

A credit union CEO proposes that "there should be some minimum board training. Watch training videos... Have your attorney come in and speak to the board about bankruptcy laws and director liability. Have your CPA come in and speak to the board ... about financial trends in the CU industry and about reading financial statements. Basically, use third parties to emphasize that this is a serious and complex business for serious individuals, especially in the boardroom." (Storey, 2006, p. 23).

Groupthink:

Insulation of the group from outside sources of information is a major contributor to groupthink - the lack of meaningful and probing discussion of issues and consideration of alternatives. To prevent groupthink and promote judicious decisions, the board should adopt a culture of inquiry, share and discuss ideas, raise questions, and explore different courses of action. Groupthink is a "common situation when the staff controls nearly all information flowing to the board" ("Avoiding Groupthink is a Good Thing", 2007, p. 16).

Succession planning:

Some writers emphasize that planning for future leadership is another important board activity. The lack of succession plans is a pervasive problem. It is due to the inability or unwillingness of credit union executives and boards to address this issue. They may want to avoid exploring succession options because they wish to forestall difficult and sensitive discussions. "Many boards devote countless hours to recruiting and hiring when searching for a new CEO but have no succession plan. Likewise, some CEOs scramble to fill key roles on short notice. A succession plan is invaluable in these circumstances" (Saul, 2007, p. 66). Succession plans establish the means by which qualified individuals are prepared to occupy certain critical positions with minor disruption. They involve "envisioning a credit union's future beyond the tenure of current managers and a concerted effort to identify and cultivate future leadership talent" (Saul, 2007, p. 66).

A recently retired credit union CEO argues that "The key is not to wait...A succession plan is a necessity for every board, not just for retirement, but for replacement of the CEO for any reason. Procedures should be set for the board members to follow, so they're not scrambling around, wondering what to do" (Molvig, 2001, p. 5).

Assessment of board performance:

This is an objective tool measuring board performance against best practices. The impetus for

such an evaluation should come from the board. A strong board chair makes the process as impersonal as possible and emphasizes the benefits to the CU (see Molvig, 2007).

Governance consultants urge boards to decisively address awkward matters including communication barriers such as personality conflicts, dysfunctional politeness and discourteous members. The process of conducting regular board and CEO assessments and self-assessments can guide the governance teams to find and resolve problems before they become totally dysfunctional (Gilpatrick, 2007).

Executive compensation:

Credit unions have rewarded their executive teams with steady compensation increases since the turn of the century, with little apparent change in the criteria for incentive and bonus pay determinations (Bankston, 2007). Today many boards are reluctant to design new plans for executive benefits. However, credit unions must compete with for-profit organizations for executive talent. For-profit businesses can offer compensation packages that include stock options, bonuses, golden parachutes, and other powerful incentives and perks. "To compete, credit unions must find creative solutions to attracting and retaining talented executives. Toward this end, credit unions "must accurately assess the market value of their executive positions" (Yancey, 1999, p. 14).

Boards need to re-examine the way they make compensation decisions, with more emphasis on objective performance measurements (Bankston, 2007). A survey of more than 400 credit unions found that those "without executive incentive plans because the board didn't want one or because the issue was never examined tended to experience lower financial performance (Yancey, 1999). Doukas (1998) urges the boards of directors to appoint a compensation committee to perform the program's initial review and analysis, and provide final recommendations to the full board.

Code of Ethics:

A former credit union CEO asserts that "As with other risks, the board should establish broad policy, in this case developing a code of ethics that is ... adhered to organization wide" (Gilpatrick, 2007, 31). The board should reexamine its code of ethics every year and update it if necessary.

In many organizations, codes of ethics are principally public relations statements. Their effectiveness depends heavily on whether they are current and robust and on how employees who break the codes are treated. Most importantly, they require top management's and the board's unequivocal support.

Efficacy of board meetings:

The attitude of some credit union CEOs toward board meetings is one of anxiety and apprehension. They view "board meetings are counterproductive, frustrating experiences that rarely result in any progress" (Storey, 2006, p. 23). Some board members may have their own

hidden agendas, insist on a certain course of action in spite of wide opposition, or attempt to micromanage the credit union. The solution is for the CEO to discuss this matter with the chair of the board and for the entire board to require these individuals to change their behavior or to resign from the board.

Risk management:

A central role of boards of directors is strategic risk management. They should establish and enforce policies that mitigate the risks of mismanagement, fraudulent behavior, or unforeseen circumstances; examine and assess management' performance; monitor lending activities; and safeguard the credit union's reputation (Gilpatrick, 2007). For these reasons, some writers and practitioners advocate the establishment of a risk management policy. It would require the board to evaluate fully the credit union's investment and lending policies in their entirety. This high degree of monitoring of lending activity helps keep risk at an acceptable level (see Pactwa, 2006).

FUTURE RESEARCH

Given the current crisis in financial institutions and markets it is vital to understand the underlying operation of all aspects of our financial system. An important and growing part of that system is the credit union. The very different nature of credit union ownership and management requires an understanding of the unique managerial and operational issues which affect the health and future of these organizations. The foregoing eleven dimensions, which should have the attention of CU boards, need careful investigation as well as answers to many related questions which are unique to these organizations such as:

- What are the demographics of CU boards vis à vis other financial institutions?
- Would these boards seem to possess the education and expertise to fulfill their responsibilities?
- What is the level of involvement of CU boards in strategic issues versus operational issues?
- Where do boards typically stand on the ongoing internal conflict between the credit union movement's philosophy of meeting members needs versus the need for profitability as in the banking philosophy?
- Is the typical board member actually knowledgeable regarding their organization and the financial industry and involved meaningfully in directing the organizations?
- Does a board member's level of involvement relate to his or her demographic characteristics, such as level of education, age, gender, professional background, and tenure?

REFERENCES

"Anatomy of a Merger," *Credit Union Magazine*, Vol. 73, No. 1, 12, 2007.
"Avoiding Groupthink is a Good Thing," *Credit Union Magazine*, Vol. 73, No. 10, 16, 2007.
Bankston, K. "Compensation Crescendo," *Credit Union Management*, Vol. 30, No. 7, 14-17, 2007.

Blake, A. *Dynamic Directors: Aligning Board Structure for Business Success.* (Hampshire: MacMillan, 1999).

"Board Orientation Basics," *Credit Union Management*, Vol. 29, No. 9, 66, 2006.

Brown, L. "Lessons Learned: Leadership Teambook Club," *Credit Union Management*, Vol. 30, No. 6, 12, 2007.

Boulton, W. R. "The Evolving Board: A Look at the Board's Changing Roles and Information Needs," *Academy of Management Review,* Vol. 3, 827-836, 1978.

Cahill, J. *Voluntary Achievement Program, History and Philosophy, 3rd. ed.* (Dubuque, IA: Kendall-Hunt Publishing Co., 1994).

Courter, E. "All About Committees," *Credit Union Management*, Vol. 29, No. 8, 61-63, 2006.

Daily, C. and Dalton, D. "CEO and Director Turnover In Failing Firms: An Illusion of Change?" *Strategic Management Journal,* Vol. 16, 393-400, 1995.

Dobrzynski, J. "Taking Charge," *Business Week*, 66-71, July 3 1989.

Doukas, J. "Develop an Effective Compensation Program," Credit Union Executive Journal, Vol. 38, No. 1, 32, 1998.

Dulewicz, V., MacMillan, K., and Herbert, P. "Appraising and Developing the Effectiveness of Boards and their Directors," *Journal of General Management*, Vol. 20, No. 3, 1-19, 1995.

Gilpatrick, K. "Teambook at the Top," *Credit Union Management*, Vol. 30, No. 1, 34-38, 2007.

Hautaluoma, J. E., Jobe, L., Donkersgoed, B., Suri, T. and Cropanzano, R. *Credit Union Boards and Credit Union Effectiveness.* (University of Wisconsin-Madison: Filene Research Institute, 1993.

Heidrick and Struggles, Inc. *The Changing Board.* (Chicago, IL: Heidrick and Struggles, Inc., 1990).

Hillman, A. and Dalziel, T. "Board of Directors and Firm Performance: Integrating Agency and Resource Dependence Perspectives," *Academy of Management Review*, Vol. 28, No. 3, 383-396, 2003.

Iacocca, L. *Iacocca: An Autobiography*. (Toronto: Bantam Books, 1984).

Johnson, J., Daily, C., and Ellstrand, A. "Boards of Directors: A Review and Research Agenda," *Journal of Management*, Vol. 22, 409-438, 1996.

Judge, W.O., Jr. and Zeithaml, C. P. "Institutional and Strategic Choice Perspectives on Board Involvement in the Strategic Choice Process," *Academy of Management Journal*, 766-794, 1992.

Lorsch, J. W. *Patrons or Potentates: the Reality of America's Corporate Boards*. (Boston: Harvard University Graduate School of Business Administration, 1989).

Mace, M. L. *Directors: Myth and Reality.* (Boston: Harvard University Graduate School of Business Administration, 1986).

McClelland, P. "Managing the Long-term Business Plan," *Credit Union Executive Journal*, Vol. 38, No. 5, 4-8, 1998.

McComb, J. "Moving from Planning to Progress," *Credit Union Executive Journal*, Vol. 41, No. 4, 24-27, 2001.

McNulty, T. and Pettigrew, A. "Strategists on the Board," *Organization Studies,* Vol. 20, No. 1, 47-74, 1999.

Merrick, B. "Diffuse Disruptive Board Factions," *Credit Union Executive*, Vol. 31, No. 4, 29-31, 1991.

Molvig, D. "Boards Raise the Bar," *Credit Union Magazine*, Vol. 73, No. 3, 48-52, 2007.

Molvig, D. "Planning for CEO Transitions," *Credit Union Executive Journal*, Vol. 41, No. 2; 4-7, 2001.

Moody, J. C. and Fite, G. C. *The Credit Union Movement: Origin and Development, 1850-1980, 2nd. ed.* (Dubuque, IA: Kendall-Hunt Publishing Co., 1984).

Ong, C. and Lee, S. "Board Functions and Firm Performance: A Review and Directions for Future Research," *Journal of Comparative International Management*, Vol. 3, 3-24, 2000.

Pactwa, T. "The Banking Industry - Ethics and Recent Trends: An Interview with William A. McKenna, Jr.," *Review of Business*, Vol. 27, No. 1, 3-9, 2006.

Patton, A. and Baker, J. "Why Won't Directors Rock the Boat?," *Harvard Business Revue,* Vol. 65, No. 6, 10-18, 1987.

Pfeffer, J. and Salancik, G. R. *The External Control of Organizations: A Resource Dependence Perspective.* (New York: Harper and Row Publishers, 1978).

Pippett, C. "New Year's Resolution: Shape Up Board Minutes," *Credit Union Magazine,* Vol. 74, No. 1, 52-54, 2008.

Saul, K. "Recognize Diversity In Succession Planning," *Credit Union Magazine*, Vol. 73, No. 10, 66, 2007.

Schoars, M. A., *Cooperatives, Principles and Practices.* (University Of Wisconsin Extension, 1971).

Shanklin, W. and Ryans, J. "Should the Board Consider This Agenda Item?," *MSU Business Topics*, Vol. 29, No. 1, 35-42, 1981.

Storey, C. "The Difficult Director," *Credit Union Management*, Vol. 29, No. 7, 22-24, 2006.

"Strategic Thinking Challenges," *Credit Union Magazine,* Vol. 72, No. 12, 15, 2006.

Umholtz, M. "Six CU Success Characteristics for 2002: Planning with these Points in Mind Will Help Ensure your CU Thrives," *Credit Union Executive Journal*, Vol. 41, No. 5, 26-29, 2001.

Wall Street Journal. (1996, March 7). "Beware Of the Trojan Horse in the Boardroom", B1.

Westphal, J. "Collaboration in the Boardroom: Behavioral and Performance Consequences of CEO-Board Social Ties," *Academy of Management Journal*, Vol. 42, No. 1, 7-24, 1999.

Whisler, T. L. *The Rules of the Game: Inside the Corporate Boardroom.* (Homewood, IL: Dow Jones-Irwin, 1984).

Worthy, J., and Neuschel, R. *Emerging Issues in Corporate Governance.* (Chicago: Northwestern University Press, 1984).

Yancey, G. "Determining Executive Pay in Credit Unions," *Credit Union Executive Journal*, Vol. 39, No. 4, 10-14, 1999.

Zahra, S. "Increasing the Board's Involvement in Strategy," *Long Range Planning*, Vol. 23, 109-117, 1990.

Zahra, S. and Pearce, J. "Boards of Directors and Corporate Financial Performance: A Review and Integrative Model," *Journal of Management*, Vol. 15, No. 2, 291-334,

Excel, Word & PowerPoint 2007 Features:
Finding the Old Ones and Using the New Ones

Session Organizers and Moderators

Wilma M. Andrews,
Virginia Commonwealth University, **Department of Information Systems**
Richmond, VA. 23284-4000, 804-827-0956, wandrews@vcu.edu

Robert L. Andrews,
Virginia Commonwealth University, Department of Management,
Richmond, VA. 23284-4000, 804-828-7101, randrews@vcu.edu

ABSTRACT
This session is for individuals struggling with Office 2007 or those that are just now making the transition from office 2003. Many features existing in 2003 have been relocated and are not easy to find. Microsoft has also added in new features that can be useful. The session leaders will present numerous features that may have frustrated users who tried to find them in Office 2007 and ones that they feel could be helpful to faculty in performing their duties. Participants will be encouraged to interact by asking questions and sharing what they have learned also.

SESSION OVERVIEW
The goal is to provide information that will be perceived as valuable to participants and to engage those attending in a dialogue. The session leaders have been using the 2007 versions of Excel, Word and PowerPoint since they came out in the beta version. They also have experience leading similar well-attended sessions at regional and international conferences.

PODCASTS IN HIGHER EDUCATION; WHY AND HOW?
REACHING STUDENTS THROUGH THE TECHNOLOGY THEY USE

John R. O'Malley, Department of Information Technology, Georgia Southern University, Statesboro, GA 30460, 912-478-7251, jomalley@georgiasouthern.edu
Lance A. Matheson, Department of Business Information Technology, Virginia Tech University, Blacksburg, VA 24061, 540-231-5804, lance@vt.edu

ABSTRACT

Learning theory suggests that lecturing is not a very effective way for students to learn (although it is cost effective). Lecturing does not engage students in their education. Many students do not regularly attend their lecture classes, and when they do; they are often not involved in the learning process. Involving the students in the class can be more effective but often means that there is not enough time to cover all the required course material. Podcasting is a technology that can help solve the engagement and coverage problems. We will discuss how traditional teaching methods do not work for current students and how newer technologies can improve the education process. We will demonstrate the creation of podcasts, which is a simple and straightforward process. We will also show how to make podcasts available to students. This is a workshop for members with all levels of experience.

Survey of Service Science
Concepts, Technology, Business

Harry Katzan, Jr.

Savannah State University

Service Science: Concepts, Technology, Business   1

The Subject of Services is ...

- ☐ The up and coming discipline for the 21st century
- ☐ Services encompass technology, entrepreneurship, business growth, and innovation
- ☐ Services are important to people in business, government, education, health care and management, religion, military, scientific research, engineering, etc.

Service Science: Concepts, Technology, Business   2

Trends in US Employment

Trends in US Employment by Sector, 1850-2000
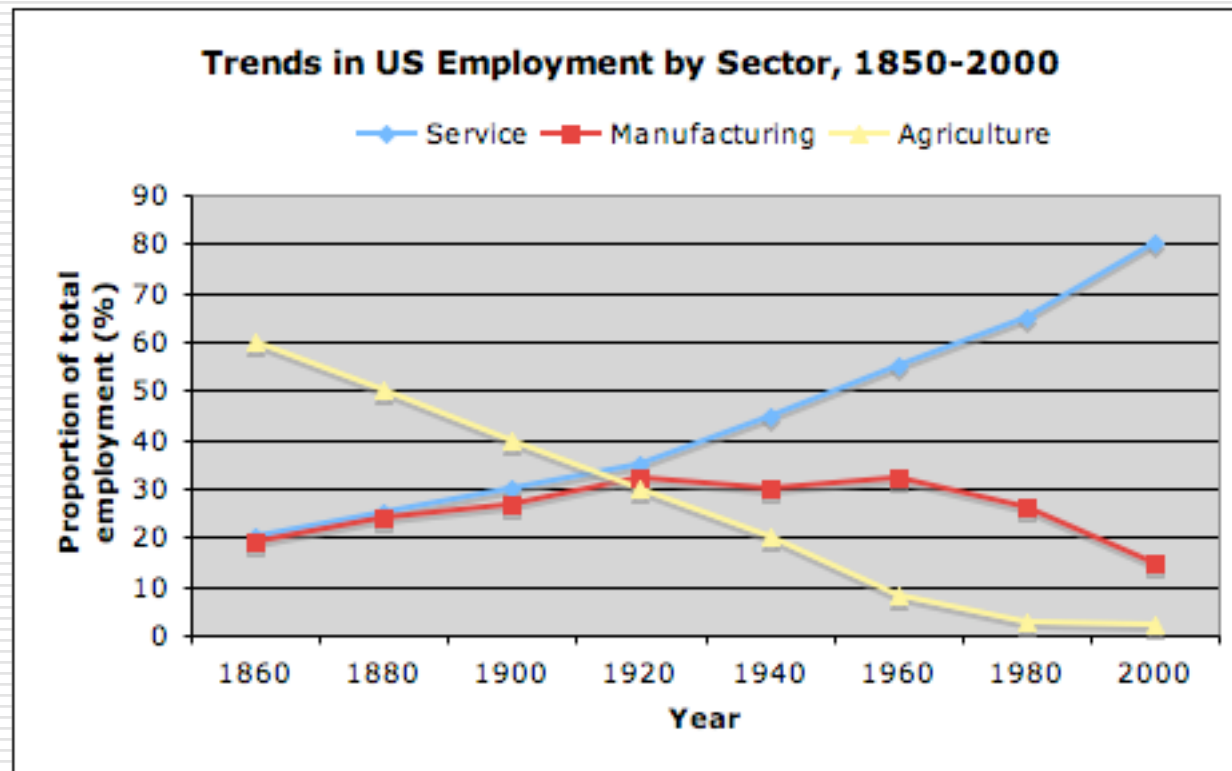
Basic Definitions

- A *service* is a client/provider interaction that creates and captures value
- A *service system* is a system of people and technology that adapts to the changing value of knowledge in a system
- *Service science* is the study of service systems

Service Science: Concepts, Technology, Business

Service

- ☐ Provider/client interaction
- ☐ Both parties participate
- ☐ Both capture value
- ☐ Roles differ
- ☐ Participants exchange information

Service Science: Concepts, Technology, Business 5

Service System

- ☐ Multiple organizations
- ☐ Collections of people, organization, technology
- ☐ Shared information
- ☐ Connected by a value proposition
- ☐ Create value for both organization

Service Science

- ☐ Study of services
- ☐ Study of service systems
- ☐ Operates by abstracting an element of service reality and putting it under the microscope of academic scrutiny

Service Science: Concepts, Technology, Business

Differences Between Products and Services

- ☐ Products are tangible; services are non-tangible
- ☐ Products are storable; services are non-storable
- ☐ When a service is finished, it is done forever
- ☐ Services are perishable
- ☐ With products, consumption follows production
- ☐ With services, consumption and production occur at the same time

Differences …

- [ ] With products, quality assessment can be made before the customer enters the scene
- [ ] With services, quality assessment is made during the service process
- [ ] With products, standardization and price competition occur
- [ ] Services are usually customized
- [ ] Product development is capital intensive
- [ ] Service delivery is labor intensive

Service Science: Concepts, Technology, Business

Service Classification

- ☐ People processing
- ☐ Possession processing
- ☐ Information processing

Service Science: Concepts, Technology, Business

Service Characteristics

- ☐ Service is a process
- ☐ A service is heterogeneous
- ☐ A service captures value
- ☐ A service cannot be inventoried
- ☐ A service in intangible
- ☐ A service is consumed at the point of production
- ☐ A service (once delivered) cannot be sold or given away
- ☐ A service is co-produced

Service Science: Concepts, Technology, Business   11

Airline Example

- ☐ An airline is in the service business
- ☐ The objective is to transport passengers
- ☐ If a seat is not filled, revenue for that flight is lost
- ☐ Operation of an airline involves several services
  - ■ Flight operations
  - ■ Food service
  - ■ Reservations
  - ■ Maintenance
  - ■ Passenger operations
- ☐ Core competencies are
  - ■ Flight operations
  - ■ Passenger operations

Service Science: Concepts, Technology, Business

# Airline continued …

- Non-core competences
  - Food service
  - Reservations
  - Maintenance
- Non-core competences can be outsourced
- Offshore outsource reservation center (call center)
  - Service level agreement (SLA) is required
  - The call center is the service provider
  - The airline is the client
- Where does the passenger fit in?

Service Science: Concepts, Technology, Business 13

Airline continued ...

- ☐ The passenger is a client of the call center
- ☐ The passenger is a client of the airline
- ☐ *Service package* is the relationship between the airline and the call center
  - ■ It is continuous
  - ■ It operates under an explicit SLA
  - ■ There is only one service event
- ☐ *Service bundle* is the relationship between the call center and the passenger
  - ■ It is discrete
  - ■ It operates under an implicit SLA
  - ■ There are many passengers and many service events

Relationship
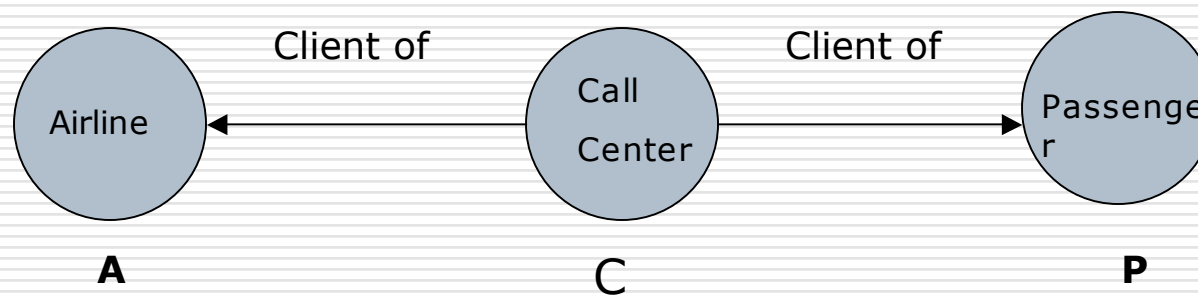
AP =CA + CP

Key Terms – so far

- Client
- Co-production
- Heterogeneous
- Information processing
- Intangible
- Inventoried
- Non-storable
- People processing

- Possession processing
- Provider
- Service
- Service system
- Service science
- Value proposition
- Service package
- Service bundle

Service Science: Concepts, Technology, Business   16

Concepts, Classes, and Service Events

- Concepts lead to classes that lead to objects
- Forms of analysis
  - deduction, analysis, and differentiation
  - induction, synthesis, and integration
- Hypothetical example
  - *Service Universe*: Services performed on a person
  - *Service Concept*: Medical provisioning
  - *Service Class*: Physician/patient
  - *Service Event*: Individual visit to the doctor

Service Dimensions

- *Service Process* – using the degrees of Customer Interaction and Customization (by the provider) and Provider Judgment or Labor Intensity as metrics

- *Service Nature* – using the Service Object and Service Result as metrics

- *Service Delivery* – using Service Scheduling and Service Mode (continuous or discrete) as metrics

- *Service Availability* – using Service Site and Service Execution (who travels) as metrics

- *Service Demand* – using Demand Fluctuation and Service Capacity as metrics

Service Science: Concepts, Technology, Business 18

Dimensions

Each dimension can be conceptualized as one view of a class of service models, and collectively, the five dimensions define a service universe.

Service Process

Customer Interaction and Customization

	Low	High
Low	Airline Hotel	Hospital Auto repair
High	Retail School	Doctor Lawyer

Provider Judgment or Labor Intensity

Service Nature

Service Object

	People	Possessions
Tangible	Transportation Restaurant Doctor	Package transport Dry cleaning Lawn service
Intangible	News media Entertainment Education	Banking Insurance

Service Result

Service Science: Concepts,
Technology, Business

Service Delivery

Service Scheduling

	Formal	Informal
Continuous	Insurance Banking Utilities Internet	Radio/TV Police
Discrete	Hair dresser Lawn mowing Doctor	Pay phone Restaurant

Service Mode

Service Availability

Service Site

	Single Site	Multiple Sites
Client Travels	Doctor Theatre Barbershop	Fast food Bus service
Provider Travels	Taxi Pest copntrol Lawn mowing	Mail delivery Utility repairs
No Travel	Home telephone Utilities	Internet service Information system

Service Execution

Service Science: Concepts,
Technology, Business

23

Service Demand

Demand Fluctuation

	Wide	Narrow
Flexible	Utilities Police	Insurance Banking Government service
Not Flexible	Tax preparation Hotel Airline	Doctor Theatre Gas station

Service Capacity

Physician/Patient Example

- Service Process:
  - Provider Judgment or Labor Intensity (high),
  - Client Interaction and Customization (high)
- Service Nature:
  - Service Result (tangible),
  - Service Object (people)
- Service Delivery:
  - Service Scheduling (formal),
  - Service Mode (discrete)
- Service Availability:
  - Service Site (single site),
  - Service Execution (client travels)
- Service Demand:
  - Demand Fluctuation (narrow),
  - Service Capacity (not flexible)

Characterization of the Service Matrices

Column Metric

Row Metric

A	B
C	D

Quadrant-Based Scale
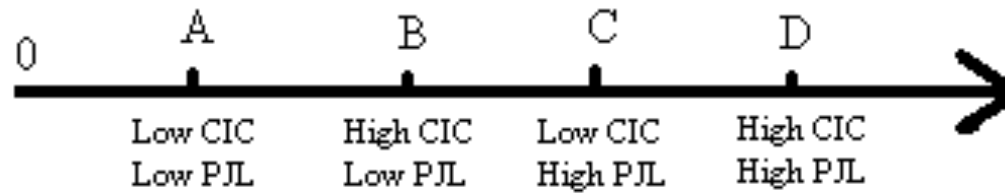
Service Hyperspace 1

Dimension #1: **Service Process**

Provider Judgment/Labor Intensity	Customer Interaction/Customization	Quadrant-Based Scale
Low	Low	A
Low	High	B
High	Low	C
High	High	D

Dimension #2: **Service Nature**

Service Result	Service Object	Quadrant-Based Scale
Tangible	People	A
Tangible	Possessions	B
Intangible	People	C
Intangible	Possessions	D

Dimension #3: **Service Delivery**

Service Mode	Service Scheduling	Quadrant-Based Scale
Continuous	Formal	A
Continuous	Informal	B
Discrete	Formal	C
Discrete	Informal	D

Service Hyperspace 2

Dimension #4: **Service Availability**

Service Execution	Service Site	Quadrant-Based Scale
Client Travels	Single Site	A
Client Travels	Multiple Sites	B
Provider Travels	Single Site	C
Provider Travels	Multiple Sites	D

Dimension #5: **Service Demand**

Service Capacity	Demand Fluctuation	Quadrant-Based Scale
Flexible	Wide	A
Flexible	Narrow	B
Not Flexible	Wide	C
Not Flexible	Narrow	D

Physician Example DNA

Service Process: Provider Judgment or Labor Intensity (high),
    D   Client Interaction and Customization (high)
Service Nature: Service Result (tangible),
    A   Service Object (people)
Service Delivery: Service Scheduling (formal),
    C   Service Mode (discrete)
Service Availability: Service Site (single site),
    A   Service Execution (client travels)
Service Demand: Demand Fluctuation (narrow),
    D   Service Capacity (not flexible)

Physician's DNA is **DACAD**

About Service DNA

- [ ] DNA stands for "DNA is Never Ambiguous"
- [ ] Each service model can be uniquely identified by a service DNA sequence
- [ ] Services with the same DNA are in the same service class
- [ ] Conceptual service models can be developed leading to innovation in services

Key Terms – so far

- Concept
- Class
- Object
- Service event
- Service process
- Customer interaction
- Provider judgment
- Service nature
- Service object
- Service result

- Service delivery
- Service scheduling
- Service mode
- Service availability
- Service site
- Service execution
- Service demand
- Demand fluctuation
- Service capacity
- Service DNA

Service Science: Concepts, Technology, Business 32

Service System Revisited

A *service system* is a collection of resources and economic entities, capable of engaging in or supporting one or more service events. The resources are the infrastructure and other facilities necessary to support the service process. The economic entities are the service provider and service client that co-produce the service event.

Service Science: Concepts, Technology, Business   33
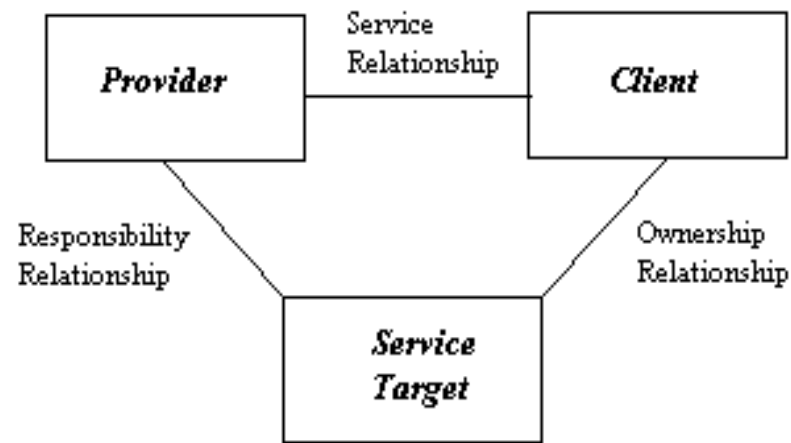
Systems View of the Service Relationship

Figure 3.1 Systems View of the Service Relationship.

Service Science: Concepts, Technology, Business

34

Service Provisioning

- ☐ Service Factory
  - ■ Customer travels to facility
  - ■ Customer remains in facility during service delivery
- ☐ Service Shop
  - ■ Customer travels to facility
  - ■ Customer leaves possession at facility
  - ■ Service object occupies space in service shop
  - ■ Customer picks up service object at a later time

Service Provisioning …

- ☐ Service Portal
  - ■ Customer engages a virtual service facility for the duration of the service event
  - ■ Includes telecommuting, online, and telephone services
- ☐ Mobile Facilities
  - ■ Provider travels to third party facilities
  - ■ Client moves and receives service – remote facilities
- ☐ Client Facilities
  - ■ Provider travels to client facilities
  - ■ Services performed on client or possession of client

Service Science: Concepts, Technology, Business 36

Generic Functions Performed During a Service Event

- ☐ Initiation
- ☐ Entry administration
- ☐ Service interactions
- ☐ Exit administration
- ☐ Archiving

Service Science: Concepts, Technology, Business

Generic Functions Performed to Sustain Service

- ☐ Scheduling
- ☐ Customer input
- ☐ Invoke services
- ☐ Representation
- ☐ Referral
- ☐ Auxiliary services
- ☐ Schedule supplemental services

Service Science: Concepts, Technology, Business   38

Business Services

- ☐ Product – service
- ☐ Service – service
- ☐ Service - product
- ☐ Pure service

Service Science: Concepts, Technology, Business 39

Key concepts in Business Service Systems

- ☐ Outsourcing
  - ■ Information technology
  - ■ Human resources
  - ■ Accounting
  - ■ Customer support
  - ■ Call center
- ☐ Transformational outsourcing
- ☐ Innovation

What really is outsourcing?

- ☐ The transfer of the ownership of a business process to a supplier
- ☐ The "transfer" is the key element
- ☐ It is different from the case in which the buyer retains control and tells the supplier how to do the work.
- ☐ In general, core competencies are not outsourced.

What should the client expect from a service system?

- ☐ Strategic alignment
- ☐ Business strategy innovation
- ☐ IT business value
- ☐ Service-dominant logic
- ☐ Business transformational outsourcing (BTO)

Service Science: Concepts, Technology, Business 42

What is transformational outsourcing?

- ☐ It is a form of IT outsourcing that combines cost savings with the potential for enhanced IT flexibility. [P. Tallon, Boston College, 2003]

- ☐ It is a way of achieving strategic flexibility.

- ☐ It supplements cost focus with an opportunity focus.

Why is innovation important

- ☐ It refers to innovation in supplying services.
- ☐ Pretax income is considerably lower than revenue:
- ☐ IBM:

	Revenue	Income
Hardware	27%	28%
Software	20%	37%
Services	53%	35%

Service Science: Concepts, Technology, Business

What is service-dominant logic?

- Good-dominant logic
  - Operand resource – resources on which an operation is performed to produce an effect (Tangible goods)
  - Tangibility is not why we buy goods - we buy goods for the service they render
  - Focus is on the efficiency of production
- Service-dominant logic
  - Operant resources – the process of applying knowledge and skills for the benefit of another entity
  - Service is a process.
  - Services are a particular kind of goods
  - Focus is on the efficiency of delivery.

[Vargo, Univ. of Hawaii, 2007]

What about the future?

- ☐ Service-oriented architecture (SOA)
- ☐ Increased and enhanced B2B interactions
- ☐ Focus on communication between computing elements (semantics)
- ☐ Intelligent agents to facilitate interaction

©2009 H. Katzan, Jr.   Service Science: Concepts, Technology, Business   46

Key Terms – so far

- Service system
- Provider
- Client
- Service relationship
- Service target
- Responsibility relationship
- Ownership relationship
- Service factory
- Service shop

- Business services
- Outsourcing
- Transformational outsourcing
- Innovation (importance of)
- Service-dominant logic
- Service-oriented architecture

Introductory SOA - Services

- [ ] We go to a restaurant for a meal.
- [ ] The meal is the service.
- [ ] We grab a table, consult the menu, and give our order to a waiter or waitress.
- [ ] Subsequently, the meal is delivered.
- [ ] We consume the meal, pay the tab, and leave.
- [ ] In our interaction with the waiter or waitress, we exchange information, so in a sense, we co-produce the service event, although we do not see the meal preparation.

Service Science: Concepts, Technology, Business

Introductory SOA - Components

- The restaurant is a collection of interacting components that provide a meal service to one or more guests.
- The components of the restaurant are:
  - The server (i.e., the waiter or waitress)
  - The kitchen (that prepares the food)
  - A cleaning component
  - A food-ordering component
  - An accounting component
  - A facility-management component
  - A restaurant management component that choreographs the services supplied by the components.
- The *service choreography* is an explicit or implicit specification of the interactions between components.

Service-Oriented Architecture

Service Science: Concepts, Technology, Business

50
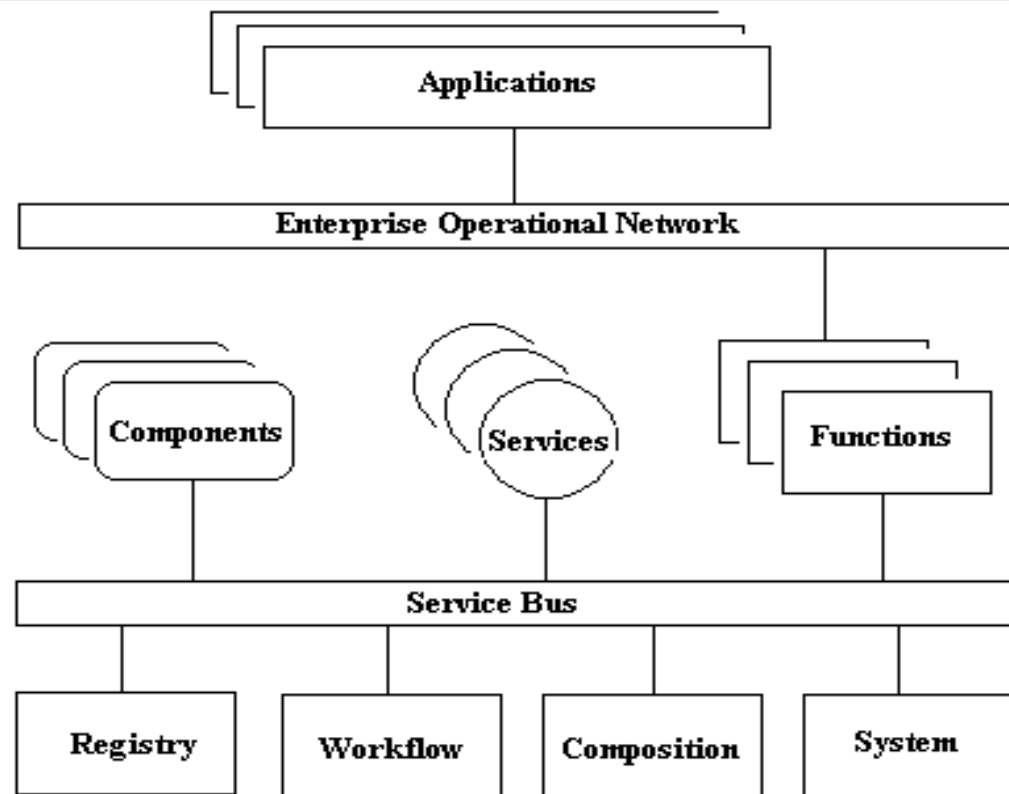
Service-Oriented Architecture

- ☐ Key structural elements
  - ■ Components
  - ■ Services
  - ■ Functions
  - ■ Applications
- ☐ Key functional elements
  - ■ Registry
  - ■ Workflow
  - ■ Composition
  - ■ System

Service Science: Concepts, Technology, Business   51

Conclusion

- ☐ Service science is a multidimensional field of study
- ☐ Service science is an approach to business process modeling
- ☐ Service science is an approach to business process management
- ☐ Service science is an enabler of service-oriented architecture

Service Science: Concepts, Technology, Business 52

Thanks!

Tools or Toys? Forum on Academic Uses of Recent Innovations

Session Organizer and Moderator
Robert L. Andrews, Virginia Commonwealth University, Department of Management, Richmond, VA. 23284-4000, 804-828-7101, randrews@vcu.edu

Participants and Contributors
Wilma M. Andrews, Virginia Commonwealth University , wandrews@vcu.edu
Carey B Cole, Jr. , James Madison University, colecb@jmu.edu
Barbara Price, Georgia Southern University, baprice@georgiasouthern.edu
Harry L Reif, James Madison University, reifhl@jmu.edu

ABSTRACT
This is a forum discussion focusing on a variety of relatively recent technology and software innovations that can potentially be used by faculty. These include tablet PCs and computers with touch-controlled screen; course management system tools like WIMBA and threaded discussions; Office 2007; collaboration and document management tools such as Microsoft SharePoint; automated feedback via student response systems (clickers); and any other products that panelists or attendees bring up during the session.

SESSION OVERVIEW
The five panelists bring to the table a rich diversity of experience using several different innovations and technologies as they teach a variety of courses and engage in research. The session will begin with comments by the panelists to present their experiences in the use of recent innovations. This information will provide the basis for involving the members of the audience, who may also have valuable experiences to share with the session attendees. The ensuing discussion will be opened up to the audience for a moderated dialogue on issues that are of common interest to those in attendance. The purpose is engage both the panelists and the audience in the discussion and to provide information that will help faculty make decisions about investing time into trying new innovations, technology or software.

Discussion of Academic Support Products for Business Statistics Instruction

Session Organizer and Moderator
Robert L. Andrews, Virginia Commonwealth University, Department of Management, Richmond, VA. 23284-4000, 804-828-7101, randrews@vcu.edu

Participants and Contributors
Joan Donohue, University of South Carolina, donohue@moore.sc.edu
Barbara Price, Georgia Southern University, baprice@georgiasouthern.edu
Kellie Keeling, Denver University, kkeeling@du.edu
Charles Correia, Virginia Commonwealth University, cacorreia@vcu.edu

ABSTRACT
Panel led open discussion of a variety of support products for business statistics. These include textbooks, automated homework systems and tutoring systems provided by publishing companies; computational tools consisting of calculators, spreadsheets and statistical packages; course management and content delivery products such as Blackboard and WebCT; automated feedback via student response systems (clickers); and any other products that panelists or attendees bring up during the session.

SESSION OVERVIEW
The panelists have a wealth of experience teaching statistics and are seeking ways to be more effective and efficient as faculty. The session will begin with the panelists sharing some of their experiences with the tools. The audience will also be encouraged to share their experiences with academic support products. The purpose of the session is to provide information to participants that can be helpful in deciding on which academic support products may be the best match for the individual needs of a faculty member.

This will include a discussion of textbooks from Cengage, Hawkes Learning System, McGraw-Hill, Prentice-Hall, and Wiley. These publishers also include automated homework grading and tutoring systems that include ALEKS, Aplia, Cengage Now, Hawkes learning System, Mc Graw-Hill Homework Manager, My Stat Lab, and Wiley Plus and participants will share their evaluations and experiences with these and other publisher supplied items.

In addition to the publisher supplied materials there are other sources such as Merlot Statistics Portal, http://statistics.merlot.org/. Also participants will present some of the materials that they have developed for their classes.

Teaching Tricks for Quantitative Analysis: Control Charts, Sampling Distributions, Multiple Regression, and Time Series Analysis

Facilitator: Kellie Keeling, Department of Statistics, University of Denver, Daniels College of Business, 2101 S. University Blvd, Denver, CO 80208-8952, kkeeling@du.edu

Presenters:
Julie Ann Stuart Williams, Department of Management/MIS, University of West Florida 11000 University Parkway, Pensacola, FL 32514-5752, JAWilliams@uwf.edu

Joan M. Donohue, Department of Management Science, University of South Carolina, Columbia, SC 29208, donohue@moore.sc.edu

Cliff Ragsdale, Department of Business Information Technology, Virginia Tech, Pamplin 1007, Blacksburg, VA 24061-0235, crags@vt.edu

Craig Harms, University of North Florida, charms@unf.edu

Abstract:
The presenters in this session will share some tips and tricks that they use in teaching quantitative analysis. Two presentations will share active learning exercises for teaching control charts and sampling distributions. One presentation will cover some built-in Excel functions that can be used in the presentation of subset selection in multiple regression. And the final presentation will cover using the application of the stock market to teach concepts such as time series and regression.

Control Charts
Julie Ann Stuart Williams, University of West Florida

Active learning exercises engage students in learning in a way that is often more interesting and more complex than a traditional lecture method. By asking students to apply the concept to a contemporary problem, I help them think through the assumptions, objective(s), potential constraints, and impacts on the organization's operations. One example is an active learning exercise I developed for the "Statistical Quality Control" unit in our undergraduate "Operations Management" course. Each student in the class is given a bag of nuts and bolts as well as a ruler. First, we discuss quality and how it can be measured and the students vote on a measurement process. Each student then measures the length of each bolt in their bag and checks for a matching nut and records their data. Next, students share their data with the class. We perform calculations and develop quality control charts together and then discuss the results with respect to quality management concepts. Student evaluation feedback has included, "Found in class exercises beneficial ex: bolts exercise".

Sampling Distributions
Joan M. Donohue

In teaching introducing sampling distributions, I will have each student roll 5 different colored dice and pretend the value on the face is their rating of a beer in that color mug. I will compile the sampling distribution results for the entire class in Excel while they work on a related exercise that illustrates the reduction in standard error as sample size increases. I called the exercise StatZee.

Subset Selection for Multiple Regression
Cliff Ragsdale, Virginia Tech

Finding the "best" subset of variables for multiple regression models can be "automated" by using some built-in functionality in Excel such as Solver and the LINEST function. This technique can help students understand and easily implement subset selection models.

Stock Market Applications
Craig Harms, University of North Florida

I use the stock market in my quantitative analysis course. We do time series, seasonal adjustment (even though nobody on CNBC every looks at seasonality), residual analysis, simple and multiple regression with a variety of models—independent variables—S&P500, rate of return on the 30 year bond, etc. We forecast historic and future. I spend about five weeks on this topic and also add my ideas about slow trading and how to use these models to slow trade—Bollinger bands as buy and sell signals. Remember, kids in college today will have no chance at social security. If the fund is still around they will be means tested out because of their good jobs and comfortable incomes. So these students must learn to slow trade—investing does not get them enough money—as we can see today. So trading and learning the ropes is critical. I teach them some of the ropes and how to use the quantitative models to make it easier to make buy and sell decisions.

IS THIS YET ANOTHER ANOMALY IN OPERATIONS RESEARCH?

Pawel J. Kalczynski
Steven G. Mihaylo College of Business and Economics
California State University, Fullerton
Fullerton, CA 92834-6848, USA
Tel.:714-278-2747
Fax: 714-278-5940
E-mail: PKalczynski@fullerton.edu

Jerzy Kamburowski
College of Business Administration
The University of Toledo
Toledo, OH 43606-3390, USA
Tel: 419-530-4361
Fax: 419-530-2290
E-mail: Jerzy.Kamburowski@utoledo.edu

ABSTRACT

If a certain optimization problem is NP-hard or even harder, one could expect that the chances of solving it optimally should decrease with an increase of the problem size. We reveal, however, that if job processing times are randomly and independently generated, then some heuristics for solving the strongly NP-hard permutation flow shop problem become more often optimal when the number of jobs increases. Furthermore, the probability of being optimal might approach even 1 as the number of jobs goes to infinity. Our findings significantly extend the well-known concept of heuristic asymptotic optimality.

Key words: Scheduling, flow shop, makespan, heuristics, optimality.

1

INTRODUCTION

There are many counter-intuitive paradoxes in the area of operations research. For example, increasing the demands and supplies in a transportation problem might actually decrease the total transportation cost; see [4, 23]. Increasing the size of the cache in a memory management system might actually yield a higher number of page faults; see [2]. Adding a new machine to a parallel machine system might actually worsen the makespan under some specified conditions; see [9]. Increasing the speed of some machines in no-wait and no-idle flow shops might actually worsen the optimal makespan; see [1, 13, 22].

In this paper we potentially reveal another anomaly that refers to the theory of computational complexity; see [7]. If a certain optimization problem is NP-hard or even harder, then one could expect that the chances of solving it optimally should rather decrease with an increase of the problem size. We demonstrate, however, that the opposite situation may occur. Clearly, if processing times of n jobs are independently generated from a common probability distribution, then the chances of solving optimally the strongly NP-hard m-machine permutation flow shop problem become higher as n increases. Furthermore, we present a heuristic whose probability of being optimal might approach even 1 as n goes to infinity. Our findings significantly extend the commonly known observation that the relative error induced by some heuristics reduces to zero (even in the sense of *almost surely*) when some parameters defining the problem size increase to infinity.

The permutation flow shop problem is defined as follows. A set of jobs, $J = \{1,2,...,n\}$, available at time zero has to be processed in a shop with machines $M_1, M_2, \ldots, M_m$, and m is fixed (not a part of the input). Each job is processed first on M_1, next on M_2, and so on, until it is processed on M_m. No machine can process more than one job at a time, no job preemptions are allowed, all setup times are included into the job processing times, and there is unlimited storage between the machines. The problem, commonly referred to as $Fm|prmu|C_{\max}$, is to determine a job sequence (a permutation of jobs) that minimizes the completion time of the last job, also known as the makespan. The $F2|prmu|C_{\max}$ problem can be solved in $O(n\log n)$ time by the famous algorithm of Johnson [10], but $F3|prmu|C_{\max}$ is strongly NP-hard; see [8].

Since the seminal work of Johnson [8], dozens of heuristics for solving $Fm|prmu|C_{\max}$ have been proposed. Recent reviews and comparisons of these heuristics can be found in [6, 11, 12, 20, 21]. In this paper we analyze the performance of the CDS heuristic of Campbell et al. [3], NEH of Nawaz et al. [16], and a new heuristic named KK (a modified version of NEH). CDS is the most effective heuristic with the established worst-case performance ratio of $\lceil m/2 \rceil$. Since 1983 NEH has been commonly regarded as a leader. Finally, the KK heuristic easily outperforms NEH as well as an improved version of NEH proposed in [12]. CDS requires $O(mn\log n)$ time, while NEH and KK can be implemented in $O(mn^2)$.

Using millions of simulation trials and a sharp lower bound on the optimal makespan, we demonstrate that, for $m \leq 10$ and $n \leq 2000$, the NEH and KK heuristics become more frequently optimal as n increases; in the case of CDS this seems to be true for at least $m \leq 5$. Moreover, we

2

conjecture that the probability of KK being optimal might approach even 1 as *n* goes to infinity, whenever the job processing times are randomly generated over the integers {1,2,...,*R*} and *R* is small.

BACKGROUND

For $i = 1,2,...,m$ and $j \in J = \{1,2,...,n\}$, let p_{ij} be the positive processing time of job *j* on machine M_i. Also, let $L_i = \sum_{j \in J} p_{ij}$ denote the load of machine M_i, and $T_j = \sum_{i=1}^{m} p_{ij}$ the total processing time of job *j*. The makespan of a sequence $\pi = (\pi(1),\pi(2),...,\pi(n))$ is expressed by:

$$C_{\max}(\pi) = \max_{1 \le k_1 \le k_2 \le \cdots \le k_{m-1} \le n} [\sum_{j=1}^{k_1} p_{1,\pi(j)} + \sum_{j=k_1}^{k_2} p_{2,\pi(j)} + \cdots + \sum_{j=k_{m-1}}^{n} p_{m,\pi(j)}].$$

It can be also represented as the length of the longest path in an acyclic networks with *mn* nodes and $O(mn)$ arcs, and thus computed in $O(mn)$ time by the critical path method; see e.g. [17]. The $Fm|prmu|C_{\max}$ problem is to find a sequence π^* with the minimum makespan.

Consider $F2|prmu|C_{\max}$ with artificial machines *A* and *B* in series defined by the processing times a_j and b_j for $j \in J$. Let λ be an optimal sequence found by applying Johnson's algorithm on a_j and b_j, and denote its makespan by $C_{\max}(\lambda; A, B)$. Recall that λ is represented as $\lambda = (\lambda^1, \lambda^2)$, where $\lambda^1 (\lambda^2)$ is the subsequence obtained from ordering the jobs of $J^1 = \{j \in J; a_j \le b_j\}$ ($J^2 = \{j \in J; a_j > b_j\}$) by non-decreasing (non-increasing) $a_j (b_j)$.

Let $D = \{(g,i); 1 \le g < i \le m\}$. For every $(g,i) \in D$, let $L_{gi} = \sum_{h=g+1}^{i-1} L_h$ and λ_{gi} be a sequence obtained by applying Johnson's algorithm on machines A_{gi} and B_{gi} defined by the times $a_{gij} = \sum_{h=g}^{i-1} p_{hj}$ and $b_{gij} = \sum_{h=g+1}^{i} p_{hj}$ for $j \in J$. Moreover, let $r_{gj} = \sum_{h=1}^{g-1} p_{hj}$ and $q_{ij} = \sum_{h=i+1}^{m} p_{hj}$. Then, the following lower bound on $C_{\max}(\pi^*)$ can be defined:

$$LB = \min_{s \ne t} \max_{(g,i) \in D} [r_{gs} + C_{\max}((s, \lambda_{gi} - \{s,t\}, t); A_{gi}, B_{gi}) - L_{gi} + q_{it}],$$

LB requires $O(m^2 n^2)$ time and we claim that it is the tightest polynomially computed lower bound on $C_{\max}(\pi^*)$ used so far; compare it with the bounds summarized by Ladhari & Haouari [15]. Despite of this, our *LB* weakens rapidly with an increase of *m*. To illustrate, for every pair $(m,n) = (m,10)$ with $m = 3,4,...,10,12,15,20$ we estimated $\Pr(LB = C_{\max}(\pi^*))$ by generating $N = 2000$ instances in which the job processing times were randomly and independently drawn from the uniform distribution over

the integers $\{1,2,\dots,99\}$; this way of generating random instances has been dominant in the flow shop literature (see e.g. very popular benchmark data sets of Taillard [24]). For every instance we computed LB and found $C_{\max}(\pi^*)$ by examining all 10! sequences. For $m = 3,4,\dots,10,12,15,20$, the obtained estimates of $\Pr(LB = C_{\max}(\pi^*))$ were merely 0.8260, 0.4960, 0.2715, 0.1165, 0.0645, 0.0215, 0.0160, 0.0130, 0.0040, 0.0035, and 0.0025, respectively. These pessimistic results forced us to restrict our study to $m \leq 10$. Note that the best branch-and-bound algorithms of Ladhari & Haouari [15] and Companys & Mateo [5] may handle the instances with up to $n = 1000$ jobs but only $m = 7$ machines. Evidently, the lack of a tight lower bound on $C_{\max}(\pi^*)$ seems to be Achilles' heel in all studies on the $Fm|prmu|C_{\max}$ problem for greater m.

Although our LB was shown to be very poor for $n = 10$, and LB seems to deteriorate for any n with an increase of m, we strongly believe that $\lim_{n \to \infty} \Pr(LB = C_{\max}(\pi^*)) = 1$ (for a fixed m). A similar conjecture was formulated by Taillard [24] for a lower bound on $C_{\max}(\pi^*)$ albeit much weaker than LB.

HEURISTICS

Below we analyze the performance of the following three heuristics: CDS, NEH and KK.

CDS heuristic of Campbell et al. [3]

For $i = 1,2,\dots,m\text{-}1$, define two artificial machines A_i and B_i by their job processing times $a_{ij} = \sum_{h=1}^{i} p_{hj}$ and $b_{ij} = \sum_{h=m-i+1}^{m} p_{hj}$, apply Johnson's algorithm on A_i and B_i to find the sequence λ_i, and compute $C_{\max}(\lambda_i)$. Find the shortest sequence among $\lambda_1, \lambda_2, \dots, \lambda_{m-1}$.

If job j is inserted into the k-th position of $\rho = (\rho(1), \rho(2), \dots, \rho(K))$, the resulting $(K+1)$-element sequence is denoted by $\rho(j,k)$. Clearly, $\rho(j,1) = (j,\rho)$, $\rho(j,k) = (\rho(1), \dots, \rho(k\text{-}1), j, \rho(k), \dots, \rho(K))$ for $k = 2,3,\dots,K$, and $\rho(j,K+1) = (\rho, j)$.

NEH heuristic of Nawaz et al. [16]

Step 1. Sequence the jobs by their non-increasing T_j to obtain the priority order γ. Set $\rho = (\gamma(1))$ and $K = \mathrm{card}(\rho) = 1$.

Step 2. Let $j = \gamma(K+1)$. For every $k = 1,2,\dots,K+1$, compute $C_{\max}(\rho(j,k))$ to find the subsequence $\rho(j,k^*)$ with the minimum makespan. (In the case of ties, k^* is the first index for which the minimum is achieved.)

4

Step 3. Set $\rho = \rho(j,k^*)$ and $K =: K+1$. If $K < n$, return to Step 2. Otherwise, ρ is the final sequence.

KK Heuristic

Step 1. For every $j \in J$, compute $a_j = \sum_{i=1}^{m}(m-i)p_{ij}$ and $b_j = \sum_{i=1}^{m}(i-1)p_{ij}$. Sequence the jobs by their non-increasing $\min(a_j, b_j)$ to get the priority order γ. Set $\rho = (\gamma(1))$ and $K = \text{card}(\rho) = 1$.

Step 2. Let $j = \gamma(K+1)$. For $k = 1,2,...,K+1$, compute $C_{\max}(\rho(j,k))$ to find the subsequence $\rho(j,k^*)$ with the minimum makespan. (In the case of ties, k^* is the first (last) index for which the minimum is achieved if $a_j \leq b_j (a_j > b_j)$.)

Step 3. See NEH.

COMPUTATIONAL RESULTS

Let π_H be a sequence produced by a heuristic $H = $ CDS, NEH, or KK. We are interested in the probability that H is optimal, that is, $OPT(H) = \Pr(C_{\max}(\pi_H) = C_{\max}(\pi^*))$. Since for $m > 2$ the optimal makespan $C_{\max}(\pi^*)$ cannot be determined, we underestimate $OPT(H)$ through replacing $C_{\max}(\pi^*)$ by the lower bound LB introduced in Section 2. Clearly, $OPT(H) = \Pr(C_{\max}(\pi_H) = C_{\max}(\pi^*)) \geq \Pr(C_{\max}(\pi_H) = LB) = LOPT(H)$.

In our first simulation experiment the job processing times were randomly and independently drawn from the uniform distribution over the integers $\{1,2,...,99\}$. For every pair (m,n), where $m = 3,4,...,10$ and $n = 20,40,60,80,100,200,500,1000$, and 2000, we generated $N = 2000$ instances for which we computed $C_{\max}(\pi_H)$ and LB. The obtained estimates of $LOPT(H)$ are presented in Table 1. Recall that $LOPT(H)$ is only a lower bound on the unknown $OPT(H)$, and this bound deteriorates with an increase of m.

Insert Table 1

To examine the impact of the extent of discreteness on the results, we repeated the above experiment this time assuming the uniform distribution over the integers $\{1,2,....,9\}$. The obtained estimates of $LOPT(H)$ are shown in Table 2. As one could expect, the results in Table 2 are significantly better then those in Table 1. Thus, a lower extent of discreteness leads to stronger lower bounds $LOPT(H)$ on the unknown $OPT(H)$.

Insert Table 2

The results in Tables 1 and 2 show that, at least for $H = $ NEH and KK, the probabilities $LOPT(H) = \Pr(C_{\max}(\pi_H) = LB)$ increase as n increases. Thus, rather surprisingly, the two heuristics become more frequently optimal as the problem size increases. We also conjecture that the limit

5

$\lim\limits_{n\to\infty} OPT(KK) = \lim\limits_{n\to\infty} \Pr(C_{\max}(\pi_{KK}) = C_{\max}(\pi^*))$ might be even 1, whenever the job processing times are randomly generated over the integers $\{1,2,...,R\}$ and R is relatively small. This conjecture is significantly stronger than all known results on the convergence of flow shop heuristics to optimality. Clearly, under some mild conditions imposed on the probability distribution from which the job processing times are generated, even a sequence selected at random, say π_{RND}, was shown to be asymptotically optimal in the sense that $\Pr(\lim\limits_{n\to\infty} C_{\max}(\pi_{RND})/C_{\max}(\pi^*) = 1) = 1$; see [14, 18, 19]. On the other hand, it can be shown that $\lim\limits_{n\to\infty} \Pr(C_{\max}(\pi_{RND}) = C_{\max}(\pi^*)) = 0$. Thus, the limit $\lim\limits_{n\to\infty} \Pr(C_{\max}(\pi_H) = C_{\max}(\pi^*))$ considered in this paper is useful for ranking the *Fm|prmu|C*$_{\max}$ heuristics, as opposed to the weaker convergence $\Pr(\lim\limits_{n\to\infty} C_{\max}(\pi_H)/C_{\max}(\pi^*) = 1) = 1$, which is satisfied by any reasonable heuristic.

FINAL REMARKS

In this paper we have identified a strongly NP-hard optimization problem that becomes easier to solve optimally when the problem size increases. Furthermore, we have presented a simple heuristic for solving this problem. The probability of this heuristic being optimal might approach even 1 as the problem size goes to infinity. Is this yet another anomaly in the area of operations research?

REFERENCES

1. Abadi INL, Hall NG, Sriskandarajah C. Minimizing cycle time in a blocking flowshop. Operations Research 2000;48: 177-180.

2. Belady LA, Nelson RA, Shedler GS. An anomaly in space-time characteristics of certain programs running in a paging machine. Communications ACM 1969;12: 349-353.

3. Campbell HG, Dudek RA, Smith ML. A heuristic algorithm for the *n* job *m* machine sequencing problem. Management Science 1970;16: 630-637.

4. Charnes A, Klingman D. The more-for-less paradox in the distribution model. Cah. d'Etud. Rech. Oper. 1971;13: 11-22.

5. Companys R, Mateo M. Different behaviour of a double branch-and-bound-algorithm on Fm|prmu|Cmax and Fm|block|Cmax problems. Computers & Operations Research 2007;34: 938-953.

6. Framinan JM, Gupta JND, Leisten R. A review and classification of heuristics for permutation flow-shop scheduling with makespan objective. Journal of the Operational Research Society 2004;55: 1243-1255 Erratum (2005), 56, 351.

6

7. Garey MR, Johnson DS. Computers and Intractability: A Guide to the Theory of NP-Completeness. New York: W.H. Freeman and Co., 1979.

8. Garey MRD, Johnson DS, Sethi R. The complexity of flow shop and job shop scheduling. Mathematics of Operations Research 1976;1: 117-129.

9. Graham RL. Bounds on multiprocessing timing anomalies. SIAM Journal on Applied Mathematics 1969;17: 416-429.

10. Johnson SM. Optimal two- and three-stage production schedules with setup times included. Naval Research Logistics Quarterly 1954;1: 61-68.

11. Kalczynski PJ, Kamburowski J. On the NEH Heuristic for Minimizing the Makespan in Permutation Flowshops. Omega, The International Journal of Management Science 2007;35 (1): 53-60.

12. Kalczynski PJ, Kamburowski J. An improved NEH heuristic to minimize makespan in permutation flow shops. Computers & Operations Research 2008;35 (9): 3001-3008.

13. Kamburowski J. More on three-machine no-idle flow shops. Computers & Industrial Engineering 2004;46: 461-466.

14. Koryakin R. On asymptotic optimality of permutation schedules in stochastic flow shops and assembly lines. In. On asymptotic optimality of permutation schedules in stochastic flow shops and assembly lines. 2004. p. 200-206.

15. Ladhari T, Haouari M. A computational study of the permutation flow shop problem based on a tight lower bound. Computers & Operations Research 2005;32: 1831-1847.

16. Nawaz M, Enscore Jr. E, Ham I. A heuristic algorithm for the m-machine, n-job flow-shop sequencing problem. Omega, the International Journal of Management Science 1983;11: 91-95.

17. Pinedo M. Scheduling: Theory, Algorithms, and Systems. Upper Saddle, N.J.: Prentice Hall, 2002.

18. Portougal V, Smith JL. The asymptotic convergence of some flow-shop scheduling heuristics. Asia-Pacific Journal of Operational Research 2001;18: 243-256.

19. Ramudhin A, Bratholdi III JJ, Calvin J, Vande Vate JH, Weiss G. A Probabilistic Analysis of Two-Machine Flowshops. Operations Research 1996;44 (6): 899-908.

20. Reza Hejazi S, Saghafian S. Flowshop-scheduling with makespan criterion: a review. International Journal of Production Research 2005;43: 2895-2929.

7

21. Ruiz R, Maroto C. A comprehensive review and evaluation of permutation flowshop heuristics. European Journal of Operational Research 2005;165: 479-494.

22. Spieksma FCR, Woeginger GJ. The no-wait flow-shop paradox. Operations Research Letters 2005;33: 603-608.

23. Szwarc W. The transportation paradox. Naval Research Logistics Quarterly 1971;18: 185-202.

24. Taillard E. Benchmarks for basic scheduling problems. European Journal of Operational Research 1993;64: 278-285.

8

Table 1. The estimated $\Pr(C_{\max}(\pi_H)=LB)$; the case of the {1,2,...,99} uniform distribution.

m	Heuristic	n=20	n=40	n=60	n=80	n=100	n=200	n=500	n=1000	n=2000
3	CDS	0.5665	0.6635	0.6880	0.7280	0.7320	0.7755	0.8630	0.8490	0.8995
	NEH	0.7435	0.7995	0.8050	0.8410	0.8370	0.8645	0.9140	0.9275	0.9540
	KK	0.7940	0.8830	0.9105	0.9330	0.9340	0.9615	0.9855	0.9895	0.9945
4	CDS	0.1510	0.1580	0.1810	0.1705	0.1760	0.2185	0.2550	0.2620	0.2830
	NEH	0.4390	0.5415	0.5980	0.6350	0.6595	0.7270	0.8050	0.8595	0.8855
	KK	0.4570	0.5870	0.6720	0.7200	0.7460	0.8320	0.8990	0.9535	0.9675
5	CDS	0.0455	0.0590	0.0625	0.0705	0.0760	0.1015	0.1280	0.1310	0.1510
	NEH	0.1770	0.3405	0.3795	0.4280	0.4710	0.5825	0.6855	0.7445	0.7975
	KK	0.1920	0.3525	0.4630	0.5045	0.5445	0.6620	0.7900	0.8455	0.8965
6	CDS	0.0120	0.0135	0.0125	0.0080	0.0150	0.0170	0.0205	0.0200	0.0240
	NEH	0.0785	0.1540	0.2170	0.2610	0.3045	0.3905	0.5245	0.6120	0.6830
	KK	0.0780	0.1715	0.2590	0.3280	0.3705	0.4870	0.6365	0.7315	0.8145
7	CDS	0.0010	0.0020	0.0020	0.0025	0.0005	0.0025	0.0040	0.0070	0.0175
	NEH	0.0195	0.0670	0.1040	0.1370	0.1535	0.2605	0.3845	0.4720	0.5635
	KK	0.0185	0.0750	0.1435	0.1780	0.2120	0.3380	0.4935	0.5950	0.6915
8	CDS	0.0005	0.0005	0.0010	0.0000	0.0020	0.0005	0.0005	0.0010	0.0020
	NEH	0.0065	0.0235	0.0500	0.0685	0.0935	0.1585	0.2745	0.3430	0.4475
	KK	0.0125	0.0280	0.0675	0.0875	0.1230	0.2450	0.3920	0.4800	0.5780
9	CDS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
	NEH	0.0025	0.0080	0.0195	0.0255	0.0300	0.0850	0.1585	0.2440	0.3425
	KK	0.0030	0.0085	0.0185	0.0305	0.0460	0.1125	0.2625	0.3870	0.4755
10	CDS	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000
	NEH	0.0015	0.0030	0.0070	0.0110	0.0195	0.0510	0.1100	0.1735	0.2475
	KK	0.0010	0.0040	0.0110	0.0180	0.0270	0.0770	0.1795	0.2905	0.3860

9

$p_{m-1,1}$

Table 2. The estimated $\Pr(C_{max}(\pi_H)=LB)$; the case of the {1,2,...,9} uniform distribution.

m	Heuristic	n=20	n=40	n=60	n=80	n=100	n=200	n=500	n=1000	n=2000
3	CDS	0.6555	0.7510	0.7765	0.8035	0.8070	0.8425	0.9000	0.9230	0.9435
	NEH	0.8470	0.9235	0.9420	0.9520	0.9595	0.9810	0.9935	0.9975	0.9995
	KK	0.8925	0.9645	0.9825	0.9890	0.9920	0.9995	1.0000	1.0000	1.0000
4	CDS	0.2185	0.2115	0.2395	0.2230	0.2285	0.2560	0.2690	0.2935	0.3040
	NEH	0.5635	0.6975	0.7820	0.8025	0.8300	0.8975	0.9460	0.9755	0.9810
	KK	0.5950	0.7645	0.8540	0.8880	0.9100	0.9660	0.9865	0.9970	0.9990
5	CDS	0.0655	0.0830	0.1020	0.0935	0.1100	0.1195	0.1410	0.1530	0.1630
	NEH	0.2640	0.4585	0.5550	0.6140	0.6340	0.7635	0.8675	0.8975	0.9315
	KK	0.2985	0.5190	0.6310	0.7040	0.7170	0.8435	0.9265	0.9580	0.9760
6	CDS	0.0200	0.0185	0.0215	0.0180	0.0195	0.0280	0.0310	0.0290	0.0340
	NEH	0.1260	0.2490	0.3165	0.3940	0.4365	0.5705	0.7310	0.7855	0.8555
	KK	0.1290	0.2885	0.3815	0.4720	0.5580	0.6780	0.8235	0.8835	0.9305
7	CDS	0.0025	0.0025	0.0045	0.0060	0.0045	0.0095	0.0095	0.0145	0.0220
	NEH	0.0375	0.1085	0.1685	0.2195	0.2505	0.4080	0.5565	0.6690	0.7590
	KK	0.0480	0.1335	0.2340	0.2900	0.3345	0.5080	0.6895	0.7745	0.8655
8	CDS	0.0000	0.0010	0.0005	0.0005	0.0015	0.0005	0.0030	0.0015	0.0030
	NEH	0.0145	0.0385	0.0835	0.1040	0.1340	0.2585	0.4270	0.5270	0.6510
	KK	0.0200	0.0570	0.1240	0.1600	0.2050	0.3720	0.5675	0.6735	0.7745
9	CDS	0.0005	0.0000	0.0005	0.0005	0.0010	0.0010	0.0010	0.0010	0.0005
	NEH	0.0060	0.0145	0.0310	0.0470	0.0655	0.1370	0.2525	0.4125	0.5425
	KK	0.0065	0.0210	0.0380	0.0660	0.1040	0.2195	0.4000	0.5670	0.6820
10	CDS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	NEH	0.0030	0.0070	0.0065	0.0205	0.0320	0.0680	0.1820	0.2755	0.3960
	KK	0.0010	0.0070	0.0140	0.0335	0.0485	0.1475	0.2970	0.4375	0.5635

10

THE IMPACT OF PATIENT NON-ATTENDANCE ON EFFICIENCY AND PREDICTION OF NON-ATTENDANCE FOR PHYSICAL THERAPY

Julie Ann Stuart Williams

Department of Management/MIS, University of West Florida, Pensacola, FL 32514

(850) 474-2283; jawilliams@uwf.edu

Steven Pepper

Department of Management/MIS, University of West Florida, Pensacola, FL 32514

(336) 963-1791; sap13@students.uwf.edu

ABSTRACT

A significant challenge for clinical administrators at outpatient physical therapy clinics is patient non-attendance. In this paper, we report the results of an archival data study for 4478 physical therapy patients that include patient attendance history, age group, payment method, and proximity to clinic. Analysis of attendance history revealed that 9790 out of 54,678 scheduled appointments were missed and efficiency was negatively impacted. Preliminary statistical analysis revealed that certain combinations of the collected factors significantly impacted patient attendance and may be used to predict the likelihood that a patient will miss their next appointment. This study points out the importance of identifying patients at risk of missing an appointment and provides insights to identify those patients.

Keywords: Health Care; Patient Non-attendance; Service Sciences

INTRODUCTION

Rehabilitation administrators manage outpatient services for a significant number of patients with restricted mobility. In the US alone, it is estimated that 10% of the population faces mobility challenges, most often due to musculoskeletal conditions [1]. While patient demand is high, supply of physical therapists in some regions is low [2]. This supply and demand mismatch is further widened by high numbers of missed physical therapy appointments. In our study reported in this paper, nearly one fifth of physical therapy appointments were missed. The impact on the patients' recovery time may be negatively impacted by non-attendance. Suppose a missed appointment slows the patient's recovery process by 2 days, then a clinic with 2000 appointments per year and a 20% patient non-attendance rate would result in 400 lost opportunities to treat patients and could potentially impact patient recovery time by 800 days. Missed appointments not only have the potential to increase recovery time and reduce the number of appointment slots for patients to be served, but they also reduce clinic revenue. In the example just noted, if each appointment slot has the potential to generate $200 in revenue, a 20% patient non-attendance rate may result in $400,000 in lost revenue and 400 lost opportunities to treat patients. Thus, today's administrators face significant challenges to improve the number of patients served while managing clinic operations.

1

Efficiency is an important metric from operations management that considers output. Output in a healthcare setting may be measured in terms of patients served. Thus, efficiency may be calculated as the ratio of the actual number of patients served versus the number of appointment slots in which patients could be served. When the output is measured in terms of the number of patients who attend their appointments, the impact of patient non-attendance may be overlooked.

In this paper, we briefly review the literature on attendance factors and management responses in healthcare. We describe our study design and report the results. We point out the limitations of our study and directions for future research.

LITERATURE REVIEW

Past studies have investigated physical therapy patient attendance with respect to varied factors including patient age, gender, race, socioeconomic demographics, attendance history, transportation, weather, clinic environment, cost of care, method of payment, and other organizational factors ([3][4][5][6][7][8][9][10], among others). One study reported that nearly 41% of the patients referred for physical therapy failed to attend either the first or subsequent appointments [9].

Management responses to patient non-attendance have varied. Some clinic administrators have adopted double booking scheduling strategies [11]. Other clinic administrators have converted to short-notice scheduling strategies, which have been called open access, advanced access, or same-day scheduling, because they have been shown to reduce the number of missed appointments [12][13]. The clinic administration may even seek to predict patient attendance [14][15]. Clinic administrators have also used appointment reminder systems to reduce patient forgetting [16]. Despite the reminder systems, patient non-attendance continues to impact clinic productivity.

STUDY DESIGN

The IRBs of the University of West Florida, Baptist Health Care, Sacred Heart Health System, and West Florida Healthcare approved an archival data collection and analysis. Using a laptop with Excel, data from paper or electronic patient documents were initially entered in alphabetical order of the patient last name. This data included:

1) One of three age groups (<16 years of age, 16-64 years of age, ≥65 years of age)
2) One of three payment categories (worker's compensation, private insurance, other)
3) Yes/No same zip code for physical therapy clinic and patient home address
4) Yes/No missed 2 or more appointments
5) Yes/No missed first appointment
6) Number of missed appointments
7) Number of kept appointments.

2

Because the data for the seven characteristics were entered in a spreadsheet without any other patient identifier, the data recorder had to double check the data entry at that time. After each patient's seven characteristics were recorded in the spreadsheet, the patient entries were then randomly reordered. This prevented the data from being saved in a sequence that could be used to later identify the patients.

We selected the categories above to serve as proxies for several important factors identified in previous studies. For example, transportation has been identified in previous studies as a factor impacting patient attendance [4][5][9][17][18]; yet transportation is not recorded in archival patient charts. The proxies for transportation in our study were age group less than 16 since driver's licenses are issued based on minimum age and comparison of zip codes for the clinic and the patient home address to reflect travel distance. We also carefully defined the age and zip code categories so that patients remained anonymous; age groups encompassed a span of years and zip code was represented by binary data comparison. Multiple studies indicate that cost of care is an important factor, but the cost to the patient is difficult to track in the US healthcare system due to the time lags for multiple sources of payment [8][18][19]. We selected payment source as a proxy for cost of care.

RESULTS

First, we report the characteristics of our data pool in terms of the age groups, comparison of patient and clinic zip codes, payment sources, and history of missed and kept appointments. Second, we discuss the impact on efficiency. Then we report the results of a preliminary statistical analysis.

For the data collected, we define five categorical factors as shown in Table 1. Table 1 includes the first five factors for the data collection that were listed earlier. As discussed later in the study limitations, the missed first appointment factor was too difficult to collect in most clinics.

Table 1 Levels of Five Factors for Prediction of Patient Non-attendance for Physical Therapy

Factor	Type	Definition
Age group	1	Age less than 16 years
	2	Age between 16 and 65 years
	3	Age 65 years or older
Zip code	1	Patient home zip code is the same as their clinic zip code
	2	Patient home zip code differs from their clinic zip code
Payment Source	1	Private insurance
	2	Other
Missed Appointment History	1	Missed 0 or 1 appointments
	2	Missed 2 or more appointments
Number of Kept Appointments	1	Kept 0 to 5 appointments
	2	Kept 6 to 12 appointments
	3	Kept 13 or more appointments

3

We collected data from 4478 patient records. The breakdown for the number of patients in each of the three age groups is shown in Figure 1a. Approximately two thirds of the patients were in the age group 16 to 64 while approximately one third of the patients were 65 years of age or older. Only 5% of patients were less than 16 years old.

In Figure 1b, we compare the home zip code of a patient with their physical therapy clinic zip code. Approximately one fourth of patients have the same home zip code as their clinic while approximately three fourths of the patients have a different zip code from that of their clinic.
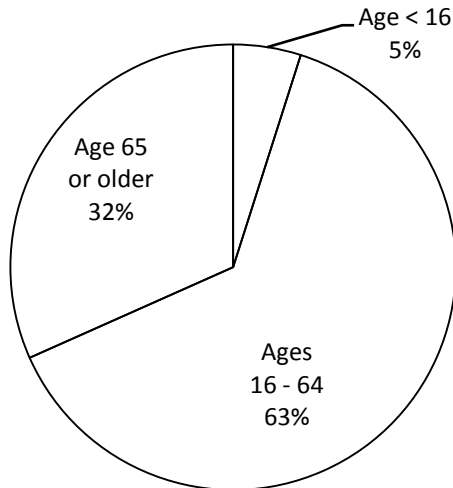
Fig. 1a Patient Age Groups   Fig. 1b Comparison of Patient & Clinic Zip codes
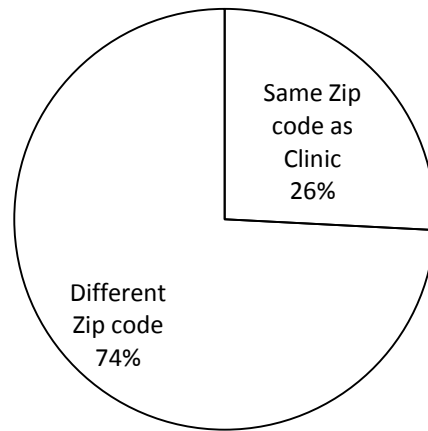
The payment sources for the patient pool are shown in Figure 2a. For example, 78% of patients had private insurance. Another 19% of patients paid with other sources, which included Medicare for American patients 65 and older. When patients 65 years and older had both Medicare and private insurance, they were categorized as having private insurance. Since only 3% of patients were covered by worker's compensation, the "Worker's compensation" payment source data was combined with the "Other" payment source data in Table 1.

The missed appointment history of patients is illustrated in Figure 2b. Amazingly, 37% of patients had perfect attendance. However, an alarming 30% of patients missed 3 or more appointments.
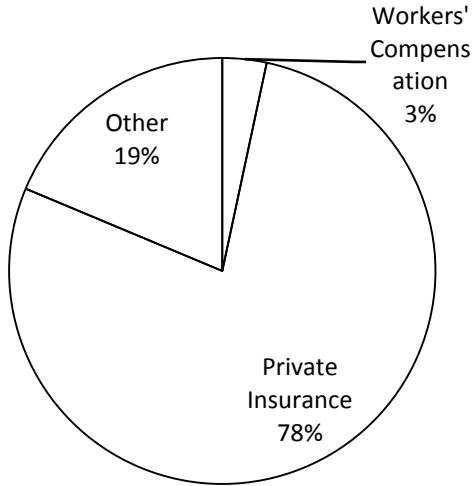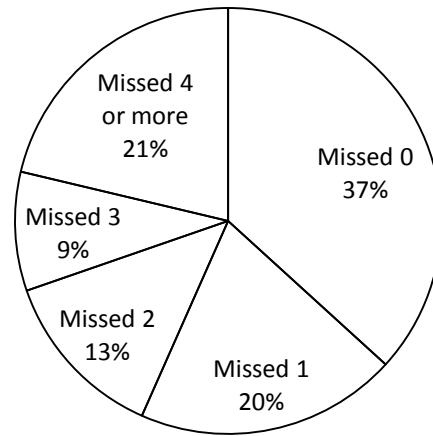
4

Fig. 2a Payment Sources

Fig. 2b Percentage of Patients Missing a Given
Number of Appointments

The percentage of patients attending appointments is graphed in Figure 3a. Since very few patients attending zero appointments had a chart, this percentage was approximately 1%. Patients attending between zero and three appointments totaled 23% while the number attending between four and ten appointments totaled 41%. Over a third of the patients attended more than 11 appointments. As shown in Figure 3b, only 6% of patients scheduled just one appointment. Slightly more than one fourth of patients scheduled two to six appointments while nearly another fourth scheduled seven to ten appointments. Over one third of patients scheduled between 11 and 24 appointments and another ten percent scheduled 25 or more appointments.
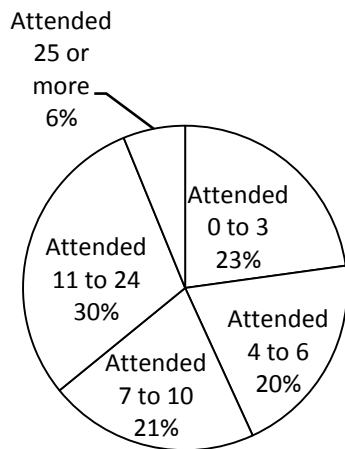
Fig. 3a Percentage of Patients Attending a
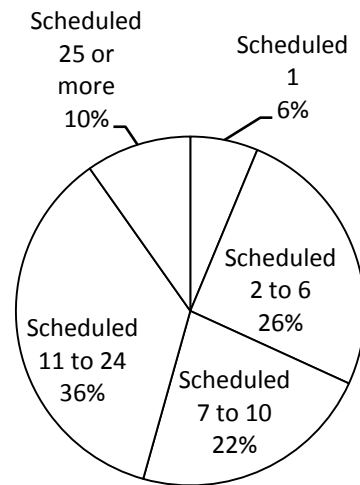Given Number of Appointments

Fig. 3b Percentage of Patients Scheduling a
Given Number of Appointments

5

After evaluating the attendance characteristics of our data set, we also considered the impact of patient attendance on efficiency. Our data revealed 9790 missed appointments versus 44,888 appointments attended. Efficiency is calculated as the ratio of the actual number of patients served versus the number of patients that could have been served. The number of appointment slots not scheduled is not known for the eleven clinics over the data collection period. However, we do know that at least 9790 appointment slots were unused due to missed appointments. Thus, the maximum efficiency loss is shown in equation (1).

$$\text{Maximum Efficiency Loss} = \frac{9790}{44,888 + 9790} = 0.179 \tag{1}$$

Thus, patient non-attendance lowered efficiency by as much as 17.9%. The efficiency metric can be helpful to measure progress over time. For example, if the clinic tracks efficiency before and after implementing a strategy to improve patient attendance, the efficiency metric will help them measure the impact of the change. Some strategies to improve patient attendance require identifying which patients are likely to miss their next appointment. Next, we discuss forming a model to predict the likelihood that an existing patient will miss his or her next appointment.

We tested the initial factors in Table 1 and developed a model, but its prediction strength was weak, primarily due to data sparsity. To remedy this problem, we reduced the number of levels for each factor as shown in Table 2.

Table 2 Reduced Levels of Five Factors for Prediction of Patient Non-attendance for PT

Factor (SYMBOL)	Type	Definition
Age group (AGE)	1	Age between 16 and 64 years
	0	Otherwise
Zip code (ZIP)	1	Patient home zip code is the same as their clinic zip code
	0	Patient home zip code differs from their clinic zip code
Payment Source (PAY)	1	Private insurance
	0	Other
Missed Appointment History (MISS)	1	Missed 1 or 2 appointments
	0	Missed 3 or more appointments
Kept Attendance History (KEPT)	1	Kept 0 to 5 appointments
	0	Kept 6 or more appointments

For our preliminary statistical analysis of the data, we considered five categorical factors as shown in Table 2. Additionally, only patients who had already missed one or more appointments were considered; patients with perfect attendance history were not included in our analysis of non-attendance. Using SAS 9.1 [20], we built a prediction model using logistic regression. Since the response variable of interest, likely to miss an appointment, has a binary outcome, we formed a logit response function, which is shown in equation (2). Using the symbols defined in Table 2, the logit function in (2) indicates whether or not a given patient is likely to miss more than 30% of their physical therapy appointments.

6

logit (θ) = -1.6393 + 0.9098 AGE + 0.6739 PAY + -4.2585 ZIP + 5.7136 KEPT +   (2)
        -1.0941 AGE*MISS + 4.1781 PAY*ZIP + -4.4461 PAY*MISS

To develop our model, we tested which main effects and 2-factor interaction effects were significant. Some of the main effects and 2-factor interactions were statistically significant in predicting whether or not a patient would attend his or her physical therapy appointments. For example, in equation (2), main effects that significantly *increase* the odds of a patient missing an appointment included: the patient is 16 to 64 years of age, the patient is using private insurance, and the patient has kept fewer than 6 appointments. Likewise, main effects that significantly *decrease* the odds of a patient missing an appointment included patients living within the same zip code as the clinic. Also, interaction between patients aged 16 to 64 who missed fewer than 3 appointments or patients using private insurance who missed fewer than 3 appointments indicates a decrease in the odds of missing an appointment, while the odds of missing appointments increases for a patients using private insurance who live in the same zip code as the clinic. Goodness-of-fit statistics for this model are displayed in table 3.

Table 3 Model Goodness-of-Fit for Prediction of Patient Non-attendance for Physical Therapy

Metric	DF	Chi-Square	P-value
Deviance	18	81.5899	<0.001
Pearson	18	258.4887	<0.001
Likelihood Ratio	7	1742.6471	<0.001
Wald	7	232.1421	<0.001
Parameter	DF	Chi-Square	P-value
Intercept	1	23.5389	<0.001
AGE	1	37.0081	<0.001
PAY	1	4.1957	0.0405
ZIP	1	18.8300	<0.001
KEPT	1	188.7949	<0.001
AGE*MISS	1	20.7603	<0.001
PAY*ZIP	1	17.7956	<0.001
PAY*MISS	1	102.7452	<0.001

We tested the sensitivity of our logit response function to different degrees of missed percentages for patients. We only report the most accurate model developed in equation (2). A few comments are necessary in interpreting the accuracy of the model in equation (2). Since logit response functions represent categorical outcome variables, the coefficient of determination, R^2, must be adjusted. Three pseudo-R^2 values were evaluated. The adjusted R^2 reported by SAS [20] for the model (2) was 0.6267, which is toward the high end of the possible 0 to 1 scale for the adjusted R^2 by SAS. The McFadden's pseudo-R^2 for the model (2) was 0.4656, on McFadden's pseudo-R^2 scale of 0 to 1, indicating improvement of the fitted model over the null model [22]. By adjusting the count of the number of correctly predicted outcomes, an adjusted-count-R^2 for the model (2) was 0.6684 [22].

Because this model was developed with data aggregated from eleven clinics, we need to evaluate the prediction accuracy of the model to determine if it can help clinic managers identify patients likely to miss their next appointment. We discuss this and other study limitations and directions for future research next.

STUDY LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Our study faced several limitations; however, each of these limitations presents an opportunity for future research. One study indicates that patient attendance for primary care is sensitive to particular clinics [21]. Thus, our prediction model developed from aggregated data from eleven different clinics needs to be evaluated further. Second, the sparsity of some data in the contingency tables impacted our analysis. For example, there were no patients in the less than 16 age group and very few patients in the 65 and older age group with the Worker's Compensation payment source category for any zip code. Thus, as indicated in Table 1, we had to combine the "Worker's Compensation" payment source data with the "Other" payment source data when we performed our statistical analysis. Further combined data sets for age group and kept appointments are shown in Table 2. Third, the data for missing a first appointment was not recorded in all of the patient charts; therefore, it could not be recorded at the time the patient chart information was collected. As a result, missing a first appointment was not available for our analysis. Fourth, we had to use proxies for cost of care and transportation. Each of these challenges provides an opportunity for future research directions.

CONCLUSIONS

The study reported in this paper provides important insights from aggregated attendance data for 4478 physical therapy patients scheduled to visit one of eleven local clinics. We collected data from 54,678 scheduled appointments and recorded 9790 missed appointments. Clearly, missed appointments impacted the efficiency of physical therapy clinic operations. We also discuss our preliminary results from building a logistic regression model to predict whether a patient is likely to miss more than 30% of their appointments. We point out study limitations and opportunities for future research.

The number of appointments missed in our data collection approached 10,000 at the eleven clinics. This high number of missed opportunities for patient care represents significant losses. Assuming each missed appointment slowed a patient's progress for recovery by two days, patients lost 19,580 days of recovery progress. Similarly, assuming a $200 appointment fee, the eleven local clinics in our study lost a combined total of $1,958,000 in revenue due to missed appointments. These preliminary studies reveal why clinic administrators need to predict and improve patient attendance.

ACKNOWLEDGMENTS

8

REFERENCES

[1] Cherry Engineering Support Services, Inc., "Report to congress on physical rehabiliation research, prepared for the U.S. department of education, on behalf of interagency committee on disability research," 2007.

[2] Economic Modeling Specialists, Inc., "Occupation report," Moscow, Idaho, 2007.

[3] J. Armitstead, "An evaluation of initial non-attendance rates for physiotherapy," *Physiotherapy,* vol. 83, pp. 591-596, 1997.

[4] L. Vasey, "DNAs and DNCTs -- why do patients fail to begin or to complete a course of physiotherapy treatment?" *Physiotherapy,* vol. 76, pp. 575-578, 1990.

[5] C. Brookes, "Loss of treatment time due to non-attendance for physiotherapy out-patient appointments in a district general hospital: pilot study," *Physiotherapy,* vol. 78, pp. 349-352, 1992.

[6] N. P. Ryan, J. C. Wade, A. Nice, H. Shenefelt and K. Shepard, "Physical therapists' perceptions of family involvement in the rehabilitation process," *Physiotherapy Research International,* vol. 1, pp. 159-179, 1996.

[7] B. W. Brewer, J. L. Raalte, A. E. Cornelius, A. J. Petitpas, J. H. Sklar, M. H. Pohlman, R. J. Krushell and T. D. Ditmar, "Psychological factors, rehabilitation adherence, and rehabilitation outcome after anterior cruciate ligament reconstruction," *Rehabilitation Psychology,* vol. 45, pp. 20-37, 2000.

[8] E. J. Grindley and S. J. Zizzi, "Using a multidimensional approach to predict motivation and adherence to rehabilitation in older adults," *Topics in Geriatric Rehabilitation,* vol. 21, pp. 182-193, 2005.

[9] C. Worsfold, J. Langridge, A. Spalding and M. A. Mullee, "Comparison between primary care physiotherapy education/advice clinics and traditional hospital based physiotherapy

9

treatment: a randomized trial," *British Journal of General Practice,* vol. 46, pp. 165-168, Mar. 1996.

[10] Williams, Julie Ann Stuart, M. Webb, J. Day and S. Pepper, "Insights from staff perceptions regarding patient attendance for physical therapy and clinic productivity," *Proceedings of the Southeast Decision Sciences Institute*, in Orlando, FL, Feb. 20-22, 2008, pp. 788-795.

[11] L. R. LaGranga and S. R. Lawrence, "Clinic overbooking to improve patient access and increase provider productivity," *Decision Sciences,* vol. 38, pp. 251-276, 2007.

[12] X. Qu, R. L. Rardin, Williams, Julie Ann Stuart and D. R. Willis, "Matching daily healthcare provider capacity to demand in advanced access scheduling systems." *European Journal of Operational Research,* vol. 183, pp. 812-826, 2007.

[13] J. G. Kodjababian, "Improving patient access and continuity of care: a successful implementation of open access scheduling," Accessed September 2008, http://www.ecgmc.com/insights_ideas/pdfs/Open_Access_Scheduling_Implementation.pdf, 2003.

[14] V. J. Lee, A. Earnest, M. I. Chen and B. Krishnan, "Predictors of failed attendances in a multi-specialty outpatient centre using electronic databases," *BMC Health Services Research,* vol. 5, pp. 51-58, Aug 6, 2005.

[15] A. G. Bean and J. Talaga, "Predicting appointment breaking," *Journal of Health Care Marketing,* vol. 15, pp. 29-34, 1995.

[16] J. Collins, N. Santamaria and L. Clayton, "Why outpatients fail to attend their scheduled appointments: a prospective comparison of differences between attenders and non-attenders," *Australian Health Review,* vol. 26, pp. 52-63, 2003.

[17] Anonymous, "Rehab Continuum Report; No-shows, cancellations demand look at facility, staff, and access: the problem isn't always with the patient, clinics find," vol. 13, pp. 85(4), 2004.

[18] R. Gleeson, A. Chant, A. Cusick, N. Dickson and E. Hodgers, "Non-compliance with occupational therapy outpatient attendance: a quality assurance study," *Australian Occupational Therapy Journal,* vol. 38, pp. 55-61, 1991.

[19] G. I. Hackett, M. F. Hudson, J. B. Wylie, A. D. Jackson, K. M. Small, P. Harrison, J. O'Brien and P. Harrison, "Evaluation of the efficacy and acceptability to patients of a

physiotherapist working in a health centre," *British Medical Journal (Clinical Research Edition),* vol. 294, pp. 24-26, Jan 3, 1987.

[20] SAS Institute, Inc., SAS 9.1, 2003, Cary, NC, USA.

[21] K. E. Lasser, I. L. Mintzer, A. Lambert, H. Cabral and D. H. Bor, "Missed appointment rates in primary care: the importance of site of care," *Journal of Health Care for the Poor and Underserved,* vol. 16, pp. 475-486, 2005.

[22] J. S. Long, Regression models for categorical and limited dependent variables, 1997, Sage Publications, London, UK.

11

USING RUBRICS TO ASSESS LEARNING
IN QUANTITATIVE COURSES: A SUCCESS STORY

Cindy H. Randall
Georgia Southern University

Barbara A. Price
Georgia Southern University

Kathryn D. Randall
Georgia Southern University

ABSTRACT

Many colleges and universities are relying heavily on program assessment to comply with accreditation demands. The rubric, an assessment tool that can measure performance based on a range of criteria, can be used as a scoring guide. In this research rubrics were designed and used to assess student learning in quantitative courses. Adjustments in the delivery of material were made after an initial assessment identified areas of weakness. Subsequent assessments revealed improvement in these areas. Tests of significance found significant differences in assessment scores when students were grouped by final letter grade in the course.

ASSESSMENT

Assessment can be defined as any regular and systematic process by which faculty design, implement, and use valid data gathering techniques for determining program effectiveness and making decisions about program conduct and improvement. [Metzler and Tjeerdsma 1998] Its purpose is to enable faculty to make judgments about student learning as well as goal achievement for a program [Torgerson 1991]. Rubrics are often noted as desirable tools for assessment data gathering.

BACKGROUND

Accrediting institutions have placed a greater and greater emphasis on assessment in recent years [Blaha and Murphy 2001]. The latest standards adopted by the AACSB (Association to Advance Collegiate Schools of Business) require that business programs set goals for the knowledge and skills they want students to learn and then demonstrate that the students have in fact met these learning objectives [Betters-Reed, Chacko, Marlino, and Novin 2003]. ABET (Accreditation Board for Engineering and Technology) focuses on program and institutional assessment of student learning [Rogers 2008]. SACS (Southern Association of

Colleges and School) requires that the institution demonstrate a commitment to student learning and achievement ["Principles of Accreditation…" 2001]. The demands of these accrediting bodies have shifted focus from teaching to learning, from requirements to results [Torgerson 1991]. Many colleges and universities have been slow to make appropriate modifications.

In the fall of 2004 a university in the southeast hosted a visitation team from SACS, hoping to renew accreditation. The report generated by the team members noted that while the university's commentary hit all the correct points, there was a lack of evidence to support ongoing assessment and the use of assessment outcomes in decision making. The university was given one academic year to demonstrate its commitment to assessment.

During the summer of 2005, the university assembled a multi-disciplined task force, charged with ensuring that the concerns of the SACS visitation team were successfully addressed. Members of the task force were sent to training sessions on assessment. Experts came to campus to help team members focus on the task at hand. Task force members were dispersed to their colleges to head up assessment committees. Since the College of Business Administration (COBA) was facing AACSB reaccreditation in the near future in addition to SACS, the COBA task force attempted to establish an assessment of programs, at the undergraduate and graduate level, that would satisfy both accrediting bodies.

As a starting point the COBA committee members used the college's mission statements to create Student Learning Outcomes (SLO). Next it determined in which core classes it would be appropriate to measure these SLO. Before data was collected, the committee had to create instruments with which the SLOs could be measured. That is, rubrics had to be designed.

RUBRICS

Learning outcomes must be defined but also measured [Eastman, Aller, Superville 2001]. The rubric is an assessment tool that can be used to measure students' work. It serves as a scoring guide so that performance is evaluated based on a range of criteria, describing

progression towards meeting the SLO, versus a single score. ["Assessment Rubrics"; Rogers 2006 (1)] It accomplishes this in a fair, consistent, and unbiased manner [Sloane, Wilson, and Samson 1996] and can be used consistently among faculty across sections of the same course [Rogers 2006(2)]. Its strength lies in its specificity. Students can attain some, but not all standards. [Rose 1999] Creating a rubric, which defines levels of attainment for core competencies and goals, is a necessary step in the assessment process [Betters-Reed et. al. 2003]. The authors of this paper participated in the assessment process for the COBA and designed a rubric to be used in Quantitative Analysis (BUSA 3132), a course in the junior business core.

The researchers decided to create basic rubrics that would permit assessment of one program SLO created by the COBA assessment task force as well as three course objectives for BUSA 3132. At the program level (COBA), the following SLO was to be assessed:

> COBA graduates will be able to identify and analyze relevant data using contemporary computer-based technology and apply the results to make decisions concerning the specific question or problem.

At the course level, there were 3 objectives to be assessed:

1. To quantitatively formulate, solve, and interpret mathematical solutions.
2. To develop an understanding of the application of quantitative analysis to the solution of management problems.
3. To be able to communicate recommendations based on the outcome of mathematical procedures.

The researchers developed one rubric to assess the first of the course objectives using Linear Programming. Students were asked to translate a scenario into a model; the formulation process in Linear Programming (sees Appendix 1). The researchers assessed 5 dimensions of the formulation process: an understanding of the decision variables, a statement of the objective function, the ability to create general constraints and summation constraints, and the statement of non negativity. The rubric allowed each of these to be evaluated on a scale of 0 to 2 using the model formulations provided by the students, with 0 indicating the student had no understanding

of a dimension of the formulation process and 2 indicating the student had successfully applied the concept.

A second rubric was designed to assess the COBA SLO as well as second and third course objective using final stage of Linear Programming: the students' ability to interpret and apply data provided in the solution model (see Appendix 2). Students were given an optimal Excel solution along with a Sensitivity Report. A series of questions were posed that required the students to locate and interpret information within the reports. Students were required to answer the questions as if they were reporting to their boss, using statements that were grammatically correct. The rubric was built to assess the interpretation of the LP solution for 5 dimensions: understanding of the target cell, basic and nonbasic variables, constraints, and shadow prices. Each of these was evaluated on a scale of 0 to 2 using the statements written by the students.

DATA COLLECTION AND ANALYSES

At the university where the researchers are on faculty, Quantitative Analysis is a required course in the junior business core. It is an Excel-based class, taught in computer labs. In fall 2007, a total of 5 classes were assessed using the 2 rubrics, providing 121 usable observations. The following semester an additional 102 students were assessed. For those registered for the class during the 2007-08 academic year, final letter grades were recorded along with the results of the rubrics.

Fall 2007

Analyses of data using the first rubric revealed several areas in which students were weak (see Appendix 3). Overall students struggled to define decision variables and their units of measure, use summation variables in other constraints, and to create a nonnegativity constraint. Eighty percent of those assessed could create a constraint, including expressing the units of measure for the resource. Sixty-six percent could correctly state the objective function.

Collectively 98 of the 127 students scored at least a 5 out of a possible 10 in the first rubric (see Appendix 4).

Analyses of data using the second rubric revealed one area in which students were very weak (see Appendix 5). Students struggled in the understanding of nonbasic variables and only 27 percent could use the value of a nonbasic variable. Eighty-three percent could apply the value of a target cell, 83 percent could interpret and use values of basic decision variables. Over 70 percent could express how constraints were used and could interpret shadow prices. Collectively 103 of the 127 students scored at least a 5 out of a possible 10 in the second rubric (see Appendix 6).

Spring 2008

Analyses of data gathered using the first rubric during fall 2007 exposed several areas of weakness. The researchers attacked these areas the following semester. Up until now, the statement of the decision variables was often verbal. In the spring there was much discussion concerning defining the decision variables and the results were always written on the board. It was felt that this would improve their understanding of the decision variables and lead to a more accurate statement of the objective function. The impact of the nonnegativity constraint was stressed. More time was spent on problems which contained summation variables.

Improvement was documented in some areas. More students were able to correctly state the decision variables, the objective function, and create constraints (see Appendix 3). However there was no improvement in summation constraints and the statement of nonnegativity. Eighty-five percent of those students assessed in spring 2008 scored at least a 5 out of a possible 10 in the first rubric as opposed to 66 percent in fall 2007 (see Appendix 4).

For the second rubric, improvement was seen in all 5 areas (see Appendix 5). Ninety-six percent of those students assessed in spring 2008 scored at least a 5 out of a possible 10 in the first rubric as opposed to 85 percent in fall 2007 (see Appendix 6).

Test of Significance

In addition to rubric scores, the researchers recorded the final letter grade for each of the students in the assessment. Next students were grouped by their final letter grade, using a 0 to represent an F, a 1 to represent a D, a 2 to represent a C, a 3 to represent a B, and a 4 to represent an A. The mean and standard deviation of the rubric scores for each letter grade grouping were calculated. ANOVA was used to determine if there was significance difference between the means and standard deviations of these groups of students. With a significance level of .000, it was determined that there was a significant difference between scores received in the assessment when comparing students by final letter grade (see Figure 1).

Figure 1
Assessment Scores versus Final Letter Grade
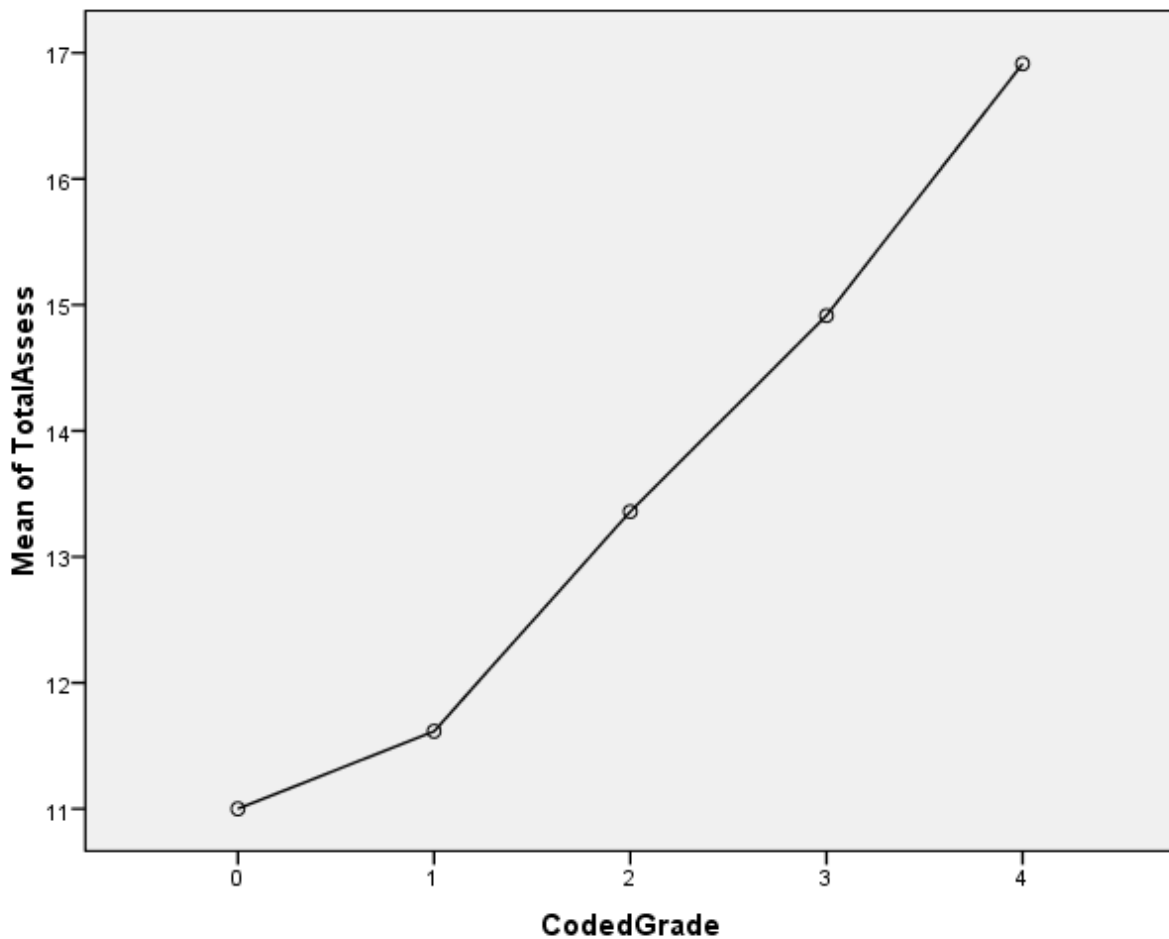
CONCLUSIONS

Assessment is important for students and faculty. Differences in teachers, tests, and scoring across sections make it unadvisable to allow grades to be indicative of student learning. While it may seem that the purpose of assessment is to meet the latest standards imposed by accrediting organizations, assessment can improve learning.

Rubrics permit student performance to be evaluated based on a range of criteria versus a single score. It accomplishes this across sections, across teachers in a fair, consistent, and unbiased manner. Its strength lies in its specificity. Students can attain some, but not all standards.

In this research project, rubrics were used by 2 faculty members in 5 sections of a quantitative analysis class. Before using the rubric, the faculty would observe that test grades were low or high. With the rubric the faculty members were able to identify problem areas, concepts with which students were struggling. Before the next semester ideas were exchanged on how to improve student understanding of these problem areas. These ideas were implemented, 3 more classes were assessed, and research revealed that in fact student learning did improve.

Assessment is critical in identifying where an institution is finding success in meeting student learning outcomes as well as where it is falling short. It gives the faculty the opportunity to adjust teaching methods to reach areas of weakness and improve the overall educational outcome for its graduates. Clearly, the rubrics must be evaluated and updated as the course materials and learning objectives evolve. However, the experiences in the quantitative methods courses of our institution have demonstrated to two "not so sure rubrics work" faculty members that rubrics can and do provide input that can result in improved learning.

BIBLIOGRAPHY

"Assessment Rubrics," accessed on 9/20/08 from http://edtech.kennesaw.edu/intech/rubrics.htm

Betters-Reed, Bonita L., Chacko, Jacob M., Marlina, Deborah, and Adel M. Novin (2003). "Assurance of Learning: Small School Strategies," *Proceedings*, 2003 Continuous Improvement Symposium, Sept 14-16.

Blaha, Kenneth D., and Laurie C. Murphy (2001). "Targeting Assessment: How to Hit the Bull's Eye," *Proceedings*, CCSC: Northwestern Conference, 112-121.

Eastman, Jacqueline K., Aller, Ralph C., and Claude R. Superville (2001). "Developing an MBA Assessment Program: Guidance from the Literature and One Program's Experience," http://www.westga.edu/~bquest/2001/assess.htm

Metzler, Michael W., and Bonnie L. Tjeerdsman (1998). "PETE Program Assessment within a Development, Research, and Improvement Framework," *Journal of Teaching in Physical Education*, 17 (July 1998), 468-492.

"Principles of Accreditation: Foundations for Quality Enhancement," Commission on Colleges, Southern Association of Colleges and Schools, December 2001, http://www.sacscoc.org/pdf/PrinciplesOfAccreditation.PDF

Rogers, Gloria (2008). "Assessment Planning," http://www.abet.org/assessment.shtml

Rogers, Gloria (2006(1)). "Assessment 101," *Community Matters*, (Sept 2006), 3.

Rogers, Gloria (2006(2)). "Assessment 101," *Community Matters*, (Dec 2006), 3.

Rose, Mary (1999). "Make Room for Rubrics," *Teachers' Timely Topics*, accessed on 9/20/08 from http://teacher.scholastic.com/professional/assessment/roomforubrics.htm

Sloane, Kathryn, Wilson, Mark, and Sara Samson (1996). "Designing an Embedded Assessment System: From Principles to Practice," *BEAR Report Series, SA-96-1*, University of California, Berkeley.

Torgerson, Richard L. (1991). "Assessing Student Academic Achievement: Bethany College*," North Central Association Quarterly*, 66 (Fall 1991), 477-481.

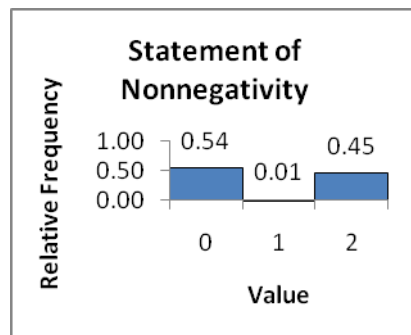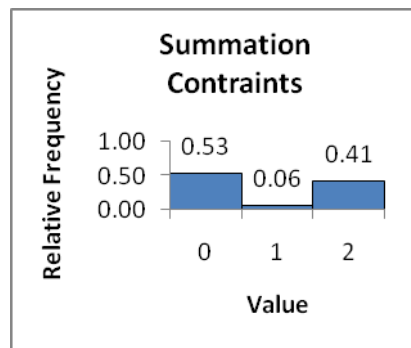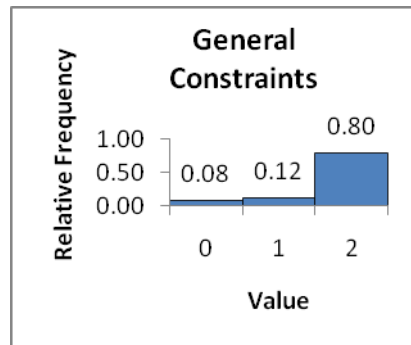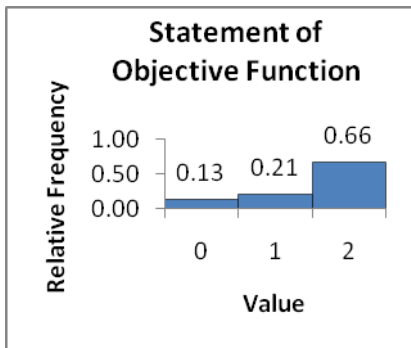| 10 Points Total	0 Points	1 Points	2 Points
Statement of Decision Variables	Does not list the decision variables.	Selects the correct variables for the objective function and constraints.	Clearly defines the decision variables, including their units of measure.
Statement of Objective Function	Does not state intent to maximize or minimize.	States intent to maximize or minimize.	Correctly states the entire objective function.
General Constraints	Does not create a constraint.	Can create a constraint.	Correctly creates a constraint, including the units of measure of the resource.
Summation Constraints	Does not create an indicated summation constraint.	Creates a summation variable using a summation constraint.	Uses the summation variable in other constraints.
Statement of Nonnegativity Constraint	Does not create a nonnegativity constraint.	Creates a nonnegativity constraint.	Clearly expresses the nonnegativity constraint, including summation variables.

10 Points Total	0 Points	1 Points	2 Points
Target Cell	Cannot state the results of the target cell.	Provides the value of the target cell.	Clearly states the results of the target cell in an understandable fashion.
Understanding Basic Variables	Cannot state values of decision variables.	Reports the values of decision variables.	Clearly interprets and uses the values of the decision variables.
Understanding Nonbasic Variables	Cannot state values of nonbasic variables.	Reports the values of nonbasic variables.	Clearly interprets and uses the values of nonbasic variables.
Constraints	Cannot state the values of resources.	Provides the values of the resources.	Clearly expresses how the resources are used in well-structured sentences.
Shadow Prices	Cannot state the shadow prices of resources.	Reports shadow prices of resources.	Clearly interprets and uses shadow prices.

APPENDIX 3

Fall 2007

Spring 2008

Statement of Decision Variables (Fall 2007): Value 0 = 0.20, Value 1 = 0.41, Value 2 = 0.38

Statement of Decision Variables (Spring 2008): Value 0 = 0.01, Value 1 = 0.51, Value 2 = 0.48

Statement of Objective Function (Fall 2007): Value 0 = 0.13, Value 1 = 0.21, Value 2 = 0.66

Statement of Objective Function (Spring 2008): Value 0 = 0.03, Value 1 = 0.10, Value 2 = 0.87

General Constraints (Fall 2007): Value 0 = 0.08, Value 1 = 0.12, Value 2 = 0.80

General Constraints (Spring 2008): Value 0 = 0.08, Value 1 = 0.12, Value 2 = 0.80

Summation Constraints (Fall 2007): Value 0 = 0.53, Value 1 = 0.06, Value 2 = 0.41

Summation Constraints (Spring 2008): Value 0 = 0.48, Value 1 = 0.08, Value 2 = 0.44

Statement of Nonnegativity (Fall 2007): Value 0 = 0.54, Value 1 = 0.01, Value 2 = 0.45

Statement of Nonnegativity (Spring 2008): Value 0 = 0.54, Value 1 = 0.01, Value 2 = 0.45

APPENDIX 4

Fall 2007

Interpretation of LP Solutions Total

Relative Frequency vs Value

Value	1	2	3	4	5	6	7	8	9	10
Relative Frequency	0.00	0.01	0.00	0.03	0.08	0.03	0.07	0.09	0.27	0.42

Spring 2008

Formulation of LP Problems Total

Relative Frequency vs Value

Value	1	2	3	4	5	6	7	8	9	10
Relative Frequency	0.00	0.00	0.07	0.08	0.09	0.13	0.20	0.23	0.07	0.15

APPENDIX 5

Fall 2007

Spring 2008

APPENDIX 6

Fall 2007

Interpretation of LP Solutions Total

Spring 2008

Interpretation of LP Solutions Total
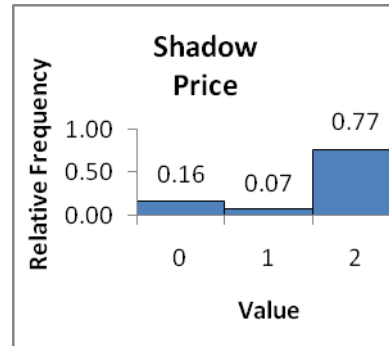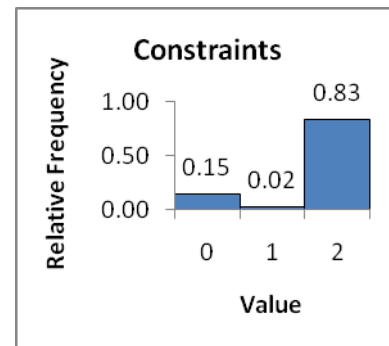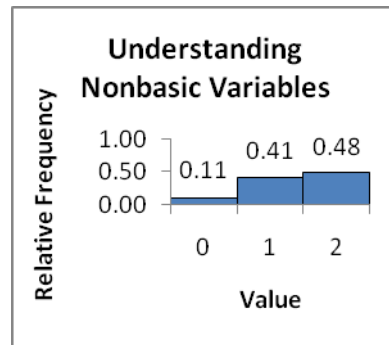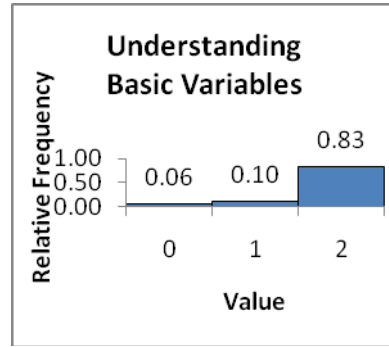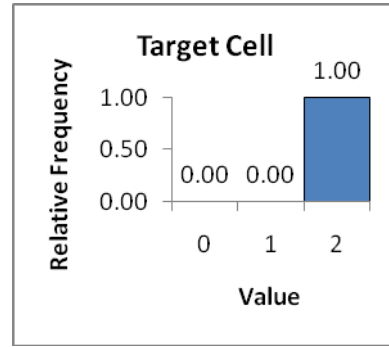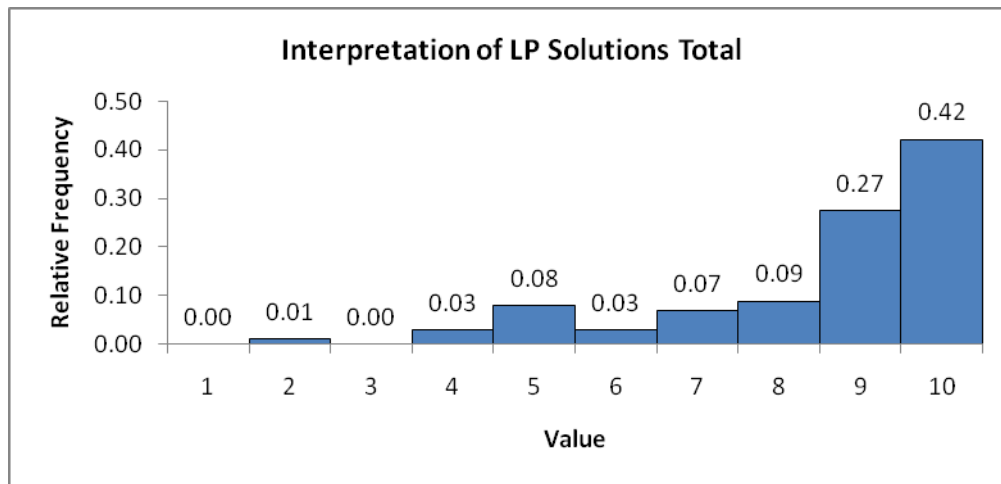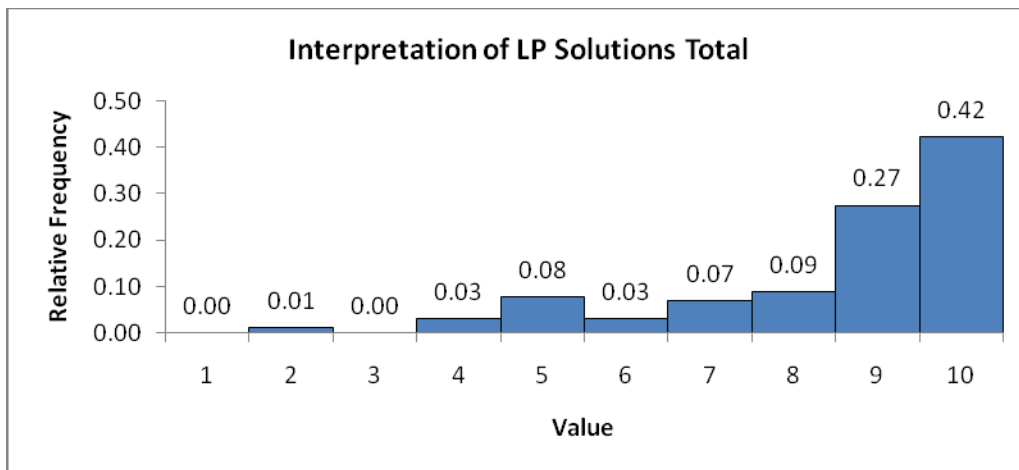
AN ANALYSIS OF INSURANCE COMPLAINT RATIOS

Richard L. Morris, College of Business, Winthrop University, Rock Hill, SC 29733,
(803) 323-2684, morrisr@winthrop.edu,
Glenn L. Wood, College of Business, Winthrop University, Rock Hill, SC 29733,
(803) 323-2599, woodg@winthrop.edu

ABSTRACT

Evaluating the quality of service from a prospective insurer is a formidable challenge—even for the most experienced financial advisors. One approach to evaluating "service" is to assess the insurer's complaint ratio. Using data that are not readily available, this study describes the complaint ratios for six basic lines of insurance and analyzes the unique problems inherent in the complaint ratios for small insurers. In addition, the authors analyze the relationship between insurer size and complaint ratios, and investigate the question of whether "bad" complaint ratios tend to be followed by improved ratios.

INTRODUCTION

The purpose of this paper is to perform a "macro" (aggregate) analysis of complaint data for six lines of business for the years 2004-2006. Unless otherwise noted, all the data for this paper were provided by material supplied by the National Association of Insurance Commissioners (NAIC) apart from information available from the Internet website [1]. The lines of business under scrutiny are:

1. Private passenger auto
2. Homeowner's
3. Group life
4. Individual life
5. Individual accident and health, and
6. Group accident and health.

More specifically, we will:

1. describe the complaint ratios for the above six lines of business,
2. analyze the relationship between insurer size and complaint ratios [2],
3. investigate the question of whether "bad" complaint ratios tend to be followed by improved ratios, and
4. determine whether there is a relation between complaint ratios of companies operating in similar lines of business.

There is no intention of analyzing the statistical problems inherent in the data as this has been done previously [3], but we will, by necessity, address a few of the major questions that arise in the interpretation of the information provided.

THE SMALL COMPANY PROBLEM

For purposes of this paper complaint ratios are calculated as follows:

$$\text{Complaint Ratio} = \frac{\text{\# of complaints}}{\text{Premium Volume}} \times 1,000,000 \tag{1}$$

In analyzing premium volume data, it becomes evident that large insurers write most of the business in every line and many, many small companies compete for the remainder. This market fact raises a very important problem with the interpretation of complaint ratio data for small companies. Specifically, the complaint ratios for small companies can be extremely misleading; they can make small companies look much better or much worse than they really are.

Consider the following simple example for two companies in the same line of business:

	Company A	Company B
Expected Number Of Complaints	800	2
Premium Volume	$5,000,000,000	$12,500,000

The term "Expected Number of Complaints" is the number of complaints we would expect from each firm if it is operating as usual. An equivalent definition is that it is the long-run average number of complaints that each firm would incur if it is operating as usual. Company A's expected complaint ratio is then:

$$\text{Expected Complaint Ratio} = \frac{800}{5,000,000,000} \times 1,000,000 = .16$$

and Company B's is:

$$\text{Expected Complaint Ratio} = \frac{2}{12,500,000} \times 1,000,000 = .16$$

So both companies are operating at a similar level of service as measured by their expected complaint ratios. However, it is very easy to see that Company B, just by chance variation, could have zero complaints in a year, resulting in a complaint ratio of 0. Likewise, if it has six complaints in a year, just by chance, it would have a complaint ratio of .48. Using the Poison distribution we can model the distribution of complaints for both companies. Using this approach, the probability of zero complaints for Company B is about 13.5%. The probability of having six or more complaints in a year is about 1.7%.

We can use a reverse analysis for Company A to get the same probabilities. The probability of Company A's having 769 or fewer complaints is about 13.7%. This would yield a complaint ratio of .154. The probability of Company A's having 861 or more complaints is about 1.7%, with a complaint ratio of .172.

Looking at this example in another way, the probability of each company operating in its range above is about 85% [100 - (13.5 + 1.7) = 84.8% for Company B; 100 - (13.7 + 1.7) = 84.6% for Company A]. So Company B's complaint ratio will lie within the range 0 to .48 while Company A's will be in the much smaller range of .154 to .172, both with equivalent probabilities.

The problems of scale in evaluating complaint ratios are very serious. The following table illustrates average complaint ratios and the variability of the ratios as premium volume increases:

TABLE 1. MEANS AND STANDARD DEVIATIONS OF COMPLAINT RATIOS BY LINE OF BUSINESS

Private Passenger

Quintile	$\bar{x}$	s
1	0.130	0.014
2	0.251	0.048
3	0.332	0.072
4	0.312	0.090
5	0.514	0.338

Homeowner's

Quintile	$\bar{x}$	s
1	0.125	0.022
2	0.150	0.030
3	0.234	0.098
4	0.250	0.107
5	0.524	0.365

Group Life

Quintile	$\bar{x}$	s
1	0.013	0.004
2	0.023	0.003
3	0.027	0.006
4	0.023	0.007
5	0.289	0.254

Individual Life

Quintile	$\bar{x}$	s
1	0.032	0.004
2	0.038	0.006
3	0.042	0.009
4	0.076	0.015
5	0.269	0.170

Individual Accident and Health

Quintile	$\bar{x}$	s
1	0.090	0.003
2	0.231	0.154
3	0.226	0.161
4	0.248	0.074
5	0.687	0.507

Group Accident and Health

Quintile	$\bar{x}$	s
1	0.081	0.026
2	0.097	0.029
3	0.079	0.023
4	0.117	0.048
5	0.182	0.106

This table shows the mean and standard deviation of the complaint ratio by quintile of premium volume for each line of business. In the table, the simple arithmetic average of each measure is calculated for the first through fifth quintile in each line of business. From Table 1 we see, for every line of business, a very strong tendency for the average complaint ratio to increase as premium volume decreases. This relationship is clear and almost perfectly consistent. A reasonable, or at least possible, explanation is that the larger companies do a better job of providing higher-quality service to their customers.

The greater variability in complaint ratio for smaller companies is likely due to the effects of a small absolute number of complaints for smaller companies versus larger absolute numbers of complaints for larger ones. After a fair amount of analysis we concluded that there is no "magic" cutoff size, i.e., a company size where the number of complaints becomes much more (or less) meaningful. To address the issue further we determined the number of zero complaint ratios in each quintile. We found that they were highly concentrated in the fifth quintile for each line of business with just a smattering of them in the fourth quintile.

In recognition of the above problems some states list only the companies with a number of complaints that exceed a specified minimum, such as ten. Other states do not list the complaint ratios of companies that have a premium volume less than a certain minimum. Unfortunately there is no method that solves the small company statistical problem without introducing additional problems. There is no "natural" dividing line between "large" and "small" companies in any line of insurance. This means any classification by size will be somewhat arbitrary and subject to criticism. Nonetheless, financial advisors (and consumers) who use complaint ratios for very small companies should understand that these ratios have little or no meaning.

IMPROVEMENTS IN COMPLAINT RATIOS

An insurer might be concerned if its complaint ratio increases substantially from year to year or is "too high" compared to comparable size companies. In other words, a company might be concerned if the complaint ratio has increased, or the company might be concerned if the level of complaints is viewed as unacceptable. That is, a "bad" complaint ratio might be viewed as one that is increasing or it could be defined as one that is higher than some standard set by the company. Consequently, in examining the question of whether companies tend to improve after "bad" ratios, we tested both concepts.

To test the idea that a company might take steps to improve its complaint ratio after experiencing a "bad" ratio, we defined a "bad" ratio as one that had increased by 5% or more from the previous year. With three years of data, we arbitrarily decided that if a company's complaint ratio increased by 5% from 2004 to 2005, then 2005 would be labeled a bad year. Then we determined whether or not those companies with a bad year in 2005 improved their complaint ratio in 2006. In the Private Passenger line of business, for example, 67% of the companies experiencing a bad year in 2005 improved their complaint ratios in 2006, suggesting that there may be a pattern of improvement after a bad year.

To determine if there was a significantly higher proportion of firms with bad complaint ratios in 2005 that improved versus those that did not have bad complaint ratios in 2005 we performed a test of two proportions. The hypotheses we tested were:

> H_o: The proportion of companies showing improvement from 2005 to 2006 is the same regardless of whether they experienced bad complaint ratios in 2005.
> H_a: The proportion showing improvement is higher for those having bad complaint ratios in 2005.

We performed this test on each line of business using a *z*-test on proportions. Because of the high variability inherent in very low numbers of complaints, we based the analysis only on companies whose number of complaints for each year was greater than ten. The results are shown in Table 2. As shown in the table, the *z*-test statistic for the Private Passenger line of business is 1.785, with a *p*-value of .037. The null hypothesis will be rejected if the *p*-value is less than the significance level, α. If we choose the customary .05 α, we would reject the null and can conclude that there was a significant improvement effect in the Private Passenger line.

TABLE 2. IMPROVEMENTS AFTER A "BAD" RATIO

Line of Business	#of Bad CR's in 2005	Proportion Improving	# of Good CR's in 2005	Proportion Improving	*z-statistic*	*p*-value
Private Passenger	67	67.2%	249	55.0%	1.785	0.037[*]
Homeowner's	25	76.0%	109	53.2%	2.079	0.019[*]
Group Life	3	33.3%	8	50.0%	-0.494	0.689
Individual Life	35	65.7%	71	47.9%	1.731	0.042[*]
Individual Accident and Health	39	56.4%	95	53.7%	0.288	0.387
Group Accident and Health	64	65.6%	137	59.1%	0.881	0.189

[*]Significant at the .05 level
[**]Significant at the .01 level

Note that the sample sizes for Group Life insurance are too small to draw any meaningful conclusions. This is true of the remaining tables in this section also. Therefore, we will eliminate this line of business from any further consideration.

In Table 2, the second column lists the number of bad complaint ratios for 2005 in each line of business. The next column is the proportion of those with bad complaint ratios that improve from 2005 to 2006. The next two columns list the number of firms with good complaint ratios in 2005 and the proportion of those that improved from 2005 to 2006. These firms act as a control group we can compare to those with bad ratios. From this table, it can be seen that while the proportion improving was higher for those companies having bad complaint ratios in 2005 in five of the lines of business, only three, Private Passenger, Homeowner's and Individual Life, had significantly higher proportions at the 5% level of significance.

Taking the other approach, we reasoned that some companies might look at other similar companies as a means of deciding whether their complaint ratios need improvement. A very rough way of doing this is to look at whether a company's complaint ratio is high relative to the mean of the quintile it is in. We used the same 5% figure as in the previous analysis. That is, if a firm's complaint ratio is 5% higher than its quintile average, then it would be classified as a bad ratio. We then determined the proportion of those with bad complaint ratios that improved and

compared this to the proportion of those companies not classified as having bad ratios that improved. Table 3 shows the proportions of companies in both categories that improved from 2004 to 2005 and Table 4 shows the same information for improvements from 2005 to 2006. As before, we eliminated from consideration those companies with ten or fewer complaints in any of the three years considered.

**TABLE 3. IMPROVEMENTS RELATIVE TO
SIMILAR SIZE COMPANIES (2004 AND 2005)**

Line of Business	#of Bad CR's in 2004	Proportion Improving	# of Good CR's in 2004	Proportion Improving	z-statistic	p-value
Private Passenger	157	86.0%	159	61.0%	5.026	0.000**
Homeowner's	76	84.2%	58	67.2%	2.308	0.010**
Group Life	5	80.0%	6	66.7%	0.494	0.311
Individual Life	54	64.8%	52	51.9%	1.347	0.089
Individual Accident and Health	113	68.1%	21	52.4%	1.397	0.081
Group Accident and Health	100	69.0%	101	58.4%	1.560	0.059

*Significant at the .05 level
**Significant at the .01 level

**TABLE 4. IMPROVEMENTS RELATIVE TO
SIMILAR SIZE COMPANIES (2005 AND 2006)**

Line of Business	#of Bad CR's in 2005	Proportion Improving	# of Good CR's in 2005	Proportion Improving	z-statistic	p-value
Private Passenger	124	67.7%	192	51.0%	2.933	0.002**
Homeowner's	58	67.2%	76	50.0%	2.000	0.023*
Group Life	3	33.3%	8	50.0%	-0.494	0.689
Individual Life	52	65.4%	54	42.6%	2.353	0.009**
Individual Accident and Health	112	58.0%	22	36.4%	1.866	0.031*
Group Accident and Health	93	72.0%	108	51.9%	2.929	0.002**

*Significant at the .05 level
**Significant at the .01 level

Table 2, as discussed previously, suggests that companies try to improve after a bad year, but the results are not particularly dramatic. Tables 3 and 4 give stronger results. In Table 3, only two lines of business yield significant results, but the rest produce *p*-values fairly close to the .05 level of significance. Table 4 produces significant results (at the .05 level) in all of the five lines of business after excluding Group Life insurance. Three of these five are significant at the .01 level.

Do the results tend to support the idea that companies try to improve after experiencing bad complaint ratios? The preceding analysis suggests that they do. We cannot say with certainty that they use the complaint ratios themselves to decide if they receive too many complaints; they may use more informal measurements or they may use different criteria than we used for detecting improvements. Nevertheless, the results strongly suggest that insurers are concerned about getting too many complaints and that they do indeed take steps to improve bad complaint experience.

CORRELATIONS BETWEEN LINES OF BUSINESS AND YEARS

We are also interested in seeing if complaint ratios are correlated between different lines of business. To analyze this question, we calculated the Spearman rank correlation coefficient (r_S) for Personal Passenger and Homeowners' insurance for each of the years for which we have data, shown in the next table:

TABLE 5. CORRELATIONS FOR PERSONAL PASSENGER AND HOMEOWNER'S INSURANCE

Year	2006	2005	2004
r_S	0.496	0.593	0.582
p-value	2.24E-08	4.44E-12	1.41E-12

So, for example, the correlation relating complaint ratios of Personal Passenger insurance and Homeowners' insurance is .593 for 2005. This bears a little explanation. To begin with, the correlation coefficient itself lacks a reasonably good interpretation. However, its statistical companion, the coefficient of determination, or r_s^2, can be interpreted as the amount of variability in one variable that can be "explained" or accounted for, by the other. The r_s^2 for 2005 is .352 ($.593^2$). So 35.2% of the variability in the complaint ratios for Personal Passenger insurance can be "explained" by the variation in complaint ratios for Homeowners' insurance (and vice-versa; the relationship holds in both directions).

It might help also to show a graph of the complaint ratios for the two lines of business for 2005:

**FIGURE 1. COMPLAINT RATIO RANKINGS OF
PERSONAL PASSENGER AND HOMEOWNER'S INSURANCE, 2005**
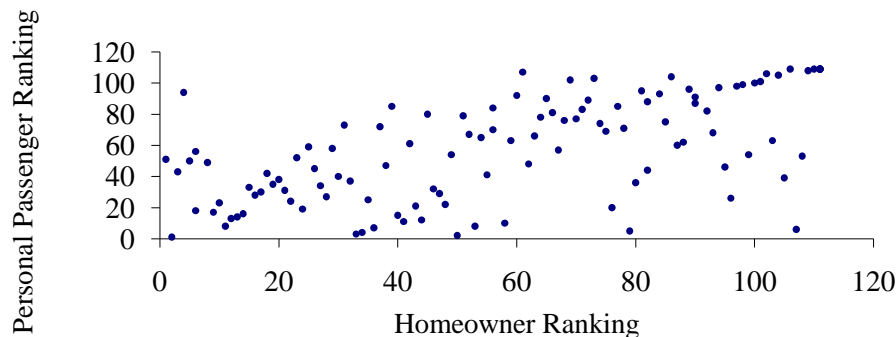
From this it can be seen that the correlation between the two isn't that dramatic. The third row of Table 5 contains the *p*-values of the coefficients. The *p*-values are extremely low, indicating that the correlations are highly significant, but this doesn't mean that they're particularly meaningful, just that there's a relationship (maybe a small one) that can be detected in a statistical test of hypotheses. So if we're trying to answer the question of whether or not companies tend to have comparable complaint ratios in separate lines of business, the answer is "Yes, but it's not a particularly close relationship."

CONCLUSIONS

Complaint ratios vary greatly by line of business. Complaints in property and liability insurance are consistently much higher than in life insurance. This might be explained by the fact that most complaints arise from the handling of claims, with underwriting, policyholder service, and marketing and sales all together accounting for a minority of all complaints.

All insurance markets are dominated by large insurers, and the analysis of complaint ratios for small companies is very difficult because of statistical problems. With a small premium volume, small fluctuations in the absolute number of claims will cause the complaint ratio to fluctuate wildly. Accordingly, the complaint ratios of very small companies are essentially meaningless.

The analysis supports the conclusion that larger companies have lower complaint ratios than smaller companies. This was true for every line of business in every year of our analysis.

Using two different definitions of "bad" complaint ratios, we found statistically significant results at the .05 level in all lines of business (not including Group Life insurance, which had too few complaints to analyze). In three of the five lines of business the results were significant at the .01 level. This is strong evidence that insurance companies are concerned about their complaint ratios and it seems probable that they take steps to improve their service if complaints increase.

We also looked at the correlations between lines of business and found that there was a significant correlation in rankings of complaint ratios for companies engaged in different lines of business. However, while significant, the correlations were not particularly meaningful.

REFERENCES

[1] National Association of Insurance Commissioners (NAIC) Consumer Information Source https://eapps.naic.org/cis/

[2] Query, J. T., Hoyt, R, E, & He, M. Service quality in private passenger automobile insurance. *Journal of Insurance Issues,*2007*, 30(2), 155-165.

[3] Venezian, E. Complaint ratios: What (or where) is the beef? *Journal of Insurance Regulation*, 2002, 20(4) 19-46.

DECISION SUPPORT FOR REAL ESTATE EVALUATION

Helen M. Moshkovich, School of Business, University of Montevallo, Montevallo, AL, 35115, (205) 665-6546, MoshHM@montevallo.edu,

Alexander I. Mechitov, School of Business, University of Montevallo, Montevallo, AL, 35115, (205) 665-6543, Mechitov@montevallo.edu,

Luiz Flávio Autran Monteiro Gomes, Ibmec/RJ, Av. Presidente Wilson 118, 20.030-020, Rio de Janeiro, RJ, Brazil, +55 21 45034053, Autran@ibmecrj.br

ABSTRACT

Appraisal of the real estate is a rather subjective process. The paper presents an original three-phase approach to market value estimation on the basis of the multicriteria decision making to help appraisers produce more stable and reliable results. The process is illustrated through an application. The results show improvement in accuracy of evaluation.

INTRODUCTION

Accurate evaluation of real estate property is an important task as many other long-term decisions (taxes, mortgages, loans, etc.) are based on this evaluation. Lentz and Wang (1998) analyzed main challenges facing real estate appraisers and stressed limitations of current approaches to the task. The Sales Comparison (The Appraisal) approach is most frequently used for estimating the market value of residential properties and is the focus of this study.

Evaluation of property values within the framework of Sales Comparison approach assumes that available sold properties in the area are used to find the "closest" alternatives to the property under valuation. They are carefully analyzed against different factors and corresponding subjective "adjustments" are made to the value of differentiating parameters and after that the overall value for the "new" property is estimated (Gau et al., 1992; Lipscomb and Gray, 1990.)

The Sales Comparison approach assumes that 1) there is a way to estimate their "closeness in quality" to the property under valuation with the goal of selecting of a small number of appropriate properties for a detailed comparison; 2) there is a method to estimate market value of the property under valuation based on similarities/differences with the selected properties.

The solution is complicated and may be improved by providing appraisers with a decision support. Multiple criteria decision methods traditionally deal with this type of problems (Keeney and Raiffa, 1993; Roy and Bouyssou, 1993; Barba-Romero, 2000; Belton and Stewart, 2002.) The paper proposes an integrated approach which deals with the last two problems stated above.

PHASE 1: PROPERTIES' RANKING USING A MULTICRITERIA METHOD

The goal of this step is to use a milticriteria method to rank order properties according to their overall quality. It is important to emphasize two peculiarities of the approach compared to traditional approaches:

1) All properties on the local market as well as recently sold properties should be analyzed and used in the ranking. This is necessary as market value of the property is based not only on the qualities of the property itself but also on the qualities of other properties on the market.
2) Properties are evaluated against a set of characteristics (criteria) important for the local market but this set does not include "price". The "price" is considered to be the result of the overall "quality" of the property (not an "input" value.)
3) The ranking will be used to locate "closest in quality" sold properties for a detailed comparative analysis.

The initial step of milticriteria decision making is the formation of a set of alternatives (properties) and a set of criteria for their evaluation. This step requires input from the decision maker (expert) in the problem, e.g., the most experienced appraiser(s) in the local agency. The number and content of criteria depend on the peculiarities of the area as well as on the task at hand. Once criteria are formed, alternative properties are estimated against them by the decision maker/experts and these estimations are used to evaluate overall quality of alternatives and rank order them in accordance with this quality.

The problem may be formulated as follows:
1) There is a set of alternatives $a_1, a_2, \ldots, a_n$.
2) There is a set of criteria $C_1, C_2, .., C_m$
3) Each alternative a_j is evaluated against a set of criteria $C_1, C_2, .., C_m$ and may be presented as a vector $a_j = \{a_{1j}, a_{2j}, \ldots, a_{mj}\}$, $j = 1, 2, \ldots, n$,
4) On the basis of this information and the decision maker's preferences, rank order alternatives according to their overall value $V(a_j)$, $j = 1, 2, \ldots, n$..

One of the most popular and simple to use multicriteria techniques is Simple Additive Weighting (SAW) Method. The approach is based on the multiple attribute utility theory (MAUT) and uses a linear additive function to estimate the value of each alternative in the form:

$$V(a_j) = \sum_{i=1}^{m} w_i v_{ij} , \qquad (1)$$

where $V(a_j)$ is the overall quality value for alternative a_j, w_i is the weight assigned by the decision maker to the criterion C_i, and v_{ij} is the evaluation of alternative a_i against criterion C_i.

To apply this method we need information on the relative importance of criteria. The estimations may be given by the decision maker using some scale, e g., 5-point, or 10-point or 100-point, and then normalized. Estimates of alternatives against criteria are also normalized and then used in the formula (1.)

PHASE 2: SELECTING "CLOSEST" PROPERTIES FOR COMPARISON

Once the evaluation is carried out all alternatives in the set may be ranked ordered according to their overall quality. The next step is to identify "closest" properties with known prices for each "unsold" property in the set. In majority of cases, there will be two comparable sold properties (alternatives) – one property more preferable than the alternative under valuation and another property which is less preferable that the alternative under valuation. These are the two "closest" properties on the market, even if they are not as close in quality as one would like.

Let mark the alternative under valuation as a*, while a+ will be alternative with assigned price which is more preferable that alternative a*, and a- will be alternative with assigned price which is less preferable that alternative a*, or V(a+)>V(a*)>V(a-). The easiest way to assign the price for alternative a* is to propagate the difference of alternatives in the overall value to difference in price through a "proportional approach":

$$P(a*) = P(a+) - \frac{[P(a+) - P(a-)][V(a+) - V(a*)]}{V(a+) - V(a-)} \quad (2)$$

where P(a) is the price for property a.

But if the goal is to answer the question: *"what price (market value) of alternative a* will make it equally competitive with alternatives a+ and a-?"* (Kaklauskas et al., 2007,) price should be considered as one more criterion, and the task is to find price P(a*) that ensures that overall value of a* (including price) will be comparable with values of a+ and a-.

PHASE 3: ASSIGNING MARKET PRICE

To implement the "adjusted value" approach it is necessary to: 1) evaluate alternatives' overall values $Vp(a_i)$ including price as an additional criterion; 2) formulate the notion "comparable" for the alternatives' overall values.The first requirement is easy to implement if we assign "initial" price to alternative a* as the average of prices for alternatives a+ and a-: P(a*)=[P(a+)+P(a-)]/2. This price may be used to evaluate overall value $Vp(a_i)$ for each of the three alternatives the same way as was stated in previous section for all alternatives, using, for example the SAW method. The price may be "adjusted" if the Vp(a*) is not close enough to Vp(a+) and Vp(a-) until the "closeness" is satisfactory.

The second requirement for the SAW method is applied as a measure the relative distance between alternatives a*, a+, and a- when evaluated with the criterion "Price." The distance (d) may be expressed as the average percent difference between the three values Vp(a*), Vp(a+), and Vp(a-):

$$d = \left[\frac{Vp(a*) - Vp(a+)}{\max[Vp(a*), Vp(a+), Vp(a-)]} + \frac{Vp(a*) - Vp(a-)}{\max[Vp(a*), Vp(a+), Vp(a-)]}\right]/2 \quad (3).$$

If we set some limit d* to this distance then we have to adjust the price for a* until |d|<d. The whole process of defining the price in the "adjusted value" approach may be carried out through the following steps:
   1) Add the criterion "Price" to the initial set of criteria with a quantitative scale.
   2) Re-evaluate criterion weights to include criterion "Price" with assigned weight of 0.5 (equal importance to all other criteria together).
   3) Assign price to alternative a* as the average of prices for alternatives a+ and a-.
   4) Use estimates a_{ij} for alternatives a+, a*, a- (for all criteria, including "Price" estimate) to normalize into values v_{ij}, (take into account that "Price" is to be minimized).
   5) Calculate overall values $Vp(a_i)$ for alternatives a+, a*, and a-, using the SAW method.
   6) Set the limit to the relative difference in values for the alternative d* at some level (e.g., 5% or 0.05).

7) Calculate **d** using formula (3).
8) If |d|>d*, re-calculate P(a*) using d as an adjustment factor, and return to step 5.
9) If |d|<d*, the market value for alternative a* is equal to the last assigned value P(a*).

ILLUSTRATION OF THE PROPOSED APPROACH

The case is a continuation of the application presented in Gomes and Rangel (2007.) The study sought to evaluate rent value for some residential properties in the city of Volta Redonda (Brazil.) In order to evaluate the properties a set of criteria with corresponding scales and importance weights were established with the help of an experienced realtor in the area (see Table 1 below). Verbal scales of qualitative criteria were converted to cardinal ones. Weights were evaluated by the decision maker using a 5-point scale and then normalized.

TABLE 1. CRITERIA, SCALES, AND WEIGHTS

No.	Criterion Description	Scale	Normalized Weights
C1.	Location	Qualitative, score 1 to 5	0.25
C2.	Constructed Area	Square meters	0.15
C3.	Construction Quality	Qualitative, score 1 to 3	0.10
C4	State of Conservation	Qualitative, score 1 to 4	0.20
C5	Number of Garage Spaces	Number	0.05
C6	Number of Rooms	Number	0.10
C7	Attractions	Qualitative, score 0 to 4	0.05
C8	Security	Qualitative, score 0 to 1	0.10

Fifteen alternative properties in the area were identified and evaluated against the set of criteria by specialists from the real estate agency. Six alternatives were with known rental values.

Ranking Alternatives using the SAW Method

The first step is to normalize all scales using formula (4), so that all criteria data are compatible.

$$v_{ij} = \frac{a_{ij}}{\sum_{k=1}^{n} a_{ik}} \quad i = 1,2,..,m; j = 1,2,..,n \quad (4)$$

These estimates and weights were used in formula (1) to evaluate overall quality of each alternative property and rank 15 properties. There was one rank reversal in the system: alternative A9 ($133) was preferred to A10 ($166.) Analysis by the real estate agent allowed to re-evaluate property A10 against criterion C3 (Construction Quality) as level 2, not 1. This change resolved the problem. The resulting rank ordering of alternatives is presented in Table 2.

TABLE 2. RANKING OF ALTERNATIVES USING THE SAW METHOD

A5	A14	A11	A13	A1	A15	A4	A8	A3	A2	A6	A10	A12	A9	A7
$712		$414				$309					$166		$133	

Evaluating Rent for Residential Properties

The "adjusted value" approach was used to estimate market price for each rental property. Let us illustrate the process of evaluating the amount of rent for the property using alternative A13. According to ranking (table 2), alternative 13 is better than alternative 4 (A4) but less preferable that alternative 11 (A11.) Using "proportional approach:"

$$P(A13)= 414-[(414-309)(.087-0.702)]/(0.087-0.064)=\$345.52$$

The "proportional" approach produced rent value for property A13 at \$345.52

Let evaluate the rent amount using the "adjusted value" procedure to ensure that the overall value of alternative A13 is close to corresponding values of A4 and A11 by less than 1% (d*=0.01.) First, criterion "Price" (C9) is added and alternative A13 is assigned the price equal to average of rents for A4 and A11: $P(A13)=[P(A4)+P(A11)]/2= (414+309)/2=\$361.5$

Next, criterion weights are re-calculated, adding 0.5 weight for price criterion and dividing by 2 all other criterion weights (so their sum will still equal to 1). All values are normalized using formula (4) except for "Price" as "Price" is the only criterion needed to be minimized. To achieve normalized values for a minimization criterion the following steps are carried out: 1) initial prices are normalized using formula (4); 2) the resulting value for each alternative is reversed by dividing it by the minimum among them; 3) the results are normalized again using formula (4). Overall value with "Price" criterion using the SAW method was 0.640 for A13, 0.665 for A11, and 0.694 for A4. Using these values in formula (3) the average relative distance *d* was calculated as -0.0559. The negative distance means that alternative A13 is on average less attractive than alternatives A11 and A4 with the rent of \$361.5. As the requirement is "less than 1% difference," the rent for A13 is re-adjusted for (lowered) to make A13 more attractive.

New price is calculated as $P'(A13)=P(A13)+dP(A13)=361.5+(-0.559)361.5=\$341.3$. This price is used instead of \$361.5 in the initial values. All other values are re-calculated. Overall there were three iterations with the resulting rent price of \$326.8 and relative distance of -0.71%.

The procedure was repeated for all fifteen properties. To evaluate the accuracy of the proposed approach, properties with known prices were also evaluated through the procedure. Real prices and prices assigned using "proportional" and "adjusted value" approaches are presented in table 3 below. The results show that the "adjusted value" approach provides on average more accurate results than the "proportional approach:" 12% average error compared to 21%, the difference is significant statistically at a 10% significance level with p-value in a t-test is equal to 0.08.

DISCUSSION AND CONCLUSION

The study proposed an integrated approach to property valuation based on the multicriteria decision making approach. The proposed method produced reasonable results from the point of view of the known property values. Rank order of alternatives produced reflected well the order of known rent values and allowed re-evaluation of one of the properties against one of the criteria. The "adjusted value" approach to assigning price to the property showed its good

potential in the application. Prices obtained through the "adjusted value" approach were much more accurate than the ones obtained through the "proportional" approach. The difference was statistically significant at a 10% level of significance.

TABLE 3. ACCURACY OF ASSIGNED RENT VALUES USING TWO APPROACHES

Alternative	Known Rent	Assigned rent approach		Difference by approach	
		"Proportional"	**"Adjusted Value"**	**"Proportional"**	**"Adjusted Value"**
A5	712	$536.66	$513.80	25%	28%
A11	414	$501.14	$406.74	21%	2%
A4	309	$236.15	$271.00	24%	12%
A3	214	$280.66	$234.00	31%	9%
A10	166	$150.49	$159.00	9%	4%
A9	133	$155.10	$155.24	17%	17%
		Average	Difference	21%	12%
		p-value	**for t-test**	**0.08**	

The study shows that using multiple criteria approach to property valuation is very promising. The average difference between known prices and their prediction through the "adjusted value" approach was around 12% which is much lower than the average of 30% for the most often used multiple linear regression approach, applied on the basis of large property data sets (Lentz and Wang, 1998.)

REFERENCES are available upon request from the first co-author

Extending the Vector Analytical Hierarchy Process Clustering Algorithm to Create More Coherent Subgroups

Andrew N. Arnette
Department of Business Information Technology
The R. B. Pamplin College of Business
Virginia Polytechnic Institute and State University
1007 Pamplin Hall, Blacksburg, VA 24061
540.231. 5051
aarnette@vt.edu

ABSTRACT

The Vector Analytical Hierarchy Process (VAHP) is an extension of the original Analytical Hierarchy Process that translates the decision-makers' preferences into geometric resultant unit vectors. VAHP is beneficial in the creation of subgroups based on these vectors, but has some inherent problems that are magnified in relation to the diversity of the population being analyzed. Use of the original VAHP clustering algorithm can leave a large number of decision-makers out of the meaningful clusters and makes the interpretation of subgroup preference vectors more difficult. This paper proposes four extensions to the VAHP clustering algorithm that result in more coherent and meaningful subgroup creation.

Track: Student Papers

INTRODUCTION

The Vector Analytical Hierarchy Process (VAHP) is an extension of the original Analytical Hierarchy Process that translates the decision-makers' preferences into geometric resultant unit vectors. This allows for visualization of the results on an n-dimensional sphere, as well as allowing for the utilization of geometric calculations to determine relationships between vectors and the creation of coherent subgroups of preference vectors. VAHP is beneficial in the creation of these subgroups, but has some inherent problems that are magnified in relation to the diversity of the population being analyzed. As the relationships between the vectors become more pronounced, the use of the original VAHP clustering algorithm leaves a large number of decision-makers out of the meaningful clusters and makes the interpretation of the similarities and differences between preference vectors more difficult. This paper proposes four extensions to the VAHP clustering algorithm that result in more coherent and meaningful subgroup creation.

ANALYTICAL HIERARCHY PROCESS

The Analytical Hierarchy Process (AHP) [8] is a multi-criteria decision making approach that is used to elicit priorities from groups of decision makers. AHP allows for the hierarchical arrangement of the objectives, goals, and attributes of the decision. Priorities for the elements are derived through a series of pair-wise comparisons between each of the elements at one level of the hierarchy. The use of AHP is widespread, demonstrating usefulness in a variety of disciplines, for example: forecasting [4], politics [9], education [10] and environmental impact assessment [6].

Two of the most popular social choice axioms have been evaluated in relation to AHP [7], geometric mean method (GMM) and the weighted arithmetic mean method (WAMM). It was argued that the GMM will not always satisfy the Pareto optimality axiom. This claim was refuted [3] and it was argued that this was irrelevant if the proper aggregation approach was selected. If the group is assumed to act together, then aggregation of individual judgments (AIJ) should be used; while if the members of the group are acting as individuals, then aggregation of individual priorities (AIP) should be used. In AIJ, the members of the group are assumed to be acting in the best interests of the whole, subjugating their own preferences so the group behaves as one. AIP should be used when a group is comprised of members representing a variety of opinions and it is unlikely that they will be able to reach a consensus. When using AIJ only the geometric mean can be used, while AIP group preferences can be computed using either the arithmetic or geometric mean [1]. Creating homogeneous subgroups from a heterogeneous group, which can be implemented using either AIP or AIJ, better reflects some of the variability in the individual preferences and the subgroup preference results more accurately reflect the opinions of the decision makers within each subgroup as opposed to the creation of preferences only for the group as a whole.

VECTOR ANALYTICAL HIERARCHY PROCESS

The application of the Analytic Hierarchy Process chosen for this research involves an extension of the traditional AHP approach that translates the pairwise comparisons into Euclidean vector space, providing geometric meaning to the results [11]. This methodology, referred to as the vector analytical hierarchy process (VAHP), creates preference vectors in multi-dimensional space, where the number of dimensions equals the number of different alternatives being considered. A preference vector is created for each respondent in the population as a resultant unit vector normalized to unit length of one, i.e.

$$V^T V = 1.\tag{1}$$

A measure of similarity between different decision makers' preferences can be represented by the cosine of the angle between two corresponding preference vectors, i.e.

$$(V^1)^T V^2 = \cos\alpha.\tag{2}$$

A cosine value of one represents complete agreement between the decision makers; the vectors are aligned and thus there is no angle between them. A group preference vector is computed through addition of the individual preference vectors. This group preference vector can then be normalized as a unit vector along the resultant vector such that

$$\hat{G}_j^{\,k} = \frac{\sum_{i\in C_k} V_j^i}{\sqrt{\sum_j^{\,n}(\sum_{i\in C_k} V_j^i)^2}}\tag{3}$$

which guarantees the vector is normalized to a length of one

$$(\hat{G}^{\,k})^T \hat{G} = 1.\tag{4}$$

In contrast, the AHP approach typically generates this single representative result for AIP by taking either the arithmetic or geometric mean of the collection of individual preference vectors [3]. The calculation used in VAHP is similar to the calculation of arithmetic mean, and produces similar results, but differs from the arithmetic mean due to the normalization in VAHP creating a vector that is unit length in n-dimensional space, as opposed to conventional AHP normalizing the results so the sum of the elements is equal to one [11].

Another benefit of using VAHP is that a measure of coherence for a cluster can be calculated. Coherence is the average dot product for all pairs of vectors in the cluster:

$$\rho = \left\langle V^i \bullet V^J \right\rangle = \left\langle (V^i)^T V^J \right\rangle \tag{5}$$

where (i, j = 1,..., N, i $\neq$ j) and $\langle \ \rangle$ implies average. A coherence value of one results from a cluster in which all preference vectors are aligned in the same direction. Additionally, a weighted average coherence value, χ_i, can be calculated for the collection of subgroups. This value is calculated as the sum of the coherence for each cluster weighted by the relative proportion of the population within that cluster, i.e.

$$\chi_i = \sum_{j=1}^{K_i} \frac{nj}{N} \rho^j \tag{6}$$

An algorithm for utilizing the VAHP individual resultant preference vectors and creating clusters of homogeneous decision makers has been developed [12]. The cluster unit vector can be compared to an individual decision maker's preference vector using the cosine calculation. Zahir provides an algorithm for creating clusters by comparing the cosine of an individual preference vector to a cluster's resultant unit vector based on a specified value, gamma.

At the outset of the algorithm all respondents are placed into the unassigned set. As respondents are assigned to clusters, they are removed from the unassigned set. The algorithm begins by randomly selecting one of the respondent vectors from the unassigned set and assigning it to be the first member of a new cluster. Another respondent vector is randomly chosen and compared to the cluster resultant unit vector. When there is only one member in a cluster the resultant unit vector for the cluster is equal to that respondent's unit vector. The calculation of similarity between the vectors, i.e. the cosine of the angle between them, is then computed and compared to the gamma level.

If this cosine value is less than the gamma level, the respondent is placed into the temporary set. The temporary set is comprised of respondent unit vectors that have been compared, and were not assigned, to the current cluster. Another respondent vector is then chosen from the unassigned set and the process is repeated until a respondent is chosen that has a cosine value greater than or equal to the gamma level, or until the unassigned set is emptied. If the unassigned set is empty, the current cluster is complete and all respondents in the temporary set are released back into the unassigned set, and the process begins for a new cluster.

If the cosine is greater than or equal to the gamma level, the respondent is added to the cluster and a new resultant unit vector is calculated for that cluster. All members of the temporary set are then released back into the unassigned set and the process is repeated until the cluster is complete. The algorithm continues until all respondents have been placed into clusters.

DATA COLLECTION

The data used in this paper was obtained at the first in a series of watershed nutrient planning and management workshops. A decision aid is being developed with the participation of the stakeholders from this watershed. These stakeholders have varied backgrounds and interests that are representative of the diverse population that exists within this watershed. Given this set of decision-makers, the problem of aggregation is very important and the AIP approach towards creating subgroup rankings is the logical choice.

The decision-makers were provided six sample objectives for the watershed and were then asked to take a few minutes and think of additional possible objectives. They were then randomly placed in groups of four or five for a discussion period. Following the small-group discussion period, each small group was asked to share one of its objectives. Two rounds of

sharing took place with objectives being recorded during the process. The participants then worked together as a group to combine similar objectives, reword objectives and reduce the list of possible objectives to a maximum of ten. The AHP survey was then created and distributed to the participants, the pairwise comparisons being presented in the same order to each participant.

CLUSTER GENERATION

The first step was to translate the participants' original pairwise comparisons into ten-dimensional Euclidean vector space and calculate a priority unit vector for each of the thirty-four respondents using the VAHP methodology [11]. Following this translation Zahir's clustering algorithm [12] was run 100 times for each of a set of different gamma values, with results found in Table 1 reflecting the average of these runs. The first gamma level employed was 0.99 and there were 4.52 multi-member clusters (i.e. clusters of size two or more) created with 23.27 respondents allocated to these clusters on average. This left an average of 10.73 respondents that were assigned to their own single-member clusters, representing a high percentage (31.5%) of our decision makers being left out of the meaningful mulit-member clusters. Coherence cannot be calculated for clusters of size one, thus the calculation of χ_i, the weighted average coherence, is not useful when a clustering structure contains singleton clusters. The coherence values shown in Table 1 are the unweighted average of the coherence values for the multi-member clusters. The unweighted average coherence does provide additional information regarding the clustering algorithm results, but is not useful for the analysis conducted in this paper.

Table 1
Results from Zahir's VAHP Clustering Algorithm (100 replications)

Gamma	Avg. Num of Multi-Member Clusters (Std Dev)	Avg. Multi-Member Cluster Size (Std Dev)	Avg. Multi-Member Max Cluster Size (Std Dev)	Avg. Num of Respondents in Multi-Member Clusters (Std Dev)	Avg. Num of Respondents in Single-Member Clusters (Std Dev)	Average Coherence (Unweighted) of Multi-Member Clusters (Std Dev)
0.98625	2.07 (0.6072)	13.71 (3.857)	24.34 (0.7683)	26.48 (0.9372)	7.52 (0.9372)	0.9848 (0.0014)
0.9875	2.52 (0.6587)	11.16 (4.4318)	22.37 (1.1069)	25.27 (1.0454)	8.73 (1.0454)	0.9880 (0.0016)
0.98875	3.55 (0.7437)	7.43 (1.5536)	17.9 (2.5564)	25.27 (1.0811)	8.73 (1.0811)	0.9880 (0.0008)
0.99	4.52 (0.8817)	5.31 (0.8938)	10.58 (2.6022)	23.27 (1.3322)	10.73 (1.3322)	0.9898 (0.0011)
0.99125	4.58 (0.9967)	4.07 (0.8993)	6.92 (1.6310)	17.81 (1.3157)	16.19 (1.3157)	0.9924 (0.0008)
0.9925	5.1 (0.4144)	3.06 (0.2167)	5.24 (0.6834)	15.53 (0.9583)	18.47 (0.9583)	0.9939 (0.0003)
0.99375	5 (0)	2.13 (0.0952)	2.66 (0.4761)	10.66 (0.4761)	23.34 (0.4761)	0.9956 (0.0002)

Additional runs of the algorithm were performed on gamma levels varying from 0.98625 to 0.99375 in increments of 0.00125. The results show that as the gamma level was decreased, fewer respondents were left out of multi-member clusters (7.52 at the lowest gamma level), fewer multi-member clusters were created (2.07) and one of the multi-member clusters typically was allocated a large number of respondents (24.34 of the 26.48 respondents placed into multi-member clusters at the 0.98625 gamma level were placed into a single subgroup). As the gamma level was increased the converse took place: more respondents were left out of multi-member clusters (23.34 at the highest gamma level), and though more multi-member clusters were created (5), they were comprised of only two or three respondents each. The unweighted average coherence increases as the gamma level is increased. This is to be expected because the clusters become more tightly-knit, resulting in the creation of smaller, more coherent subgroups.

EXTENSIONS TO ZAHIR'S CLUSTERING ALGORITHM

One of the issues that arise when using Zahir's clustering algorithm is that a large number of decision-makers can be left out of the meaningful clusters, those clusters which are composed of two or more respondents. Creation of homogeneous subgroups from a diverse group can be difficult to achieve using this algorithm. As Zahir's algorithm is run, respondents are randomly chosen as starting points for the new clusters. The algorithm then goes through each of the yet unassigned respondents and attempts to assign them to this new cluster if the measure of distance, the cosine of the angle between the vectors, is greater than or equal to the specified gamma level. If none of the other respondents are assigned to the new cluster this means that none of these respondents have priority vectors that are close enough to the starting point vector and the chosen starting point vector ends the algorithm as a single-member cluster. These singletons will not wind up in multi-member clusters unless the gamma value is decreased to a point where few large, less coherent clusters are created, which is antithetical to the rationale for using the algorithm.

Four extensions to Zahir's clustering algorithm were explored to resolve the singleton issue. The desired result of these extensions is to classify each of the respondents into meaningful mutli-member clusters that result in improved weighted average coherence values.

Extension 1: Combined Singleton Cluster

The first extension to Zahir's clustering algorithm involved combining all of the singleton respondents into one new cluster after the initial procedure was complete. All clusters of size one are thus eliminated and only multi-member clusters remain at the algorithm's completion. Eliminating the singleton clusters provides the ability to calculate a χ_i value for

the clustering structure. This extension was run 100 times for each gamma level and the

results are shown in Table 2.

Table 2
Results from Extension 1: Combined Singleton Cluster (100 replications)

Gamma	Avg. Num of Original Multi-Member Clusters (Std Dev)	Avg. Multi-Member Cluster Size (Std Dev)	Avg. Num of Respondents in Original Multi-Member Clusters (Std Dev)	Avg. Num of Respondents in the Singleton Cluster (Std Dev)	Avg. Coherence for Singleton Cluster	Avg. χ_i	Max χ_i
0.98625	2.07 (0.6237)	13.86 (4.1523)	26.59 (0.9438)	7.41 (0.9438)	0.9560 (0.0022)	0.9769 (0.0009)	0.9797
0.9875	2.56 (0.6247)	10.77 (3.9628)	25.28 (0.9957)	8.72 (0.9957)	0.9599 (0.0017)	0.9778 (0.0009)	0.9789
0.98875	3.45 (0.6256)	7.53 (1.2652)	25.25 (1.0766)	8.75 (1.0766)	0.9591 (0.0019)	0.9707 (0.0399)	0.9805
0.99	4.44 (0.808)	5.42 (0.8719)	23.42 (1.3347)	10.58 (1.3347)	0.9592 (0.0024)	0.9794 (0.0014)	0.9820
0.99125	4.57 (1.0076)	4.07 (0.8872)	17.79 (1.2972)	16.21 (1.2972)	0.9644 (0.0009)	0.9785 (0.0011)	0.9811
0.9925	5.06 (0.4887)	3.08 (0.2461)	15.49 (1.02)	18.51 (1.02)	0.9662 (0.0009)	0.9784 (0.0005)	0.9793
0.99375	5 (0)	2.12 (0.0989)	10.59 (0.4943)	23.41 (0.4943)	0.9689 (0.0002)	0.9771 (0.0002)	0.9773

The results show cluster sizes that are very similar to the original VAHP results. The size of

the singleton cluster, which corresponds to the number of single-member clusters in Table 1,

increases as the gamma level is increased. At the lowest gamma level there were 7.41

respondents on average in the singleton cluster, but these represent the most diverse set of

decision-makers and are the most distant from other respondents. As the gamma level is

increased more respondents are allocated to the singleton cluster, 23.41 at the highest gamma

level. These respondent vectors are closer to one another at the increased gamma level,

meaning the singleton cluster is no longer comprised of only the most extreme values and the

coherence increases as the gamma level increases. The results shown in Table 3 represent the

most coherent set of clusters, $\chi_i = 0.9820$ at the 0.99 gamma level, achieved through all runs

of this extension. Though the χ_i value is lower than the unweighted average coherence values

found in the runs of Zahir's original clustering algorithm, this is expected because the

measure of coherence now includes all respondents, not just the portion of closely-aligned

respondents classified previously.

Table 3
Most Coherent Set of Clusters from Extension 1

Cluster #	Number of Members	Coherence
1	7	0.9895
2	5	0.9884
3	5	0.9895
4	4	0.9901
5	2	0.9905
6	11	0.9663
	χ_i =	0.9820

This approach does have some problems. First, it retains the relationship between number of

clusters and size of clusters in regards to the gamma level that was found in the original

results. The average values shown in Table 1 and Table 2 are very similar and at the lowest

gamma level, there are few clusters being created, one of which is quite large. At the highest

gamma level, there are numerous small clusters being created and one large cluster for the

singletons. Though this approach does classify each of the respondents into clusters that can

now be used for further analysis the idea of placing all of the outlying respondents into one

cluster may not achieve the desired goal as they are only being placed into this new cluster

due to the distance that exists between these vectors and the other cluster resultant vectors.

This extension does not take the direction of the vectors into account and the singleton cluster

can be composed of vectors that are outliers in many different directions. This can be seen in

the singleton cluster (Cluster 6) shown in Table 3, which has the lowest coherence value

(0.9663) of the clusters created.

Extension 2: Incremental Gamma Reduction

The second extension of Zahir's clustering algorithm is based on the specified gamma level that is the means of assigning respondents to clusters. Instead of using a fixed gamma level throughout the clustering procedure, the algorithm now begins with the specified gamma level and creates clusters in the same manner as Zahir's original algorithm during this first iteration. When the algorithm finishes running at that gamma level, all respondents that are in single-member clusters are released back into the pool of unassigned respondents. All of the respondents placed into clusters of size two or more remain in these clusters. These clusters are randomly chosen as the starting points in the next iteration rather than selecting the starting points from the unassigned set. The gamma level is reduced at each iteration by a specified amount and the algorithm attempts to place the unassigned respondents into the existing clusters at the new, lower gamma level. The procedure repeats and the gamma level is reduced until all respondents have been placed into clusters.

This extension was run 100 times and each of the seven gamma levels previously used were chosen as the starting gamma values and the gamma reduction value was set to 0.00125. The results shown in Table 4 reflect the average values across the 100 runs at each gamma level. The most noticeable result is that the χ_i values are better than in the first extension at six of the seven starting gamma levels. This means that the clusters created in this extension were more coherent. Additionally, the average final gamma level for each of the different starting gamma levels was very similar. This means that no matter what gamma level is chosen as the starting point, the value will be reduced to nearly the same value before all respondents are classified.

Table 4
Results from Extension 2: Incremental Gamma Reduction (100 replications)

Starting Gamma	Avg. Final Gamma (Std Dev)	Avg. Num of Clusters (Std Dev)	Avg. Cluster Size (Std Dev)	Avg. Max Cluster Size (Std Dev)	Avg. Num Assigned at Starting Gamma (Std Dev)	Avg. χ_i (Std Dev)	Max χ_i
0.98625	0.9657 (0.0047)	1.93 (0.4552)	18.81 (5.7873)	29.42 (1.9132)	26.37 (0.8487)	0.9766 (0.0019)	0.9804
0.9875	0.9646 (0.0035)	2.71 (0.456)	12.98 (2.5843)	26.72 (1.9336)	25.67 (0.9107)	0.9777 (0.0016)	0.9788
0.98875	0.9656 (0.0032)	3.4 (0.6667)	10.43 (2.3233)	22.01 (3.6251)	25.17 (1.083)	0.9791 (0.0014)	0.9818
0.99	0.9673 (0.0034)	4.52 (0.9831)	7.80 (1.4545)	13.44 (3.2359)	23.15 (1.2743)	0.981 (0.001)	0.9832
0.99125	0.9658 (0.0035)	4.64 (1.0301)	7.75 (1.9679)	13.16 (3.3173)	18.1 (1.4249)	0.98 (0.0014)	0.9834
0.9925	0.9650 (0.0042)	4.99 (0.438)	6.87 (0.6356)	12.53 (2.6722)	15.52 (0.9585)	0.9801 (0.0008)	0.9822
0.99375	0.9653 (0.0033)	5 (0)	6.8 (0)	12.37 (2.4148)	10.6 (0.4924)	0.9780 (0.0008)	0.9814

As in the original runs of Zahir's original algorithm and the first extension, the results show that at the lower gamma levels there is one large cluster comprised of the most moderately spaced vectors created, the average size is 29.42 at the lowest gamma level, and the most similar outlying values were placed into one or two small clusters. Additionally, at the lowest gamma level there was only one cluster created for the entire set of respondents 12% of the time. As the gamma level is increased, more clusters were created and the maximum cluster size decreases. The best χ_i value found in this extension, 0.9834 at the starting gamma level of 0.99125, is an improvement over the value obtained in the first extension and these results are shown in Table 5. The improved coherence is due to the outlying respondent vectors being assigned to the cluster they most closely resemble, rather than simply grouping the outlying vectors together. The seven clusters created all have coherence values that are better than the singleton cluster found in the previous extension, and two of the subgroups

created in this approach have higher coherence values than the best subgroup coherence value in Table 3. This extension yields more coherent clusters than the first extension and is an additional improvement on Zahir's original algorithm.

Table 5
Most Coherent Set of Clusters from Extension 2

Cluster #	Number of Members	Coherence
1	9	0.9792
2	5	0.9891
3	3	0.9884
4	9	0.9756
5	4	0.9900
6	2	0.9949
7	2	0.9919
	$\chi_i =$	0.9834

Extension 3: VAHP & K-Means (Traditional K-Means Distance Calculation)

What if the organizers of this watershed management project wanted to use a certain number of subgroups and use the VAHP clustering algorithm? Zahir's clustering algorithm does not provide any mechanism for specifying the number of clusters desired. Previous research [2] has provided a metric for the expected number of clusters for a given data set based on the size of the ensemble. With thirty-four respondents in this data set there are 6.05 clusters expected. In Zahir's original algorithm the best unweighted average coherence was achieved at the 0.99375 gamma level and was comprised of five good clusters, each of which contained two members. This left twenty-four single-member clusters that were created for a total of twenty-nine clusters in the most coherent run. In the first extension the highest χ_i value was found for six clusters and the second extension had seven clusters at which the best χ_i value was achieved. These extensions thus yield more acceptable numbers of clusters than in the original algorithm, but they don't allow the respondents to be placed into a specified number of clusters.

K-means [5] is a widely-used algorithm for clustering data due to its efficiency. K-means allows a user to specify the number of clusters to be created from a data set. Starting points for each cluster are randomly chosen and a distance measure is calculated between each data point and each cluster starting point. The data point is then assigned to the cluster to which it has the shortest distance. After all of the data points are assigned to clusters, new middle points for each cluster are calculated and the process is repeated again, reassigning a data point to a new cluster if there is a distance value between the data point and another cluster middle point that is shorter than the distance to the cluster which it is currently assigned. The algorithm continues until convergence is achieved and no data points are reassigned.

The third extension of Zahir's VAHP uses the k-means algorithm to classify the respondent vectors into a specified number of clusters. The cluster mid-points were calculated as the resultant unit vector. The distance values were calculated as the square root of the sum of the squared distances between the respondent vector and the resultant unit vector for each of the ten component objective values, i.e.

$$d(u_i, u_j) = \left(\sum_{k=1}^{10} (u_{ik} - u_{jk})^2 \right)^{1/2}, \forall u_i, u_j \tag{7}$$

This combines the traditional k-means distance calculation while maintaining the correct calculation of cluster resultant unit vectors.

This algorithm was run for sets of clusters ranging in size from two to six, with 1000 runs for each value of k. Six was chosen as the maximum number of clusters based on the calculation above. The results are found in Table 6 and show some similarities to the previous results. At k=2 there were two clusters created, one large (30 members) and one small (4 members). As the value of k increases the sizes of the clusters become more evenly distributed and the total distance calculated decreases. At k=5 and k=6, the values of χ_i are greater than values

found in the previous extensions. Thus the k-means approach is producing more coherent clusters than the previous extensions in addition to allowing the number of clusters to be specified. Results for the most coherent set of clusters at k=6 with a χ_i value of 0.9850 are found in Table 7.

Table 6
Results from Extension 3: VAHP + k-Means (Traditional Distance Calculation)

Num. of Clusters	Cluster Sizes	Total Distance	χ_i
2	30, 4	4.7688	0.9781
3	4, 18, 12	4.3795	0.9807
4	10, 9, 4, 11	4.0921	0.9826
5	4, 12, 7, 7, 4	3.8518	0.9840
6	3, 7, 7, 6, 6, 5	3.6539	0.9850

Table 7
Most Coherent Set of Clusters from Extension 3

Cluster #	Number of Members	Coherence
1	3	0.9787
2	7	0.9880
3	7	0.9841
4	6	0.9882
5	6	0.9808
6	5	0.9873
	$\chi_i =$	0.9850

Extension 4: VAHP & K-Means (VAHP Cosine Distance Calculation)

The final extension to Zahir's VAHP clustering algorithm also incorporates the k-means methodology. Instead of calculating distance based on the numeric distance between each component of the vectors, this extension uses a variation on the calculation of distance utilized in Zahir's algorithm. The cosine value represents the distance between the respondent vector and the resultant unit vector for a cluster. The higher the value of the cosine the closer the vectors are to one another and a value of one represents complete agreement between the vectors. K-means seeks to classify the data points based on the shortest distance, which is calculated as one minus cosine in this extension.

Similar to the previous k-means combination approach, this extension was run with values of

k ranging from two to six. The results are shown in Table 8. Again, as the number of

clusters is increased, the sizes of the clusters become more evenly distributed and the total

distance is minimized. However, this approach did not yield more coherent clusters than the

previous extension. At k=2 the values for coherence are equal because the clusters are the

exact same, but at every other level of k the coherence is worse than previous results using

the traditional k-means distance calculation and only at k=6 does the weighted average

coherence (0.9840) improve upon the incremental gamma reduction extension. The set of

clusters created for k=6 are shown in Table 9.

These lower coherence values were unexpected as cosine is the measure of distance used in

the original classification algorithm. The traditional k-means distance calculation created

more coherent clusters than the cosine calculation did. This shows that there may be some

deficit in using the cosine calculation for subgroup creation in VAHP.

Table 8
Results from Extension 4: VAHP + k-Means (Cosine Distance Calculation)

Num. of Clusters	Cluster Sizes	Total Distance	χ_i
2	4, 30	0.3508	0.9781
3	4, 13, 17	0.2989	0.9807
4	9, 9, 4, 12	0.2641	0.9823
5	10, 8, 10, 3, 3	0.2468	0.9831
6	6, 8, 4, 5, 3, 8	0.2257	0.9840

Table 9
Most Coherent Set of Clusters from Extension 4

Cluster #	Number of Members	Coherence
1	6	0.9882
2	8	0.9816
3	4	0.9746
4	5	0.9879
5	3	0.9892
6	8	0.9834
	$\chi_i =$	0.9840

CONCLUSIONS

The creation of meaningful homogeneous subgroups when implementing AHP can prove very beneficial. These subgroups can be created based on external criteria, such as the occupations or affiliations of the respondents used in this data set. However, these external criteria may not correspond to the actual preferences of the respondents and the set of clusters created based on these external criteria had a χ_i value of 0.9743 (Table 10), a value that is much lower than any coherence value found in the four extensions. The derivation of subgroups based on the respondents' actual preferences is more beneficial in the creation of like-minded subgroups. VAHP provides the geometric calculations that can be used in the creation of subgroups from the respondent unit vectors.

Table 10
Coherence Values for VAHP Preferences for Clusters Based on Occupations/Affiliations

Cluster #	Number of Members	Coherence
1	5	0.9634
2	10	0.9755
3	9	0.9705
4	10	0.9821
$\chi_i =$		0.9743

However, the creation of homogeneous subgroups can be difficult to achieve when working with a heterogeneous data set. As the diversity of the respondent population increases, the farther the vectors lie from one another in the vector space, making the creation of subgroups more problematic when using the original clustering algorithm provided by Zahir. The use of a specified value, gamma, in creation of the subgroups can prove inadequate. If the value is placed too low, few subgroups are created with large numbers of respondents within. If the value is too high, then numerous subgroups are created with only a few decision-makers in each. And in some cases, such as the data set used in this paper, the diversity of the population is so great that even at those different gamma values a large number of

respondents are being assigned to their own individual clusters of size one. These single-member clusters are not beneficial in the creation of meaningful subgroups. Subgroup creation can be very important when working with a population of stakeholders over time, such as the watershed planning project from which this data set is taken. The subgroups will be used for various focus group activities, future workshops, discussions and continued analysis through the life of the project. Creating numerous single-member subgroups does not assist this future work.

The creation of meaningful subgroups has been extended through four methods in this paper. The first extension created an additional subgroup to which all of the single-member cluster respondents were allocated. This extension ignores the direction in which the outlying vectors are pointing, resulting in the lowest coherence for this additional cluster. The second extension reduces the gamma level at each step of the algorithm until all respondents have been placed into clusters. This extension was an improvement in the coherence of the subgroups. However, this extension, as in the first extension, still depends on the gamma level chosen to start the algorithm and this choice can impact the size of the groups. At higher gamma levels there were many smaller clusters created, and at lower gamma levels there was one large cluster and one or two smaller clusters.

Creating clusters through the integration of k-means into the VAHP clustering process resulted in the highest coherence levels of the extensions. The third extension of the original algorithm integrated k-means and was based on the traditional k-means distance calculation, while the fourth extension used a variation on the cosine calculation to create the subgroups. Interestingly, the most coherent subgroups of the four extensions were created using the traditional distance calculation. This was the only extension that did not utilize the cosine of

the angle between the vectors for classification. This result could be due to the randomized starting points chosen for the subgroups, or it could have been related to the distribution of preference vectors and number of objectives in this data set. Further research on different data sets could provide more detail regarding the differing performance between the two k-means extensions.

Comparing the rankings for the most coherent runs for each extension (Tables 11- 14) it is interesting to note the changes in the rankings as the weighted average coherence of subgroups changes. For Extension 1, which had the lowest coherence of the four extensions, four of the six subgroups agreed that Objective 9 was the most important. Objective 9 was ranked as the most important by four of the seven subgroups in Extension 2, one of the six subgroups in Extension 3 and two of the six subgroups in Extension 4. The lowest ranking for Objective 9 is sixth in Extension 1, fifth in Extension 2 and ninth in Extensions 3 and 4. As the weighted average coherence of the subgroups increases Objective 9 becomes less popular as the number one choice for subgroups and it also finds lower rankings amongst the subgroups. Similar differences amongst the objective rankings can be seen in the four tables. More coherent subgroups provide greater detail about the variation of opinion that exists within the entire group, information that is lost when using less coherent subgroups.

When creating a set of subgroups for a new data set using VAHP it is advisable to employ the most coherent subgroups possible. Creating more coherent subgroups reduces the variation within each subgroup, providing stronger definition for the subgroup priorities. Finding the most coherent subgroups may involve trial and error and utilizing more than one, or all, of these extensions as the results may vary depending on size of the population, diversity of the population, and the number of objectives being considered. Creating these subgroups

provides more information regarding the population than looking at a single overall set of results. The subgroups describe the variation that exists within the population, and this information can be very beneficial to future decision making by the stakeholders.

Table 11
Rankings for Most Coherent Set of Clusters from Extension 1

Cluster	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6	Obj. 7	Obj. 8	Obj. 9	Obj. 10
1	5	10	9	6	1	8	7	4	3	2
2	7	9	6	3	2	5	4	10	1	8
3	4	9	7	8	3	6	5	10	1	2
4	3	10	6	9	2	4	7	8	1	5
5	2	7	8	3	10	4	6	9	1	5
6	8	9	10	3	4	7	1	5	6	2

Table 12
Rankings for Most Coherent Set of Clusters from Extension 2

Cluster	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6	Obj. 7	Obj. 8	Obj. 9	Obj. 10
1	5	8	10	7	6	9	4	3	1	2
2	5	10	9	6	1	8	7	4	3	2
3	5	9	3	8	2	4	7	10	1	6
4	10	9	8	1	2	4	3	7	5	6
5	4	8	5	7	3	9	6	10	2	1
6	5	9	7	8	4	6	2	10	1	3
7	2	8	10	9	3	4	6	7	1	5

Table 13
Most Coherent Set of Clusters from Extension 3

Cluster	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6	Obj. 7	Obj. 8	Obj. 9	Obj. 10
1	10	6	8	1	5	4	2	3	9	7
2	4	9	8	7	3	6	5	10	1	2
3	5	10	9	8	1	7	6	3	2	4
4	8	9	7	2	1	6	5	10	3	4
5	6	7	10	5	9	8	3	4	2	1
6	3	9	4	8	1	5	7	10	2	6

Table 14
Rankings for Most Coherent Set of Clusters from Extension 4

Cluster	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6	Obj. 7	Obj. 8	Obj. 9	Obj. 10
1	7	9	8	3	1	5	4	10	2	6
2	2	9	5	8	4	6	7	10	1	3
3	10	6	8	2	7	5	1	3	9	4
4	4	10	7	6	2	8	5	9	3	1
5	5	10	8	7	4	6	2	9	1	3
6	5	9	10	8	1	6	7	4	2	3

REFERENCES

[1] Aczel, J. and Roberts, F.S. On the Possible Merging Functions, *Mathematical Social Sciences*, 1989, 17, 205-243.

[2] Botbol, J.M. 1989. Multivariate Clustering Based on Entropy. US Geological Survey, US Department of Interior

[3] Forman, E. and K. Peniwati. Aggregating Individual Judgments and Priorities With the Analytic Hierarchy Process. *European Journal of Operational Research*, 1998, 108, 165-169.

[4] MacCormac, E.R. Forecasting Loads and Designing Rates for Electric Utilities. *Applications of the Analytic Hierarchy Process*, Springer-Verlag, New York, 1989, 171-181.

[5] MacQueen, J.B. Some Methods for Classification and Analysis of Multivariate Observations. *Proceedings of the 5th Berkeley Symposium on Mathematical Statistics and Probability*, Berkeley, University of California Press, 1967, 1, 281-297

[6] Ramanathan, R. A Note on the Use of the Analytic Hierarchy Process for Environmental Impact Assessment. *Journal of Environmental Management*, 2001, 63, 27-35.

[7] Ramanathan, R. and Ganesh, L.S. Group Preference Aggregation Methods Employed in AHP: An Evaluation and an Intrinsic Process for Deriving Members Weightages. *European Journal of Operational Research*, 1994, 79: 249-265.

[8] Saaty, T.L. How to Make a Decision: The Analytic Hierarchy Process. *European Journal of Operational Research*, 1990, 48: 9-26.

[9] Saaty, T.L. and Bennett, J.P. A Theory of Analytical Hierarchies Applied to Political Candidacy. *Behavioral Sciences*, 1977, 22, 237-245.

[10] Saaty, T.L. and Rogers, P.C. Higher Education in the United States (1985-2000): Scenario Construction Using a Hierarchical Framework with Eigenvector Weighting. *Socio-Economic Planning Sciences*, 1976, 10, 251-263.

[11] Zahir, Sajjad. Geometry of Decision Making and the Vector Space Formulation of the Analytical Hierarchy Process. *European Journal of Operational Research*, 1999, 112, 373-396.

[12] Zahir, Sajjad. 1999. Clusters in a Group: Decision Making in the Vector Space Formulation of the Analytic Hierarchy Process. *European Journal of Operational Research*, 1999, 112, 620-634.

CAN INFORMATION TECHNOLOGY PROJECT MANAGERS INCREASE THEIR PROJECT SUCCESS THROUGH THE USE OF POLITICAL SKILL?

Jennifer E. Gerow, Department of Management, Clemson University, 101 Sirrine Hall, Clemson, SC 29634, (864) 656-2011, jgerow@clemson.edu

ABSTRACT

This is a conceptual/theoretical article that is intended to lay the groundwork for future empirical research that will answer the question, "Does higher political skill by the project manager lead to greater project success from the perspective of the project sponsor and project team?" A model is proposed to show how job performance, organizational structure, and project risk are important mediators/moderators between political skill and project success. The motivation for this research is the critical role of successfully implementing IT strategic initiatives in order to continually renew organizations through project management. By using political skill, IT project managers can increase the success rate of their IT projects, thereby allowing organizations to receive positive returns from their investments.

INTRODUCTION

A central theme within the business environment in the 21st century is the significant role of project management in continually renewing the organization by implementing information technology (IT) strategic initiatives. While businesses are spending 50% of their nominal capital on IT spending [6] [20], project management difficulties and outright failures within the IT arena are numerous [28]. Evidence suggests IT investments fail to deliver their expected returns 40% of the time [6] which costs US businesses about $75 billion each year [20]. Further, 18% of IT projects were canceled even before completing the development cycle [43].

So why is there such a high rate of failure? While the potential reasons are numerous, a central theme of the practitioner journals is the importance of interpersonal skills and "influencing the organization" through power and politics [1]. This area of study is essential because successful projects not only generate a positive reputation for the project manager [30] but also lead to additional compensation, special projects, or other leadership roles [3]. Considering the importance of the issue, too few studies have considered the specific topic of project management in the context of analyzing political skill [e.g. 7] [13] while fewer have focused on projects as a general context [e.g. 3] [4] [27] [30] [31]. Further, no studies have considered political skill as the driver of project success.

In order to address the importance of political skill in project management, this research endeavor seeks to answer the following question:

> *Does higher political skill by the project manager lead to greater project success from the perspective of the project sponsor and project team?*

BACKGROUND

The practitioner literature has a dominant theme that focuses on the importance of project managers possessing interpersonal skills that can be used to effectively influence the organization through power and politics [1] [2]. These interpersonal skills are critical because involving stakeholders during IS design is both important and difficult, as indicated in the literature [e.g. 29]. As IT projects continue to grow in size and complexity, there is an increased interdependence between the various stakeholders and the project manager [44]. The difficulty in getting the required stakeholder involvement is amplified because multiple stakeholders have competing goals over how the end product must be engaged [23] [35]. Furthermore, the deep application-specific knowledge required to successfully build most large and complex applications is thinly spread throughout the user community [10] making knowledge extraction, collection, distribution, storage, and retrieval extremely difficult [38].
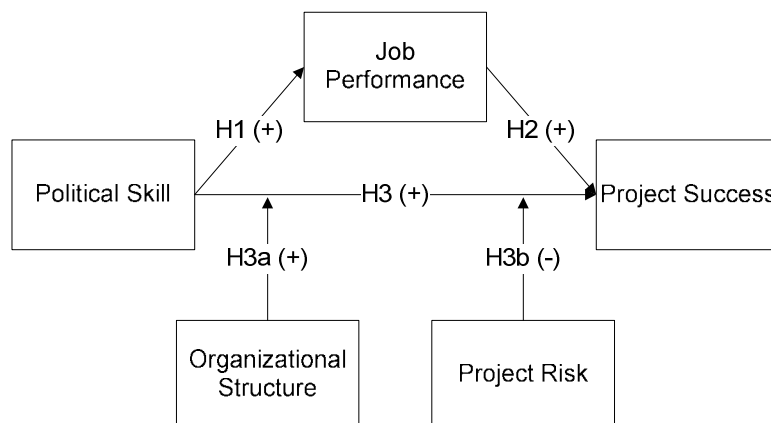
This increased interaction between stakeholders and IT personnel is viewed as a social process where participants exchange their views and expectations about the project and the IT project team responds by attempting to synthesize the knowledge into a viable solution [e.g. 39]. Conflicts and politics occur during the design process when there are resource pressures, time constraints, or disagreements over system specification or deliverable priorities. If the conflicts are handled improperly, it could result in an end product that is less useful than promised and, consequently, user rejection or subversion [e.g. 42]. On the other hand, conflict that is dialectic or educational in nature can result in team members learning from each other so the team is more effective [20] [32]. Thus, the success of an IT project is related to the ability to apply political skills for managing conflict and achieving consensus over a shared set of specifications.

The rest of the article is organized as follows. The next section describes the constructs, theoretical model, and hypotheses developed from the extant literatures. The paper concludes with discussion of the potential implications of this research.

THEORETICAL MODEL AND HYPOTHESES

The following model is informed and developed through the organizational behavior and human resource literatures.

FIGURE 1: THEORETICAL MODEL OF POLITICAL SKILL ON PROJECT SUCCESS

Political Skill
Political skill and its attributes are learned and developed over time through training and socialization [15] [33] [45]. Individuals with high political skill utilize interpersonal skills to effectively influence others through persuasion, manipulation, negotiation, and motivation [3] [4] [12-14] [24] [25] [27]. Political skills can also be used by project managers to inspire trust and confidence in their leadership through sincerity and an engaging manner [4] [11] [13] [45]. Further, those with high political skill possess strong social interaction abilities including personal magnetism, assertiveness, networking, communication, and mediation [9] [13] [15] [24] [27] [31].

Job Performance
Job performance is defined by both objective (task performance) and subjective (contextual performance) measures [15] [19] [25]. Task performance includes the formally prescribed, substantive tasks and duties that are the core technical responsibilities tied to the position [15] [19] [25]. Contextual performance, on the other hand, is not formal or required but valued by the organization because it encompasses the social, organizational, and psychological environment in which the task is performed [8] [15] [19] [25]. Job performance is often measured through self-reports and/or supervisor evaluations [e.g. 17] [18] [25] and can include the individual's goals, competence, professionalism, interpersonal skills, contribution, and achievement in the workplace [4] [17] [19] [41].

Previous research [e.g. 3] [14] [34] indicates individuals with high political skills are likely to present their work in the best possible light in order to influence management's evaluation of their work [13]. Therefore, I propose:

> *Hypothesis 1*: Project managers with a higher level of political skill are more likely to have higher job performance evaluations.

Project Success
Project success is the degree to which the pre-arranged time, cost, scope, and quality requirements have been met at the end of the project. If the project schedule is completed as agreed-upon by all parties, the time component is a success. If the original cost of the project is equal to or less than the value all parties agreed to support, the cost portion is considered successful. When the agreed-upon products, services, and results are achieved at the end of the project, the scope of the project is a success. Finally, the quality component is a success when the original requirements set at the beginning of the project are fulfilled at project completion [1].

Project managers that set goals and then achieve these goals in order to receive higher performance evaluations [4] [41] are also more likely to take the extra step needed to make the project successful. Therefore, I expect:

> *Hypothesis 2*: Project managers with higher job performance evaluations are more likely to have a higher level of project success as judged by project sponsors and project teams.

Through effective leadership, negotiation, communication, motivation, and positively influencing others in the organization, project managers are able to gather information more quickly and mobilize support for their project [4]. By properly utilizing this support, these managers are more likely to deliver the product, service or result according to the pre-arranged requirements and within the project deadline. This is expressed as follows:

> *Hypothesis 3*: Project managers with higher political skill are more likely to have a higher level of project success as judged by project sponsors and project teams.

Organizational Structure
The organizational structure is the structure of the performing organization and can constrain or enhance the individual's control of the project. This structure ranges from projectized to functional. In a projectized structure, resources are dedicated to projects and project managers have total authority over the project. A functional structure, on the other hand, does not have individuals assigned to a specific project. Instead, employees are grouped by specialty, projects exist but are limited by functionality, and project decisions must be sent up the organizational hierarchy for authorization. In between these two extremes are matrix organizational structures. In the weak matrix structure, the project manager is a coordinator or expeditor as opposed to a manager. In the balanced matrix structure, the organization sees a need for a project manager but doesn't give that individual full power or project funding. The strong matrix structure is more like the projectized structure, so there is a full-time project manager with a certain level of power. Most organizations use a combination of these structures at various levels, called a composite structure [1].

Despite the desire for the project manager to persuade, manipulate, and negotiate for enhanced control, it is less likely an individual can actually achieve this control in organizations with a functional structure. But it is more likely these same individuals could achieve their desired level of control in a projectized environment due to the nature of the organizational structure. Hence:

> *Hypothesis 3a*: Organizational structures that are more projectized (with full authority given to the project manager) strengthen the association between a project manager's political skill and project success.

Project Risk
Project risks include both external and internal factors that are out of the control of the project manager [21] [40]. External risk factors involve both unexpected environmental conditions (e.g. water, fire, or service failure) [37] and marketplace conditions at the time the project is completed. Marketplace conditions encompass any unexpected changes in the types of products, services, and results available in the marketplace or environment [1] [21]. These conditions can include changes in how technology is integrated both within and across organizations as well as the hard-to-predict market appeal of customer-facing processes [16]. Internal risk factors include unexpected technical issues (e.g. hardware or software problems), licensing issues, or changes in available technical support due to new technology [21] [22]. They also include lack of top management involvement or commitment due to a lack of understanding about how the technology works [5] [21] [26] [37].

While successful projects are often defined by the degree of improvement in the organization's position or whether or not the new product, service, or result allows the company to defend its position [36], the success is also mitigated by whether or not any internal problems that surface can be addressed and the degree to which the rest of the market responds to the new offering. For example, if other organizations or individuals introduce the same or a better product, service, or result, the project will not give the organization a competitive advantage (i.e. loss of first-mover advantage) and the project will often not be considered successful [16]. Hence, I propose:

> *Hypothesis 3b*: Project risk will weaken the relationship between political skill and project success for project managers.

CONCLUSION

This paper initially made the case for the importance of the IT project manager's political skill in successful project implementation as perceived by the sponsor and project team. Through the proper use of effective leadership, negotiation, communication, motivation, and positively influencing others in the organization, I propose project managers will gain the necessary stakeholder involvement and increase the success rate of their IT projects. Through this success, businesses are less likely to lose their invested capital because the system will deliver the expected quality and results so end-users will be able to exploit the system.

REFERENCES

[1]   *A Guide to the Project Management Body of Knowledge: PMBOK Guide*, 3rd ed. Newtown Square, PA: Project Management Institute, Inc., 2004.

[2]   *A Guide to the Project Management Body of Knowledge: PMBOK Guide*, 2nd ed. Newtown Square, PA: Project Management Institute, Inc., 2000.

[3]   Ahearn K.K., Ferris G.R., Hochwarter W.A., Douglas C. and Ammeter A.P. Leader Political Skill and Team Performance. *Journal of Management*, 2004, 30(3), 309-327.

[4]   Ammeter A.P., Douglas C.G., W.L., Hochwarter W.A. and Ferris G.R. Toward a Political Theory of Leadership. *The Leadership Quarterly*, 2002, 13(6), 751-796.

[5]   Barki H., Rivard S. and Talbot J. Toward an Assessment of Software Development Risk. *Journal of Management Information Systems*, 1993, 10(2), 203-225.

[6]   Benko C. and McFarlan W. *Connecting the Dots: Aligning Projects with Objectives in Unpredictable Times*. Boston, MA: Harvard Business School Press, 2003.

[7]   Bloomfield B.P. and Danieli A. The Role of Management Consultants in the Development of Information Technology: The Indissoluble Nature of Socio-Political and Technical Skills. *Journal of Management Studies*, 1995, 32(1), 23-46.

[8]   Borman W.C. and Motowidlo S.J. Expanding the Criterion Domain to Include Elements of Contextual Performance. In: Schmitt N. and Borman W.C. (Eds), Personnel Selection. Jossey-Bass, San Francisco, 1993, pp. 71-98.

[9]   Christiansen N., Villanova P. and Mikulay S. Political Influence Compatibility: Fitting the Person to the Climate. *Journal of Organizational Behavior*, 1997, 18(6), 709-730.

[10]   Curtis B., Krasner H. and Iscoe N. A Field Study of the Software Design Process for Large Systems. *Communications of the ACM*, 1988, 31(11), 1268-1287.

[11]   Davis W.D. and Gardner W.L. Perceptions of Politics and Organizational Cynicism: An
         Attributional and Leader-Member Exchange Perspective. *The Leadership Quarterly*,
         2004, 15(4), 439-465.
[12]   Ferris G.R. and Judge T.A. Personnel/Human Resources Management: A Political
         Influence Perspective. *Journal of Management*, 1991, 17(2), 447-488.
[13]   Ferris G.R., Perrewe P.L., Anthony W.P. and Gilmore D.C. Political Skill at Work.
         Organizational Dynamics, 2000, 28(4), 25-37.
[14]   Ferris G.R., Treadway D.C., Kolodinsky R.W., Hochwarter W.A., Kacmar C., Douglas
         C. and Frink D.D. Development and Validation of the Political Skill Inventory. *Journal
         of Management*, 2005, 31(1), 126-152.
[15]   Ferris G.R., Treadway D.C., Perrewe P.L., Brouer R.L., Douglas C. and Lux S. Political
         Skill in Organizations. *Journal of Management*, 2007, 33(3), 290-320.
[16]   Fichman R.G., Keil M. and Tiwana A. Beyond Valuation: "Options Thinking" in IT
         Project Management. *California Management Review*, 2005, 47(2), 74-96.
[17]   Harris K.J., Kacmar K.M., Zivnuska S. and Shaw J.D. The Impact of Political Skill on
         Impression Management Effectiveness. *Journal of Applied Psychology*, 2007, 92(1), 278-
         285.
[18]   Hochwarter W.A., Ferris G.R., Zinko R., Arnell B. and James M. Reputation as a
         Moderator of Political Behavior - Work Outcomes Relationships: A Two-Study
         Investigation with Convergent Results. *Journal of Applied Psychology*, 2007, 92(2), 567-
         576.
[19]   Jawahar I.M., Meurs J.A., Ferris G.R. and Hochwarter W.A. Self-Efficacy and Political
         Skill as Comparative Predictors of Task and Contextual Performance: A Two-Study
         Constructive Replication. *Human Performance*, 2008, 21(2), 138-157.
[20]   Kasi V., Keil M., Mathiassen L. and Pedersen K. The Post Mortem Paradox: A Delphi
         Study of IT Specialist Perceptions. *European Journal of Information Systems*, 2008,
         17(1), 62-78.
[21]   Keil M., Cule P.E., Lyytinen K. and Schmidt R.C. A Framework for Identifying Software
         Project Risks. *Communications of the ACM*, 1998, 41(11), 76-83.
[22]   Keil M. and Robey D. Turning Around Troubled Software Projects: An Exploratory
         Study of the Deescalation of Commitment to Failing Courses of Action. *Journal of
         Management Information Systems*, 1999, 15(4), 63-87.
[23]   Kirsch L.J. The Management of Complex Tasks in Organizations: Controlling the
         Systems Development Process. *Organization Science*, 1996, 7(1), 1-21.
[24]   Klein J.I. The Myth of the Corporate Political Jungle: Politicization as a Political
         Strategy. *Journal of Management Studies*, 1988, 25(1), 1-12.
[25]   Kolodinsky R.W., Treadway D.C. and Ferris G.R. Political Skill and Influence
         Effectiveness: Testing Portions of an Expanded Ferris and Judge (1991) Model. *Human
         Relations*, 2007, 60(12), 1747-1777.
[26]   Kutsch E. and Hall M. Intervening Conditions on the Management of Project Risk:
         Dealing with Uncertainty in Information Technology Projects. *International Journal of
         Project Management*, 2005, 23(8), 591-599.
[27]   Lerouge C., Newton S. and Blanton J.E. Exploring the Systems Analyst Skill Set:
         Perceptions, Preferences, Age, and Gender. *Journal of Computer Information Systems*,
         2005, 45(3), 12-23.

[28] Markus M.L. and Keil M. If We Build It, They Will Come: Designing Information Systems That People Want to Use. *Sloan Management Review*, 1994, 35(4), 11-25.

[29] Markus M.L. and Mao J. Participation in Development and Implementation - Updating an Old, Tired Concept for Today's IS Contexts. *Journal of the Association for Information Systems*, 2004, 5(11/12), 514-544.

[30] Novicevic M.M. and Harvey M.G. The Political Role of Corporate Human Resource Management in Strategic Global Leadership Development. *The Leadership Quarterly*, 2004, 15(4), 569-588.

[31] Peled A. Politicking for Success: The Missing Skill. *The Leadership and Organization Development Journal*, 2000, 21(1), 20-29.

[32] Pelled L.H. and Adler P.S. Antecedents of Intergroup Conflict in Multifunctional Product Development Teams: A Conceptual Model. *IEEE Transactions on Engineering Management*, 1994, 41(1), 21-28.

[33] Perrewe P.L., Ferris G.R., Frink D.D. and Anthony W.P. Political Skill: An Antidote for Workplace Stressors. *Academy of Management Executive*, 2000, 14(3), 115-123.

[34] Perrewe P.L., Zellars K.L., Ferris G.R., Rossi A.M., Kacmar C.J. and Ralston D.A. Neutralizing Job Stressors: Political Skill as an Antidote to the Dysfunctional Consequences of Role Conflict. *Academy of Management Journal*, 2004, 47(1), 141-152.

[35] Pinto J.K. and Slevin D.P. Project Success: Definitions and Measurement Techniques. *Project Management Journal*, 1988, 19(1), 67-72.

[36] Porter M.E. *Competitive Strategy*. New York City, New York, U.S.A.: Free Press, 1980.

[37] Powell P.L. and Klein J.H. Risk Management for Information Systems Development. *Journal of Information Technology*, 1996, 11(4), 309-319.

[38] Purvis R.L., Sambamurthy V. and Zmud R.W. The Assimilation of Knowledge Platforms in Organizations: An Empirical Investigation. *Organization Science*, 2001, 12(2), 117-135.

[39] Robey D. and Farrow D. User Involvement in Information System Development: A Conflict Model and Empirical Test. *Management Science*, 1982, 28(1), 73-85.

[40] Ropponen J. and Lyytinen K. Components of Software Development Risk: How to Address Them? A Project Manager Survey. *IEEE Transactions on Software Engineering*, 2000, 26(2), 98-112.

[41] Semadar A., Robins G. and Ferris G.R. Comparing the Validity of Multiple Social Effectiveness Constructs in the Prediction of Managerial Job Performance. *Journal of Organizational Behavior*, 2006, 27(4), 443-461.

[42] Serenko A. The Use of Interface Agents for Email Notification in Critical Incidents. *International Journal of Human-Computer Studies*, 2006, 64(11), 1084-1098.

[43] Tesch D., Kloppenborg T.J. and Frolick M.N. IT Project Risk Factors: The Project Management Professionals Perspective. *Journal of Computer Information Systems*, 2007, 47(4), 61-69.

[44] Tiwana A. and Keil M. Functionality Risk in Information Systems Development: An Empirical Investigation. *IEEE Transactions on Engineering Management*, 2006, 53(3), 412-425.

[45] Zellars K.L., Perrewe P.L., Rossi A.M., Tepper B.J. and Ferris G.R. Moderating Effects of Political Skill, Perceived Control, and Job-Related Self-Efficacy on the Relationship Between Negative Affectivity and Physiological Strain. *Journal of Organizational Behavior*, 2008, 29(5), 549-571.

CAN INFORMATION TECHNOLOGY PROJECT MANAGERS INCREASE THEIR PROJECT SUCCESS THROUGH THE USE OF POLITICAL SKILL?

Jennifer E. Gerow, Department of Management, Clemson University, 101 Sirrine Hall, Clemson, SC 29634, (864) 656-2011, jgerow@clemson.edu

ABSTRACT

This is a conceptual/theoretical article that is intended to lay the groundwork for future empirical research that will answer the question, "Does higher political skill by the project manager lead to greater project success from the perspective of the project sponsor and project team?" A model is proposed to show how job performance, organizational structure, and project risk are important mediators/moderators between political skill and project success. The motivation for this research is the critical role of successfully implementing IT strategic initiatives in order to continually renew organizations through project management. By using political skill, IT project managers can increase the success rate of their IT projects, thereby allowing organizations to receive positive returns from their investments.

INTRODUCTION

A central theme within the business environment in the 21st century is the significant role of project management in continually renewing the organization by implementing information technology (IT) strategic initiatives. While businesses are spending 50% of their nominal capital on IT spending [6] [20], project management difficulties and outright failures within the IT arena are numerous [28]. Evidence suggests IT investments fail to deliver their expected returns 40% of the time [6] which costs US businesses about $75 billion each year [20]. Further, 18% of IT projects were canceled even before completing the development cycle [43].

So why is there such a high rate of failure? While the potential reasons are numerous, a central theme of the practitioner journals is the importance of interpersonal skills and "influencing the organization" through power and politics [1]. This area of study is essential because successful projects not only generate a positive reputation for the project manager [30] but also lead to additional compensation, special projects, or other leadership roles [3]. Considering the importance of the issue, too few studies have considered the specific topic of project management in the context of analyzing political skill [e.g. 7] [13] while fewer have focused on projects as a general context [e.g. 3] [4] [27] [30] [31]. Further, no studies have considered political skill as the driver of project success.

In order to address the importance of political skill in project management, this research endeavor seeks to answer the following question:

> *Does higher political skill by the project manager lead to greater project success from the perspective of the project sponsor and project team?*

BACKGROUND

The practitioner literature has a dominant theme that focuses on the importance of project managers possessing interpersonal skills that can be used to effectively influence the organization through power and politics [1] [2]. These interpersonal skills are critical because involving stakeholders during IS design is both important and difficult, as indicated in the literature [e.g. 29]. As IT projects continue to grow in size and complexity, there is an increased interdependence between the various stakeholders and the project manager [44]. The difficulty in getting the required stakeholder involvement is amplified because multiple stakeholders have competing goals over how the end product must be engaged [23] [35]. Furthermore, the deep application-specific knowledge required to successfully build most large and complex applications is thinly spread throughout the user community [10] making knowledge extraction, collection, distribution, storage, and retrieval extremely difficult [38].
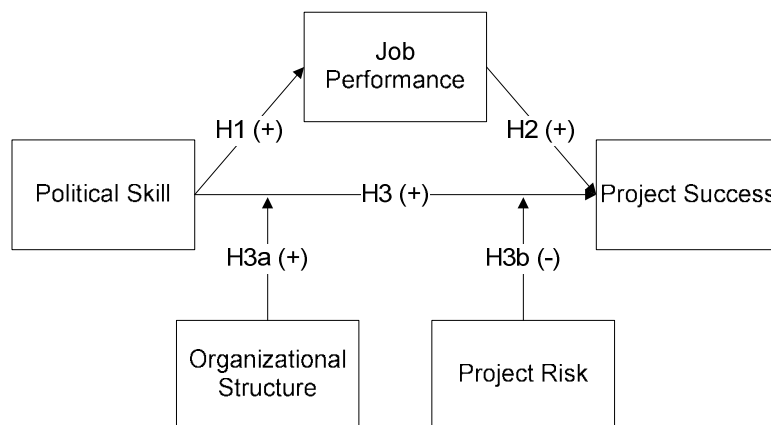
This increased interaction between stakeholders and IT personnel is viewed as a social process where participants exchange their views and expectations about the project and the IT project team responds by attempting to synthesize the knowledge into a viable solution [e.g. 39]. Conflicts and politics occur during the design process when there are resource pressures, time constraints, or disagreements over system specification or deliverable priorities. If the conflicts are handled improperly, it could result in an end product that is less useful than promised and, consequently, user rejection or subversion [e.g. 42]. On the other hand, conflict that is dialectic or educational in nature can result in team members learning from each other so the team is more effective [20] [32]. Thus, the success of an IT project is related to the ability to apply political skills for managing conflict and achieving consensus over a shared set of specifications.

The rest of the article is organized as follows. The next section describes the constructs, theoretical model, and hypotheses developed from the extant literatures. The paper concludes with discussion of the potential implications of this research.

THEORETICAL MODEL AND HYPOTHESES

The following model is informed and developed through the organizational behavior and human resource literatures.

FIGURE 1: THEORETICAL MODEL OF POLITICAL SKILL ON PROJECT SUCCESS

Political Skill

Political skill and its attributes are learned and developed over time through training and socialization [15] [33] [45]. Individuals with high political skill utilize interpersonal skills to effectively influence others through persuasion, manipulation, negotiation, and motivation [3] [4] [12-14] [24] [25] [27]. Political skills can also be used by project managers to inspire trust and confidence in their leadership through sincerity and an engaging manner [4] [11] [13] [45]. Further, those with high political skill possess strong social interaction abilities including personal magnetism, assertiveness, networking, communication, and mediation [9] [13] [15] [24] [27] [31].

Job Performance

Job performance is defined by both objective (task performance) and subjective (contextual performance) measures [15] [19] [25]. Task performance includes the formally prescribed, substantive tasks and duties that are the core technical responsibilities tied to the position [15] [19] [25]. Contextual performance, on the other hand, is not formal or required but valued by the organization because it encompasses the social, organizational, and psychological environment in which the task is performed [8] [15] [19] [25]. Job performance is often measured through self-reports and/or supervisor evaluations [e.g. 17] [18] [25] and can include the individual's goals, competence, professionalism, interpersonal skills, contribution, and achievement in the workplace [4] [17] [19] [41].

Previous research [e.g. 3] [14] [34] indicates individuals with high political skills are likely to present their work in the best possible light in order to influence management's evaluation of their work [13]. Therefore, I propose:

> *Hypothesis 1*: Project managers with a higher level of political skill are more likely to have higher job performance evaluations.

Project Success

Project success is the degree to which the pre-arranged time, cost, scope, and quality requirements have been met at the end of the project. If the project schedule is completed as agreed-upon by all parties, the time component is a success. If the original cost of the project is equal to or less than the value all parties agreed to support, the cost portion is considered successful. When the agreed-upon products, services, and results are achieved at the end of the project, the scope of the project is a success. Finally, the quality component is a success when the original requirements set at the beginning of the project are fulfilled at project completion [1].

Project managers that set goals and then achieve these goals in order to receive higher performance evaluations [4] [41] are also more likely to take the extra step needed to make the project successful. Therefore, I expect:

> *Hypothesis 2*: Project managers with higher job performance evaluations are more likely to have a higher level of project success as judged by project sponsors and project teams.

Through effective leadership, negotiation, communication, motivation, and positively influencing others in the organization, project managers are able to gather information more quickly and mobilize support for their project [4]. By properly utilizing this support, these managers are more likely to deliver the product, service or result according to the pre-arranged requirements and within the project deadline. This is expressed as follows:

Hypothesis 3: Project managers with higher political skill are more likely to have a higher level of project success as judged by project sponsors and project teams.

Organizational Structure
The organizational structure is the structure of the performing organization and can constrain or enhance the individual's control of the project. This structure ranges from projectized to functional. In a projectized structure, resources are dedicated to projects and project managers have total authority over the project. A functional structure, on the other hand, does not have individuals assigned to a specific project. Instead, employees are grouped by specialty, projects exist but are limited by functionality, and project decisions must be sent up the organizational hierarchy for authorization. In between these two extremes are matrix organizational structures. In the weak matrix structure, the project manager is a coordinator or expeditor as opposed to a manager. In the balanced matrix structure, the organization sees a need for a project manager but doesn't give that individual full power or project funding. The strong matrix structure is more like the projectized structure, so there is a full-time project manager with a certain level of power. Most organizations use a combination of these structures at various levels, called a composite structure [1].

Despite the desire for the project manager to persuade, manipulate, and negotiate for enhanced control, it is less likely an individual can actually achieve this control in organizations with a functional structure. But it is more likely these same individuals could achieve their desired level of control in a projectized environment due to the nature of the organizational structure. Hence:

Hypothesis 3a: Organizational structures that are more projectized (with full authority given to the project manager) strengthen the association between a project manager's political skill and project success.

Project Risk
Project risks include both external and internal factors that are out of the control of the project manager [21] [40]. External risk factors involve both unexpected environmental conditions (e.g. water, fire, or service failure) [37] and marketplace conditions at the time the project is completed. Marketplace conditions encompass any unexpected changes in the types of products, services, and results available in the marketplace or environment [1] [21]. These conditions can include changes in how technology is integrated both within and across organizations as well as the hard-to-predict market appeal of customer-facing processes [16]. Internal risk factors include unexpected technical issues (e.g. hardware or software problems), licensing issues, or changes in available technical support due to new technology [21] [22]. They also include lack of top management involvement or commitment due to a lack of understanding about how the technology works [5] [21] [26] [37].

While successful projects are often defined by the degree of improvement in the organization's position or whether or not the new product, service, or result allows the company to defend its position [36], the success is also mitigated by whether or not any internal problems that surface can be addressed and the degree to which the rest of the market responds to the new offering. For example, if other organizations or individuals introduce the same or a better product, service, or result, the project will not give the organization a competitive advantage (i.e. loss of first-mover advantage) and the project will often not be considered successful [16]. Hence, I propose:

> *Hypothesis 3b*: Project risk will weaken the relationship between political skill and project success for project managers.

CONCLUSION

This paper initially made the case for the importance of the IT project manager's political skill in successful project implementation as perceived by the sponsor and project team. Through the proper use of effective leadership, negotiation, communication, motivation, and positively influencing others in the organization, I propose project managers will gain the necessary stakeholder involvement and increase the success rate of their IT projects. Through this success, businesses are less likely to lose their invested capital because the system will deliver the expected quality and results so end-users will be able to exploit the system.

REFERENCES

[1]   *A Guide to the Project Management Body of Knowledge: PMBOK Guide*, 3rd ed. Newtown Square, PA: Project Management Institute, Inc., 2004.

[2]   *A Guide to the Project Management Body of Knowledge: PMBOK Guide*, 2nd ed. Newtown Square, PA: Project Management Institute, Inc., 2000.

[3]   Ahearn K.K., Ferris G.R., Hochwarter W.A., Douglas C. and Ammeter A.P. Leader Political Skill and Team Performance. *Journal of Management*, 2004, 30(3), 309-327.

[4]   Ammeter A.P., Douglas C.G., W.L., Hochwarter W.A. and Ferris G.R. Toward a Political Theory of Leadership. *The Leadership Quarterly*, 2002, 13(6), 751-796.

[5]   Barki H., Rivard S. and Talbot J. Toward an Assessment of Software Development Risk. *Journal of Management Information Systems*, 1993, 10(2), 203-225.

[6]   Benko C. and McFarlan W. *Connecting the Dots: Aligning Projects with Objectives in Unpredictable Times*. Boston, MA: Harvard Business School Press, 2003.

[7]   Bloomfield B.P. and Danieli A. The Role of Management Consultants in the Development of Information Technology: The Indissoluble Nature of Socio-Political and Technical Skills. *Journal of Management Studies*, 1995, 32(1), 23-46.

[8]   Borman W.C. and Motowidlo S.J. Expanding the Criterion Domain to Include Elements of Contextual Performance. In: Schmitt N. and Borman W.C. (Eds), Personnel Selection. Jossey-Bass, San Francisco, 1993, pp. 71-98.

[9]   Christiansen N., Villanova P. and Mikulay S. Political Influence Compatibility: Fitting the Person to the Climate. *Journal of Organizational Behavior*, 1997, 18(6), 709-730.

[10]   Curtis B., Krasner H. and Iscoe N. A Field Study of the Software Design Process for Large Systems. *Communications of the ACM*, 1988, 31(11), 1268-1287.

[11]   Davis W.D. and Gardner W.L. Perceptions of Politics and Organizational Cynicism: An Attributional and Leader-Member Exchange Perspective. *The Leadership Quarterly*, 2004, 15(4), 439-465.

[12]   Ferris G.R. and Judge T.A. Personnel/Human Resources Management: A Political Influence Perspective. *Journal of Management*, 1991, 17(2), 447-488.

[13]   Ferris G.R., Perrewe P.L., Anthony W.P. and Gilmore D.C. Political Skill at Work. *Organizational Dynamics*, 2000, 28(4), 25-37.

[14]   Ferris G.R., Treadway D.C., Kolodinsky R.W., Hochwarter W.A., Kacmar C., Douglas C. and Frink D.D. Development and Validation of the Political Skill Inventory. *Journal of Management*, 2005, 31(1), 126-152.

[15]   Ferris G.R., Treadway D.C., Perrewe P.L., Brouer R.L., Douglas C. and Lux S. Political Skill in Organizations. *Journal of Management*, 2007, 33(3), 290-320.

[16]   Fichman R.G., Keil M. and Tiwana A. Beyond Valuation: "Options Thinking" in IT Project Management. *California Management Review*, 2005, 47(2), 74-96.

[17]   Harris K.J., Kacmar K.M., Zivnuska S. and Shaw J.D. The Impact of Political Skill on Impression Management Effectiveness. *Journal of Applied Psychology*, 2007, 92(1), 278-285.

[18]   Hochwarter W.A., Ferris G.R., Zinko R., Arnell B. and James M. Reputation as a Moderator of Political Behavior - Work Outcomes Relationships: A Two-Study Investigation with Convergent Results. *Journal of Applied Psychology*, 2007, 92(2), 567-576.

[19]   Jawahar I.M., Meurs J.A., Ferris G.R. and Hochwarter W.A. Self-Efficacy and Political Skill as Comparative Predictors of Task and Contextual Performance: A Two-Study Constructive Replication. *Human Performance*, 2008, 21(2), 138-157.

[20]   Kasi V., Keil M., Mathiassen L. and Pedersen K. The Post Mortem Paradox: A Delphi Study of IT Specialist Perceptions. *European Journal of Information Systems*, 2008, 17(1), 62-78.

[21]   Keil M., Cule P.E., Lyytinen K. and Schmidt R.C. A Framework for Identifying Software Project Risks. *Communications of the ACM*, 1998, 41(11), 76-83.

[22]   Keil M. and Robey D. Turning Around Troubled Software Projects: An Exploratory Study of the Deescalation of Commitment to Failing Courses of Action. *Journal of Management Information Systems*, 1999, 15(4), 63-87.

[23]   Kirsch L.J. The Management of Complex Tasks in Organizations: Controlling the Systems Development Process. *Organization Science*, 1996, 7(1), 1-21.

[24]   Klein J.I. The Myth of the Corporate Political Jungle: Politicization as a Political Strategy. *Journal of Management Studies*, 1988, 25(1), 1-12.

[25]   Kolodinsky R.W., Treadway D.C. and Ferris G.R. Political Skill and Influence Effectiveness: Testing Portions of an Expanded Ferris and Judge (1991) Model. *Human Relations*, 2007, 60(12), 1747-1777.

[26]   Kutsch E. and Hall M. Intervening Conditions on the Management of Project Risk: Dealing with Uncertainty in Information Technology Projects. *International Journal of Project Management*, 2005, 23(8), 591-599.

[27]   Lerouge C., Newton S. and Blanton J.E. Exploring the Systems Analyst Skill Set: Perceptions, Preferences, Age, and Gender. *Journal of Computer Information Systems*, 2005, 45(3), 12-23.

[28] Markus M.L. and Keil M. If We Build It, They Will Come: Designing Information Systems That People Want to Use. *Sloan Management Review*, 1994, 35(4), 11-25.

[29] Markus M.L. and Mao J. Participation in Development and Implementation - Updating an Old, Tired Concept for Today's IS Contexts. *Journal of the Association for Information Systems*, 2004, 5(11/12), 514-544.

[30] Novicevic M.M. and Harvey M.G. The Political Role of Corporate Human Resource Management in Strategic Global Leadership Development. *The Leadership Quarterly*, 2004, 15(4), 569-588.

[31] Peled A. Politicking for Success: The Missing Skill. *The Leadership and Organization Development Journal*, 2000, 21(1), 20-29.

[32] Pelled L.H. and Adler P.S. Antecedents of Intergroup Conflict in Multifunctional Product Development Teams: A Conceptual Model. *IEEE Transactions on Engineering Management*, 1994, 41(1), 21-28.

[33] Perrewe P.L., Ferris G.R., Frink D.D. and Anthony W.P. Political Skill: An Antidote for Workplace Stressors. *Academy of Management Executive*, 2000, 14(3), 115-123.

[34] Perrewe P.L., Zellars K.L., Ferris G.R., Rossi A.M., Kacmar C.J. and Ralston D.A. Neutralizing Job Stressors: Political Skill as an Antidote to the Dysfunctional Consequences of Role Conflict. *Academy of Management Journal*, 2004, 47(1), 141-152.

[35] Pinto J.K. and Slevin D.P. Project Success: Definitions and Measurement Techniques. *Project Management Journal*, 1988, 19(1), 67-72.

[36] Porter M.E. *Competitive Strategy*. New York City, New York, U.S.A.: Free Press, 1980.

[37] Powell P.L. and Klein J.H. Risk Management for Information Systems Development. *Journal of Information Technology*, 1996, 11(4), 309-319.

[38] Purvis R.L., Sambamurthy V. and Zmud R.W. The Assimilation of Knowledge Platforms in Organizations: An Empirical Investigation. *Organization Science*, 2001, 12(2), 117-135.

[39] Robey D. and Farrow D. User Involvement in Information System Development: A Conflict Model and Empirical Test. *Management Science*, 1982, 28(1), 73-85.

[40] Ropponen J. and Lyytinen K. Components of Software Development Risk: How to Address Them? A Project Manager Survey. *IEEE Transactions on Software Engineering*, 2000, 26(2), 98-112.

[41] Semadar A., Robins G. and Ferris G.R. Comparing the Validity of Multiple Social Effectiveness Constructs in the Prediction of Managerial Job Performance. *Journal of Organizational Behavior*, 2006, 27(4), 443-461.

[42] Serenko A. The Use of Interface Agents for Email Notification in Critical Incidents. *International Journal of Human-Computer Studies*, 2006, 64(11), 1084-1098.

[43] Tesch D., Kloppenborg T.J. and Frolick M.N. IT Project Risk Factors: The Project Management Professionals Perspective. *Journal of Computer Information Systems*, 2007, 47(4), 61-69.

[44] Tiwana A. and Keil M. Functionality Risk in Information Systems Development: An Empirical Investigation. *IEEE Transactions on Engineering Management*, 2006, 53(3), 412-425.

[45] Zellars K.L., Perrewe P.L., Rossi A.M., Tepper B.J. and Ferris G.R. Moderating Effects of Political Skill, Perceived Control, and Job-Related Self-Efficacy on the Relationship Between Negative Affectivity and Physiological Strain. *Journal of Organizational Behavior*, 2008, 29(5), 549-571.

A COMPARISON OF PATIENT ATTENDANCE PREDICTION MODELS

Steven Pepper
Department of Management/MIS, University of West Florida, Pensacola, FL 32514
(336) 963-1791; sap13@students.uwf.edu

ABSTRACT

Nonattendance is an important issue in healthcare. Administrators need to monitor attendance and determine which patients are likely to miss. This paper compares thirteen models that offer methods to predict patient attendance in an attempt to aid decision making for healthcare management. The attendance factors, study designs, and results of each model are reported and compared. While attendance prediction accuracy is limited, these models still provide important information to decision makers. A number of factors that impact attendance were identified, as well as isolated successes for individual clinics.

Keywords:　　Healthcare; Patient Non-attendance; Predictive Model; Missed Appointments

INTRODUCTION

Patient attendance is a critical concern for healthcare administrators. Missed appointments can cause hospitals and clinics to lose productivity through the misuse or inactivity of physicians or other medical resources. Non-attendance also has more visible problems in the form of lost revenue to the healthcare entity, as well as negative health consequences for the non-attending patient. Many studies have already been conducted throughout the medical field on the impact and consequences of missed appointments. Other studies have identified potential contributing factors to the causes of patient non-attendance. However, far fewer studies have developed models to predict patient attendance. Predicting attendance would allow managers of clinics and hospitals to make better informed decisions about whether to take steps towards mitigating the contributing factors, adopting strategies to improve the attendance of those patients most likely to miss, or utilizing overbooking strategies.

This paper identifies the patient attendance studies that have developed models to predict nonattendance across various fields in healthcare. A comparison of these models is presented. First, the attendance factors utilized in each model are discussed. Then, each study design is discussed. Finally, the results and limitations of each study are compared so that hospital and clinic managers can more easily compare and contrast the prediction models proposed to date. Based on this review of attendance models and the limitations identified, possible directions for further study are presented.

COMPARISON OF PATIENT ATTENDANCE PREDICTION FACTORS

In reviewing the literature, 13 models were identified that predict patient attendance across six fields of healthcare. The fields included physical therapy [1,6,9], exercise science [2,4], oncology (cancer) [8,9], otolaryngology (ear, nose, and throat) [9], ophthalmology (eye) [9], and primary care [3,5,7,9,10,11,12,13]. The locations for these studies were California, USA [7], Indiana, USA [12], Massachusetts, USA [1,5], Minnesota, USA [13], Virginia, USA [3], West Virginia, USA [6], Calgary, Canada [2], Ontario, Canada [4], England, UK [10,11], Sweden [8], and Singapore [9]. While most studies did not further limit the population, five studies did focus on specific populations which included women [4,8], the elderly [6], students [2], or athletes [1].

The number of different factors thought to influence patient attendance is numerous and includes demographic, behavioral, psychological, physiological, clinical, and environmental characteristics. Each model that has been developed to predict patient attendance has included different factors that are thought to influence whether or not a patient will attend his or her next appointment. The factors used for prediction by each of the 13 models are shown in Table 1.

Table 1 Factors Used in Patient Attendance Prediction Models

FACTORS	MODEL REFERENCE NUMBER												
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Attendance History		✓	✓	✓	✓				✓		✓	✓	
Motivation	✓	✓		✓		✓					✓		
Knowledge	✓	✓				✓		✓					
Perceptions	✓	✓		✓		✓		✓			✓		
Family Support		✓					✓	✓					✓
Gender							✓		✓	✓			✓
Age			✓		✓	✓			✓	✓		✓	✓
Race									✓				✓
Socioeconomic										✓			
Cost/Payment						✓	✓	✓				✓	✓
Scheduling			✓	✓			✓		✓			✓	
Type of Care	✓				✓	✓	✓	✓	✓				
Transportation			✓						✓				
Clinic Environment						✓	✓	✓					
External Environment												✓	

The 15 factors given in Table 1 are aggregated categories for similar terms used in different prediction models. For example, *attendance history*, one of the most consistently used factors for prediction, is also called adherence [1,2], no-show rate [3], past behavior [4,11], prior appointment-keeping behavior [5], no-show appointment behavior [6], and percentage of previous failed appointments [9].

Table 1 shows that attendance history, perceptions, age, and type of care are the most utilized factors when predicting attendance. For the purpose of this comparison, perceptions indicates a patient's perceived barriers or obstacles to recovery, perceived benefits of healthcare, and

perceived ability to control the situation. Type of care indicates a model that uses type, severity, and/or duration of the patient's medical problem to predict attendance.

Past behavior is a good indicator of future behavior, and attendance history has been shown to be one of the better predictors of appointment no-shows [2,3,4,5,9,11,12]. However, one study points out that future attendance is likely a direct function of past attendance; thus, attendance history is not a very powerful explanatory factor [11]. Also, healthcare managers may not find prediction models based on past attendance as useful, since these managers are already able to determine that habitually absent patients are likely to miss.

Age is also frequently included as a predictor of attendance [3,5,6,9,10,12,13]. Most models agree that attendance improves as the age of the patient increases [3,5,9,10,13]. However, there are still some discrepancies; for example, two models contend that the elderly are more likely to miss appointments [5,6]. Predicting attendance for patients under the age of 16 is also difficult [13]. The models reviewed are not consistent on the age categories used or the degree of their significance.

Perception was most often included in models utilizing behavioral theories [1,2,4,6,8,11]. These models collect patients' perceptions of their injuries and the treatment they are to receive. Confidence, positive beliefs, and a feeling of control indicate a patient is likely to attend, while stress, fear, and other negative feelings about the medical problem or treatment signify a likelihood of missing an appointment.

Type of care, used in almost half of the prediction models, designates the area of medicine involved and the specifics of the patient's illness or injury [1,5,6,7,8,9]. In these models, more acute medical problems and more intense healthcare needs correlate with higher rates of appointment no-shows. This is likely due to more appointments overall, with more frequency, and over a greater span of time.

The rest of the listed factors are included in at least one of the predictive models reviewed. Three models include as many as seven of the given factors [6,8,9], while three other models include only three factors [5,10,11]. Interestingly, none of the models included all four of the most common factors. Finally, two of the models [10,12] included unique factors, socioeconomic and external environments respectively. When socioeconomic environment was included as a factor in the form of patients living in a deprived area, a model predicted that these patients were extremely likely to miss an appointment [10]. In another model, which included weather as an external environmental factor, sunshine predicted attendance would be lower [12].

REVIEW OF STUDY DESIGNS

While reviewing the 13 models, characteristics of each study were taken into account. The size, duration, and time frame of the study, the type of interaction with the participants, and the type of information reported are presented in Tables 2a and 2b.

Table 2a Study Design of Patient Attendance Prediction Models 1-7

STUDY CHARACTERISTICS	MODEL REFERENCE NUMBER						
	[1]	[2]	[3]	[4]	[5]	[6]*	[7]
Number of Patients	80	62	756	63	376	N/A	867
Number of Clinics/Sites	1	11	1	1	1	N/A	3
Length of Study (Months)	3	4	6	4	12	N/A	1
Year(s) of Study	1998	'94-'95	'78-'79	'94-'95	1979	N/A	1982
Questionnaires Used	Yes	Yes	No	Yes	Yes	N/A	Yes
Direct Participant Access	Yes	Yes	No	Yes	Yes	N/A	No
Medical Record Access	No	No	Yes	No	Yes	N/A	No
Reported Missed Percentages	No	Yes	Yes	No	Yes	N/A	Yes
Validation Conducted	No	No	Yes	Yes	Yes	No	No
R^2	0.15	0.25	0.86	0.39	N/A	N/A	0.29

*Grindley (2005) suggests a theoretical model based on past research for prediction of attendance to rehabilitation among the elderly [6].
N/A = Not available or not reported

Table 2b Study Design of Patient Attendance Prediction Models 8-13

STUDY CHARACTERISTICS	MODEL REFERENCE NUMBER					
	[8]	[9]	[10]	[11]	[12]	[13]
Number of Patients	1450	22864	40845	749	≈ 50000	4669
Number of Clinics/Sites	4	1	4	4	1	1
Length of Study (Months)	5	48	12	12	24	3
Year(s) of Study	'97-'98	'01-'04	'98-'99	'95-'96	'03-'04	1991
Questionnaires Used	No	No	No	Yes	Yes*	No
Direct Participant Access	Yes	No	No	No	No	No
Medical Record Access	Yes	Yes	Yes	No	Yes	Yes
Reported Missed Percentages	Yes	Yes	Yes	Yes	No	Yes
Validation Conducted	No	No	No	No	No	No
R^2	0.06	0.84	N/A	0.07	0.81	N/A

*Questionnaires completed by clinic staff members in order to identify potential non-attendance factors [12].
N/A = Not available or not reported

Tables 2a and 2b demonstrate that different approaches were used for each study. The most important differences are the size of each study, the time frame of each study, and how the data was collected for each study.

The models place varying degrees of significance on the amount of data collected. The number of patients analyzed vary from a few dozen [1,2,4] to tens of thousands [9,10,12], and the number of collection sites range from 1 to 11. Studies with large populations have greater statistical validity. However, smaller studies are able to interact with each participant and collect more detailed information from each patient, while larger studies generally had to rely on previously collected data. Also, patients were analyzed over differing time lengths. One study [7] collected data over only a 1 month period, while another study [9] lasted four years. Longer studies had a larger amount of appointment data available for analysis, although these studies did not generate results as quickly.

The studies demonstrated three different methods used in collecting attendance data. Questionnaires or paper surveys were distributed in seven of the studies. These questionnaires were distributed to patients in six of these studies [1,2,4,5,7,10] and to physicians and/or other healthcare staff in five of the studies [1,5,7,11,12]. Three distributed surveys to both [1,5,7]. These questionnaires were able to collect more detailed information than medical records, but not as specific as direct participant access. A few studies used previously developed, well known surveys [1,2,7]. Direct participant access, in the form of telephone or in person interviews of patients or physicians, was used in five studies [1,2,4,5,8]. This type of data collection offered the most detailed information. The last source of data was patient medical records, used by over half of the studies [3,5,8,9,10,12,13]. These records, including patient charts and other information collected and made available by clinics, only offered the most basic of demographic and attendance data. Six of the studies collected data using some combination of the three methods [1,2,4,5,8,12].

Studies also differed by the amount of information reported. Four did not describe percentages of missed appointments [1,4,6,12], nine did not report testing their model for validity [1,2,6,7,8,9,10,11,12], and four did not report an R^2 [5,6,10,13]. These omissions make comparisons of models more difficult. Differences in study settings may also distort comparisons across models. The studies are conducted across various decades (1970s-2000s), countries (USA, UK, Canada, Sweden, and Singapore), medical fields (physical therapy, exercise science, oncology, otolaryngology, ophthalmology, and primary care), and populations (athletes, students, females, the elderly, and general).

One article took a completely different approach from the others [6]. Rather than conducting a traditional study, Grindley (2005) presents a model based on previous rehabilitation attendance research. The model uses a combination of already published models and offers recommendations to clinics for predicting and preventing non-attendance of elderly patients. As indicated in Table 2a, a validation was not reported.

Each attendance study approached the design of a prediction model in a different way. Six of the models are based on concepts from psychology or behavioral sciences [1,2,4,6,8,11], while the remainder were analyzed purely from a statistical perspective [3,5,7,9,10,12,13]. Table 3 presents the analytical models used in each design. As shown in the table, models were developed using four different methods: multiple regression (logistic or linear), path analysis, theory of planned behavior, and health belief model. Each method is briefly described next.

Table 3 Analytical Models for Patient Attendance Prediction

ANALYTICAL MODEL	MODEL REFERENCE NUMBER												
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Multiple Logistic Regression	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Multiple Linear Regression							✓				✓		
Path Analysis		✓	✓										
Theory of Planned Behavior		✓									✓		
Health Belief Model				✓		✓		✓					

Since the dependent factor in these models, attendance, is a dichotomous variable (attend or not attend), most models used logistic regression [1,2,3,4,5,7,8,9,10,11,12,13]. This statistical method uses a number of categorical or continuous predictor variables for the prediction of an event with two diametric outcomes. The models using this method report odds ratios that explain the contributory significance of each predictor variable. Most studies also report the amount of variance in attendance behavior explained by their model (R^2) [1,2,3,4,7,8,9,11,12]. Two models also used linear regression to examine continuous factors related to patient attendance [7, 11]. One used linear regression to analyze behavioral intent based on a continuous scale [7]; the other uses this method to analyze potential demographic, clinic, and disease factors contributing to non-attendance [11].

Path analysis, another form of regression analysis, was used in two models [2,3]. These studies reported causality models in which some factors are indicators of other factors which are indicators of attendance. The predicted attendance or nonattendance for each patient is arrived at by selecting factors along a branching path within the model.

Theory of planned behavior was the predictive method in two behavioral analyses [2,11]. The basis of this theory is that a person's intention to perform an action is the strongest influence on whether that behavior is performed. These models seek to analyze intention as the primary predictor of behavior based on a number of motivational and perceptional factors.

The health belief model, used by three attendance prediction models, uses measures of self-efficacy and a patient's perceptions of their health and healthcare to predict attendance [4,6,8]. These models use a number of scales to assess these factors and determine the likelihood that a patient will fail to attend an appointment.

COMPARISON OF RESULTS

Generally, these models agree that there are a number of demographic, behavioral, medical, and environmental factors that can be shown to significantly impact patient attendance. However, predicting attendance based on these factors has proven to be difficult [1,2,4,7,8,10,11,13]. Six of the prediction models reported an R^2 less than 0.40 [1,2,4,7,8,11]. These studies report being surprised by the difficulty of developing an accurate prediction model. The three models with a higher reported accuracy were each developed based on data from single clinics and have not been tested in other clinics [3,9,12]. One study concluded that their method may be accurate if a new model based on their design is developed for each new clinic [9]. Ten of the papers did not report validation studies for their models [1,2,6,7,8,9,10,11,12,13]. Of the three papers reporting validation results, two reported that the models were accurate when tested by the clinics where the original data was collected [3,5]. For example, one of these studies reported that the validation accurately predicted no-shows 94% of the time [5].

Several other limitations for predicting attendance were described in these studies. The inability to collect data on all potential attendance factors [1,2,4,8,9,10,11,12,13], concern for bias in questionnaires or interviews [2,4,8,11], concern for developing an attendance prediction model using past attendance [3,11], and limits on the size and setting of a study [1,9,12] are all identified as study limitations.

DIRECTIONS FOR FUTURE STUDY

The findings of this attendance model review offer several directions for future study. First, while the literature agrees that there are many factors that impact patient attendance and non-attendance in healthcare, it does not agree about which are the most significant. Further research could be conducted to aggregate factors from various models. Combining models could offer further insight into the complex issue of healthcare attendance. For example, the behavioral models identified in this paper use factors based on the perspective of patients and are concerned about the impact that non-attendance has on the patient [1,2,4,6,8,11], while the others are based on the clinics' perspective and are concerned with the cost, efficiency, and productivity of the clinic [3,5,7,9,10,12,13]. Only one article discusses the possible benefits of using an aggregate model, but in this instance a formal study has not been conducted [6]. Another common feature of several models that needs to be analyzed further is the consistent use of past attendance as a predictor. This factor contributes most of the predictive strength in the models in which it is included. However, such a factor does not always provide additional explanatory information to the decision-maker. Finally, many of these models need to be tested in clinic environments outside of the original study to see how useful they are in various practices.

Note that there are limitations to this literature review. The models in this paper include only those known to the author. In researching healthcare attendance prediction models, searches were conducted on CINAHL (EBSCO), Health and Wellness Resource Center (Gale), Nursing and Allied Health Source (ProQuest), Medline (CSA), PsycNet (APA), and PubMed (NLM) databases. The primary keywords used in these searches were "no-show", "appointment", "attendance", "non-attendance", "attending", "adherence", "patient", "missed", "predicting", "prediction", "predictor", and "model".

In summary, patient attendance prediction models may offer managers in healthcare a tool to aid decision making regarding crucial appointment slots. Ideally, a model takes a number of significant factors and accurately predicts whether or not a patient will or will not miss his or her next appointment. Using this information, administrators could make decisions regarding the need to take intervention or overbook. This paper compared thirteen such models covering various fields and practices for managers to consider. Most predictive capabilities were limited. However, a number of factors contributing to non-attendance were identified. Finally, a few successful models were developed on an individual clinic basis.

ACKNOWLEDGMENTS

REFERENCES

[1] B. W. Brewer, J. L. Van Raalte, A. E. Cornelius, A. J. Petitpas, J. H. Sklar, M. H. Pohlman, R. J. Krushell and T. D. Ditmar, "Attributions for recovery and adherence to rehabilitation following anterior cruciate ligament reconstruction: a prospective analysis," *Psychology and Health,* vol. 15, 2, pp. 283-291, Mar. 2000.

[2] K. S. Courneya and E. McAuley, "Cognitive mediators of the social influence-exercise adherence relationship: a test of the theory of planned behavior," *Journal of Behavioral Medicine*, vol. 18, 5, pp. 499-515, 1995.

[3] H. G. Dove and K. C. Schneider, "The usefulness of patients' individual characteristics in predicting no-shows in outpatient clinics," *Medical Care,* vol. 19, 7, pp. 734-740, Jul. 1981.

[4] K. A. DuCharme and L. R. Brawley, "Predicting the intentions and behavior of exercise initiates using two forms of self-efficacy," *Journal of Behavioral Medicine,* vol. 18, 5, pp. 479-497, 1995.

[5] L. Goldman, R. Freidin, F. Cook, J. Eigner, and P. Grich, "A multivariate approach to the prediction of no-show behavior in a primary care center," *Archives of Internal Medicine,* vol. 142, 3, pp. 563-567, Mar. 1982.

[6] E. J. Grindley and S. J. Zizzi, "Using a multidimensional approach to predict motivation and adherence to rehabilitation in older adults," *Topics in Geriatric Rehabilitation,* vol. 21, 3, pp. 182-193, 2005.

[7] D. Gruzd, C. L. Shear, and W. M. Rodney, "Determinants of no-show appointment behavior: the utility of multivariate analysis," *Family Medicine,* vol. 18, 4, pp. 217-120, Jul./Aug. 1986.

[8] M. Lagerlund, A. Hedin, P. Sparen, E. Thurfjell, and M. Lambe, "Attitudes, beliefs, and knowledge as predictors of nonattendance in a Swedish population-based mammography screening program," *Preventive Medicine,* vol. 31, pp. 417-428, 2000.

[9] V. Lee, A. Earnest, M. Chen, and B. Krishnan, "Predictors of failed attendances in a multi-specialty outpatient centre using electronic databases," *BMC Health Services Research,* vol. 5, 51, Aug. 2005.

[10] R. D. Neal, D.A. Lawlor, and V. Allgar, "Missed appointments in general practice," *The British Journal of General Practice* vol. 51, 471, pp. 830-832, Oct. 2001.

[11] P. Norman and M. Conner, "Predicting health-check attendance among prior attenders and nonattenders: the role of prior behavior in the theory of planned behavior," *Journal of Applied Social Psychology*, vol. 26, 11, pp. 1010-1026, 1996.

[12] X. Qu, R. Rardin, L. Tiemen, H. Wan, J. A. S. Williams, D. R. Willis, and M. Rosenman, "A statistical model for the prediction of patient non-attendance in a primary care clinic." Presented at the Industrial Engineering Research Conference, May 20-21, 2006, Orlando, FL.

[13] C. M. Smith and B. P. Yawn, "Factors associated with appointment keeping in a family practice residency clinic," *The Journal of Family Practice,* vol. 38, 1, pp. 25-29, Jan. 1994.

ANALYTICS:
AN EMERGING TREND IN MODERN ORGANIZATIONS

Jason Moats

ABSTRACT

This paper discusses the breadth of the field of Analytics and the impact that it has in modern organizations. Analytics being used as a tool for business is an emerging trend, this paper focuses on what is the field of Analytics and topics of particular interest to those who wish to further develop the analytical capabilities in their organization.

ANALYTICS

When a new field of study emerges, there is often a lack of agreement as to exactly what that field of study entails. Analytics is no exception. The definitions proposed by different experts are similar, but there are subtle differences as to what is considered analytics. For example, one definition includes predictive analytics, yet excludes the practice of forecasting. While this definition excludes forecasting, statistical methods of forecasting is often a part of the expected skill set of a person who is entering the field of analytics. Despite these minor differences there are some common threads between the different definitions. The first commonality is the field of analytics refers to fact-based decision making. The second of commonality is that the field of analytics requires the use of data, either existing or collected. Finally, Analytics is considered to be an ongoing activity, but many activities which are one-time projects are included in most definitions. Without a clearly established consensus for the definition of analytics, it is necessary to obtain a holistic understanding of the subject matter. This understanding should include popular definitions, vital issues concerning a strategic implementation of analytics, and professional development issues.

ANALYTICS DEFINED

The broadest definition of analytics is "the science of analysis" (Analytics 2008). This definition is applicable in every field of study, but serves as a starting point of the role that analytics plays in business. Typically the disciplines that are used in the business world for this type of activity are: Statistics, Mathematics, Operations Research, Information Systems, Computer Science, and Decision Science. Yet other fields such as Accounting can be considered analytic. Activity based costing is highly analytic in nature. Not only does this technique require a clear understanding of the segmentation of costs, but it also requires a rigorous examination of the correlation between the costs and the drivers. While this example illustrates that virtually any field can benefit from deemed analytic, academics and business professionals tend to desire a more specific definition.

"Competing on Analytics: The New Science of Winning" by Thomas Davenport and Jeanne Harris is considered to be one of the leading authorities on analytics. Davenport and Harris refers to analytics as a subset of business intelligence and puts forth the following definition of

analytics: "By analytics we mean the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions." While this definition is elegantly written, this broad definition leaves more questions than it answers. For example, what quantitative methodologies are typically needed by an analytics professional and what degree of understanding is needed to successfully use the methodologies? Despite the shortcomings of this definition, this is an excellent definition at the academic level. It provides enough specific details to provide a framework for analytic projects in any field. Unfortunately, definitions that work in academia are not always suitable for industry. In this case, it is necessary to find a definition that provides enough detail so that it is possible to understand how an analytic professional can benefit the company.

One such definition of analytics comes from The Data Warehousing Institute. TDWI defines business analytics as: "Business Analytics focuses on effective use of data and information to drive positive business actions". This discipline includes business and technical knowledge such as performance management, the delivery and definition of business metrics, data visualization, as well as technical solutions, including online analytical processing (OLAP), scorecards, dash boards, data mining and more (The Data Warehouse Institute 2008). This definition provides sufficient information for an organization to plan their analytic capabilities and utilize analytic professionals. The reporting of information and knowledge in a convenient and useful manner for the purpose of decision making is a sufficient summary of this definition. Over all, this definition represents the middle of the spectrum from broad to specific and is the most useful to businesses.

"Beyond the Balanced Scorecard: Improving Business Intelligence with Analytics," by Mark Gram Brown provides a more narrow definition of analytics. Brow defines Analytics as a number, statistic, or metric which is a composite measure of other measures to provide a single comprehensive measure to measure an organization's performance on a specific issue. These measures are typically reported on a scorecard or digital dash board to allow the manager to drill down and examine the composite measures to better direct decision making. This specific definition is extremely useful for certain business functions and in the world of consulting. Once relationships are defined between composite metrics, the process of improving the overall metric is merely to focus on improving performance in the submetics. This definition, despite its usefulness and its specificity is too narrow to be useful to most managers and academics.

Sometimes, when there is not a consensus from the experts, it can be useful to examine public opinion on the matter. There are a variety of internet websites, forums, and blogs dedicated to analytics, but when it comes to public opinion, Wikipedia is the recognized leader. Despite many academics disdain for this source, it is often the first source that business professionals and students use when trying to understand a new topic. Wikipedia defines analytics as "the extensive use of data, statistical and quantitative analysis, explanatory and predictive modeling, and fact-based decision-making." Yet it would be a mistake to confine analytics to mathematics and statistics (Wikipedia 2008). This is obviously a paraphrase of Davenport's definition, which indicates that his definition will likely become the most accepted.

Over all, these definitions represent a picture of the breadth of what may be considered to be the field of analytics. Davenport's definition offers a strategic view of analytics, the TDWI

definition offers a tactical view of analytics, and Brown's definition offers an operational view of analytics. Together, these definitions can be used as a starting point for understanding analytics. Yet merely obtaining an understanding of analytics is not enough for an analytic professional. It is necessary for an analytics professional to be able to successfully develop an organization's analytical capabilities. Currently the most useful resource is "Competing on Analytics." This book offers a variety of models and addresses numerous issues to organizations who wish to develop their analytic capabilities.

IMPLEMENTATION ISSUES

One of the first issues when developing an organization's analytic capabilities is to determine the current level of analytics within the organization. Davenport discusses at length the differences in companies' analytical capabilities. Companies are placed in a category of the five stages of Analytic Competition. The five stages are:

1. Analytically Impaired
2. Localized Analytics
3. Analytic Aspiration
4. Analytical Companies
5. Analytical Competitors

These stages can be used as guide posts for an organization on how to proceed with their analytical development. Organizations in stage one typically have little or no analytical capabilities. This is evident through the lack of acquiring data or existing data not being suitable for analysis. This stems from the wrong data being collected, or that the data which is being collected is not stored in a useful manner. Stage two organizations possess limited analytical capabilities typically located within a business functional area to support a specific effort. Being localized, these efforts are usually not shared between other business functional areas and usually focus on gaining a better understanding of the business or a particular activity. Stage three organizations are marked by the desire and efforts to integrate data for the specific purpose of conducting analysis. Efforts such as implementing a data warehouse, standardizing the data that is collected, and implementing business intelligence tools are representative of organizations in this stage. Stage four organizations are marked by actively using analytics to guide business decisions and are employed by every business function. These organizations possess IT and business intelligence capabilities that are enterprise-wide. These organizations have the tool and capabilities, but are lacking in experience and effectiveness to be considered analytic competitors. Stage five organizations use analytics to support all decisions and are effective at the practice. These organizations are leaders in their industry and leverage their analytical capabilities to create barriers to entry. Most modern organizations understand the importance of making fact based decisions and wish to become an analytic competitor.

In order for an organization to be become an analytical competitor, it is important for the company to have certain characteristics which are referred to as The Four Pillars of Analytical Competition. These are:

1. Distinctive Competition

2. Enterprise-wide analytics
3. Senior management support
4. Large-scale ambition

The most important of these pillars is the support of senior management, without their support it is impossible for the company to develop a strategy of competing on analytics. Competing on analytics is clearly a strategic decision involving vast amounts of resources. This makes it necessary for any serious efforts to become an analytic competitor to have a champion. Having a champion supports two other pillars, large-scale ambition and enterprise-wide analytics, even if the model does not directly suggest this. Large-scale ambitions refer to utilizing analytics on the largest of business opportunities. Only through success of analytics on large-scale opportunities, can the organization as a whole accept analytics as the preferred way to compete. Any analytics projects of limited scope will have limited results and therefore have limited recognition and respect. These analytic efforts must also support another of the four pillars. In order to compete on analytics, a company must have distinctive competition. Distinctive competition refers to the activities that the organization uses to compete in its industry. One example of this is Owens & Minor. This company is a distributor of medical supplies and is a well know competitor on analytics. Their analytic efforts focus on supply chain management and costs. Through the knowledge they obtain through these efforts, Owens & Minor can offers services that their competitors are unable to match effectively. These models help lay the strategic groundwork for competing on analytics, but they do not address the tactical or operational issues.

Tactical and operation issues must be addressed in order to be successful at becoming an analytical competitor. These issues are not discussed in great detail in Competing on Analytics, but there are selected topics which cover this area. One such issue is the relationship between, information technology and business intelligence. Davenport stresses the importance of this issue, but only offers very basic models and recommendation. Primarily, these models emphasize the importance of the data that the organization collects. One aspect of data that is of particular importance is that the data should be of reasonable quality. The traditional characteristics of data quality should be thoroughly considered before engaging in analytic activities. These are:

1. Completeness
2. Validity
3. Reliability
4. Timeliness
5. Relevance
6. Accuracy

Each of the characteristics has implications for the analyst but relevance, validity, and reliability are of particular importance to the field of analytics. The field of analytics spawned out of an excess of data being collected. Organizations are capturing data on almost every transaction in every business function. Much of the data which is being collected has value that can be extracted from it, while some of the data is completely useless for analysis and is only stored to support business functions. While this information is relevant to the particular business function, it may not be relevant to the analyst. This makes the analyst's judgment a key component of any analytic endeavor. Without judgment, analysts run the risk of finding irrelevant relationships and

useless conclusions. This is especially true of inexperienced analysts. While all of the data that is available to the analyst might not be relevant, the data should be valid and reliable.

Validity and reliability refers to the standardized collecting and storing of data. At the beginning of any analytic endeavor, it is essential that the analysts be involved with the definition and protocols for gathering data, especially when those gathering the data are not the parties who use the data. Analysts must work in conjunction with the IT professionals to ensure that proper data are being gathered and stored in a useful manner. All too often, protocols are not in place to ensure that the data being collected can immediately be analyzed. When analysts have to dedicate their time to cleaning data so that it may properly be analyzed, it is considered a poor use of the analytical capabilities of the organizations. Utilizing analysts to their fullest potential is an indication that that organization is serious about having a strategy based upon analytics.

In organizations that take advantage of their analytic capabilities, analysts have direct access to the data that they need to accomplish their duties. In many organizations, all information requests must go through the IT department. Unfortunately, this can often be a time consuming process that can take hours or in some cases it can take days. Sometimes, the information requested is not exactly what the analyst needed and the analyst must make yet another request. It is easy to see how this process can become a time consuming activity which may cause the organization to miss valuable opportunities. In order to take advantage of these opportunities, it is necessary for the analysts to have direct access to the data or at the very least, a strong and close relationship to the IT department. This relationship will encourage a process focus to analytics instead of a functional focus. While the relationship between the analysts and the IT department is important, even more important is the analysts themselves.

PROFESSIONAL DEVELOPMENT

One of the most important issues addressed in "Competing on Analytics" is the issue of Analytic Professionals. Analytics Professional spans the range from those who hold advanced degrees in statistics or related fields to those who may have never had a course in statistics. Davenport refers to those who do not have a strong statistical background as analytic amateurs. Since those who possess advanced degrees are relatively expensive to employ, organizations will be largely dependent on these analytic amateurs. In fact, there are people in analytical roles at some organizations that do not have any statistical background, but have an aptitude for such work. It is important for the organization to help these professional develop these skills. Capital One uses extensive testing of its employees to identify which employees have a proclivity for this type of work and provide them with the opportunities to further develop these skills.

Technical skills include both methodologies and the software that allows analysts to implement these methodologies with ease. Some of the more common methodologies include activity based costing, neural networks, data and text mining, simulation, statistics, and optimization as well as numerous other methodologies. These methodologies are supported by a vast array of applications ranging from simple spreadsheets to full integrated business intelligence applications. Applications such as SAS, Minitab, SPSS, Cognos, Business Objects, Arena, and others are becoming common place in some organizations. These tools used to be the sole domain of highly specialized professionals, but more and more businesses are demanding them

from their employees. Many of these skills are not typically found in most business schools' core curriculum, but these skills are becoming exceedingly important in the business world. Yet technical skills are not the most important skills to develop in analysts.

According to Davenport, analytic professionals often lack the soft skills that are necessary to convince upper management to act upon their recommendations. Communication skills tend to be the short coming of most concern. Dealing with problems of a technical nature on a routine basis, many analysts fail to put their recommendations in terms that are important to organizations. It is of the utmost importance for analysts to relate their findings in terms of the aspects of particular interest for the organization. Relating findings in terms of impact on revenue, expenses, or income are more likely to be acknowledged than merely stating the findings. Few analytic amateurs will have the technical and the business skills to make this association. Organizations need to actively develop these skills in their analytic amateurs, if they wish to become analytic competitors. This is also an issue for universities with business programs.

Universities such as North Carolina State University are developing (or have existing) programs in Analytics. These programs tend to focus technical skills, as these skills will be needed by the graduates to be successful professionals. Approximately 15% of the topics covered in the NCSU program are dedicated to soft-skills. These topics are critical to success of analytic professionals, but only a fraction of these 15% directly deal with how analytic professionals should present their findings to the business professional or the layperson (North Carolina State University 2008). Since the decision makers will likely be a business professional, not analytic professionals, special efforts should be taken to educate future analytic professionals on how to sell their proposals and findings. This responsibility often falls to the educator in charge of an individual course because of the principle of academic freedom. Unfortunately this topic is too important to be left to an individual. Since this is not a technical skill it is likely to be the first portion of the course to be eliminated, if the class falls behind.

Being a new field of study, analytics is likely to change in scope. Currently, the field of analytics is considered a subset of activities within what is called business intelligence. While analytics is considered only a subset, it is easy to see that analytic professionals should be familiar with the full range of business intelligence activities. Someday analytics may eventually replace the name Business Intelligence entirely. Regardless of what the practice is called, using data to guide business decisions is a trend that can be expected to continue and those with the proper tools can expect to be in high demand. Businesses who fail to operate in such a manner can expect to find that it will be come increasingly difficult to compete against companies who do use these practices. New ventures will become increasingly expensive endeavors as companies leverage their analytic capabilities to create barriers to entry. As technologies become less expensive, these activities well eventually become common practices in medium and even some small businesses. Eventually, as executives become more tech savvy, analytics will become the preferred method of making decisions in the business world. Just as quality has become woven into every aspect of an organization, eventually analytics will become fully integrated into most companies' culture.

References

Analytics. (n.d.). *Webster's Revised Unabridged Dictionary*. Retrieved October 12, 2008, from Dictionary.com website: http://dictionary.reference.com/browse/analytics

The Data Warehouse Institute. 2008. Business Analytics. Retrieved October 1, 2008 http://www.tdwi.org/Certification/CBIP/display.aspx?id=7151

Wikipedia Business Analytics. 2008. Retrieved October 1, 2008 http://en.wikipedia.org/wiki/Business_analytics

North Carolina State University 2008. Institute for Advanced Analytics.Retrieved October 1, 2008.http://analytics.ncsu.edu/?page_id=123

Individual Ignorance a la Internet Bubble

Jordan Mitchell
East Carolina University
2770 Meridian Dr. Apt. 8
Greenville, NC, 27834
Jpm0901@ecu.edu

Abstract

The purpose of this paper is to examine how the aspects of behavioral finance influence investor's decisions to purchase or sell securities. The paper will address this issue by example of the late 1990s internet/technology bubble. We will examine the behavioral finance by comparing stock prices with the value in which the stockholder places upon it.

Introduction

How are stock prices established? To ask this question to a member of the general public he/she might possibly tell you that prices are set by how well the company is performing; the higher performance of the company, the higher the stock price. Is this always true? Should we, as the public believe that if we hold a particular stock, the gains of that stock will directly reflect how the company is performing? What this paper will eventually advise is that most of the time this is not the case. Most of the time we, as a people artificially change the stock price with our own system of emotional behaviors. We let short-term setbacks determine whether we stay in the game or not. Our own opinion, which most of the time is determined by emotions, is a factor that makes a stock price change violently. This paper will explain what is meant by "behavioral finance" and how it influences stock prices by means of examining the internet bubble of the 1990s.

A field of research has lately come to explain why and how emotions and cognitive ideas influence investors and the decision-making process. Many researchers believe that a study in psychology can lend itself to providing some reason on many stock market anomalies such as

bubbles and crashes (Kahneman & Tversky, 1979). This paper will further explain how peoples' emotions and beliefs influence investment behaviors.

Let us look at the trading volume and stock price growth of the second half of the 1990s. This was the "boom" phase of the internet bubble. When one says the word "boom" they simply mean that the valuation of a stock, sector, or even the entire economy is growing above average. The average growth for the entire stock market over the past 65 years has been 12%. So if a stock, sector or the economy is growing at a rate above 12%, it is said that it is "booming". The first ever internet company that filed its Initial Public Offering (IPO) was Netscape Communications Corporation on August 9, 1995. The IPO was introduced at a price of $28 per share. That very day the high price was $75 but closed at $58.25. This is evidence of the volatility being present on the first day of trading for this stock. The peak of this boom was in February 2000 which was signified with trading volume reaching 20% of all shares in the U.S. stock exchanges. The NASDAQ, which is a stock index that was very heavily weighted on technology, reached its peak on March 10, 2000 with an index level of 5,048. This time, from August 9, 1995 (Netscape IPO) to March 10, 2000 (NASDAQ peak) is known as the era of the internet boom.

Another basic concept that needs to be addressed is the consequences of a boom. It has been said that the average growth rate for U.S. stocks for the past 65 years is 12%. This leads to the next point of correction. Correction is what happens to a stock, sector, or the economy to naturally maintain that average of 12% after either a boom or bust. Within a month and a week after its peak (March 10, 2000 – April 17, 2000) the NASDAQ would lose 34% of its value. After this, it continued losing for three years, with the final loss being 75% of its value and wiping out $7 trillion from investors' portfolios. To give reference to where we are today in this situation, the NASDAQ as of the opening bell on Tuesday, February 19, 2008 is currently priced at 2,321.80. This price is not even half of its peak of March 2000. (Corr, 2006)

Table 1

As shown in the chart above, in mid-2000, the market peaked and then fell sharply. This "bursting of the technology bubble" was brought on by many investors who obviously did not make wise investment decisions. Anyone can point this out, but can we identify why the individual investment decisions were wrong? If a prospective investor, with no prior investment experience watches the stock market boom at a rate of over 15% a year, why would not he or she want to "hop on the train" and generate gains of those figures? To determine why prospective investors invested, we need to examine what their though-process was.

So why did this happen? It is impossible that the companies themselves could gain and lose value in that short of a time frame. Financial theory states that "investors make their investment decisions based upon all the information available regarding a particular security." But is this always the case? Could there be something else that investors do not know of that somehow makes them either buy or sell? This gives way to an area of study called "Behavioral Finance". Behavioral Finance attempts to both understand and explain the effect that emotion, uncertainty, and irrational thinking can play in the decisions made by investors. Furthermore, Behavioral Finance addresses flaws in decision making so that others can predict and exploit the stock market. That is, how people can exploit others emotions for a personal gain.

Typically, emotions play a role in the average investor's technique of investing. For example, after making a decision to buy or sell a stock that results in a loss of capital, investors tend to have a feeling of sorrow and grief. Also, someone would typically put off selling a stock if he/she knew that it would result in a loss to avoid negative emotions and having to deal with disclosing the loss to the people whom he/she trusts and respects. It has also been found that investors put too much weight on their recent investment experiences, which they use emotionally to guide them for further investments. This method of investing will not allow the investor to maximize his/her wealth and will negatively go against the long run average for the market (12%). But why does it negatively go against the average? Short-term-wise, if a person is extremely lucky, they feel as if they are ten feet tall and everything they touch will turn to gold, i.e.) overconfidence bias. This is foolish because if he or she gambles with his or her money, he or she will eventually take a sever loss. Likewise, if one has been unlucky with one's investments, it will cause one to become too conservative in one's investments. If a man has taken a sever loss, such as the fellow that bought Netscape stock at its high of $75 and later that day sold it for its closing price of $58.25. That is a 22% loss in less than one day. He would tend to use that experience as a sign that all other investments he makes will take that kind of a loss. This will cause him to put all of his investments in ultra-conservative products that might earn him an average of around 4% a year. This yield obviously is under the U.S. stock average of 12%.

Another, more inherent emotional mentality is that of the herd mentality. If a person thinks back to their youth, it was "responsible" for the person to do what everyone else did, without thinking it through and mentally gathering the consequences. This is called the herd mentality; this theory states that "investor's follow the investment decisions of others so that if a bad investment decision is made, the investor can take comfort in the fact that others also made the same incorrect investment decision." If everyone else in your office invested in Investment X, wouldn't you? At the very least you would put a more positive light on that investment instead of something else you are looking at. This is the average response to the herd mentality.

The last theory that will be discussed will be the Greater Fool Theory. The Greater Fool Theory maintains that it is worth purchasing a security not for its intrinsic value, but it is worth buying an already overvalued security because there will always be someone else to purchase it at a higher price. In practice, the person that is unable to capitalize on there being a Greater Fool is the Greatest Fool, i.e.) the person that bought Netscape at $75. An example of this in real life is the concept of a chain letter. Everyone that participates in the chain letter makes money except the people at the end of the line (The Greatest Fools), where they cannot get anyone to rely to the program.

As far as current-day issues with the internet sector boom, one cannot help but mention Google. Many people do not remember that the Google IPO was given in August of 2004 at $85. At the time this paper was first written, Google recently hit its high of $747.24. That is more than a 900% gain in 3 years. Based on behavioral finance, would this be classified as a bubble that's about to burst? Does this stock price give an accurate portrayal of the company's intrinsic value? As it turns out, Google's bubble burst shortly after the first draft of this paper. The stock is currently valued around $350 per share, down above 50% from its high.

The current market has even turned some seasoned investors to pull out. The Money & Investing section of the November 24th, 2008 Wall Street Journal describes a semi-retired computer programmer that has "thrown in the towel" on the markets. Eugene Hibbs, at the beginning of the year was entirely invested in stocks. As the stock market sank, he shifted the majority of his holdings into commodities, when they sank, mutual funds, when they sank

treasury bills, where his holdings are currently. In Virginia, Chris Hess, a 41 year-old plastic surgeon has seen a 60% drop on his $1 million portfolio. After this happened, Chris sold all of his stock and put the proceeds in a cash account. (Dugan, 2008) These kinds of emotional trades often are not the best strategy for building wealth. The most dramatic of the above cases is the case of Chris Hess. Hess, after a 60% drop in his portfolio, decided to realize the losses and convert the remainder of his portfolio to cash. We must first discuss the only time one looses money in the stock market is when the individual "realizes" the loss. In other words, the investor must sell the security in order to "realize" whatever gain or loss the security has made. This action, when placed on the long-term investment context, is foolish. Over a ten-year period, the stock market has never decreased in value. With an average annual return of 12% for the Dow Industrials Index, and the average cash account paying approximately 3-4% annually, one could over the short term be better off with the cash account, however, we can see that over the long term, the cash account will barely counter-act the effects of inflation. The stock account will see more volatility than the cash account, however, if one has a long-term horizon on their first withdraw from their securities account, having an account that favored stocks would be the higher-paying option.

Bibliography

Corr, T. (2006). Boom, Bust, Boom: Internet Company Valuations - From Netscape to Google. *The Financier* , 66-84.

Dugan, I. (2008). Fear and Frustration: Some Calling It Quits. *Wall Street Journal* , C1.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision Making Under Risk. *Econometrica* .

DEVELOPING A METHODOLOGY TO IMPLEMENT CONTINUOUS QUALITY IMPROVEMENT IN HEALTH CARE ORGANIZATIONS

Rhonda L. Hensley, School of Business and Economics, North Carolina A&T State University, Greensboro, NC 27411, (336)334-7656, hensleyr@ncat.edu
Kathryn Dobie, School of Business and Economics, North Carolina A&T State University, Greensboro, NC 27411, (336)334-7656, kaydobie@ncat.edu

ABSTRACT

The quality of health care delivery has become an increasingly important consideration as health care providers balance concerns for patient care with regulatory requirements, the specter of litigation, increased costs, reduced reimbursements, personnel shortages, and increased demand for services. This paper proposes a conceptual model of the Continuous Quality Improvement process that provides a visual perspective of the process elements and their respective role in the CQI process. The conceptual model is designed to be used by CQI teams as a guide in the adoption and implementation of a CQI process in their organization. Additional managerial decision tools for the organizational implementation of the CQI process are introduced in an effort to guide implementation teams through the process.

INTRODUCTION

The quality of health care delivery has become an increasingly important consideration as health care providers balance concerns for patient care with regulatory requirements, the specter of litigation, increased costs, reduced reimbursements, personnel shortages, and increased demand for services. In this complex operating environment, health care providers strive to deliver patient satisfying, medically sound outcomes to greater numbers of patients with lower costs. Health care quality issues are especially critical because the lives of patients are directly affected by quality failures [25]. At the same time cost issues affect the ability of the health care provider to deliver quality services. Previous research in the marketing and services area has shown that lower casts and sound outcomes can best be accomplished by maintaining high service quality standards [19] [24][4].

Marketers recognize that service quality is grounded in an understanding of patients' perceptions and evaluations of the service interaction. Conversely, manufacturing has focused on specification measurement and process control with no direct interaction with customers.   A recent study by Raju and Lonial [21] indicate that a relationship exists between the environment that facilitates organizational quality practices [2] and marketing orientation [14] [17]. This research demonstrates the necessity for health care organizations to examine opportunities to meld efforts to optimize operational efficiencies with customer service oriented initiatives.

RESEARCH BACKGROUND

An examination of the unique properties of a health care service interaction serves to illustrate the opportunities afforded by the careful integration of efforts to achieve operational efficiency while maintaining a customer service orientation. Each health care service interaction is characterized by a high level of interaction between the patient (customer) and multiple individuals who contribute to the health care outcome. In addition there is the possible use of high technology treatment and diagnostic processes which are to some degree intimidating to the patient. In many cases, patients are not able to adequately measure the efficacy of the outcome and thus base perception of service quality upon the personal interaction with the service providers and the environment in which the service is delivered [7] [15]. Therefore it is necessary to consider the operational and the customer oriented aspects of the service delivery.

Operational Efficiency

Historically, manufacturing firms worked to improve operational efficiency. Efficiency may be defined as how well a process or set of processes operates compared to some standardized output level. These internal measures of performance allowed firms to produce products that met physical and performance expectations and reduced the costs of doing so. Operational efficiency in service firms is more difficult to define and measure. Because customers are involved in the provision of the service they impact operational efficiency. For example, if a health care professional is performing a procedure on a patient the procedure may have a standardized time but if the patient slows the process down (for instance, by asking lots of questions) the process may appear to be less efficient. Organizations now recognize that operational efficiency and the resulting lower costs are not a substitute for perceptions of high quality. As manufacturing firms experienced increased competition in the marketplace, they began to expand their definitions of quality to include customer perceptions of product quality. Firms operating in service environments have an even greater need to focus on both internal process knowledge and external customer involvement in those processes to make improvements in processes that lead to improved efficiency.

Customer Service Orientation

The initial market orientation construct was defined from a managerial or employee perspective [16] [14]. The importance of understanding and responding to customer needs (customer service) springs from early studies regarding the market concept which identified the positive effect between market orientation and business performance [17] [23] [27] [28]. Reeves, Matnet and Crane [22] argued that it was crucial that healthcare service providers consider both professional standards and customer expectations.

The measurement of service quality is complex because it is dependant on customers' perceptions and evaluations of the service [30] [9]. Gronroos [9] defines service quality in terms of the point in the service process where interaction between customers and service providers occurs. More current studies have emphasized the importance of incorporating customer perceptions as they are the recipients of the service interaction. A recent study by Anwar [1]

indicates that the requirement for sustainable service quality in the healthcare industry illustrates the necessity for a market orientation.

In the minds of many, six sigma and other quality methodologies are primarily focused on reducing waste and costs associated with poor quality, and improving efficiency and effectiveness of the manufacturing process [10].   In fact, when incorporated within the service environment, six sigma and other quality programs such as Continuous Quality Improvement have also shown to produce positive results. Customer perceptions of quality (functional quality), measurable service delivery quality (technical quality) and cost/waste reduction have all been positively impacted [3]. In a health care service interaction, the patient in essence judges the technical competence of the health care provider by how he/she is treated during the service interaction [11].
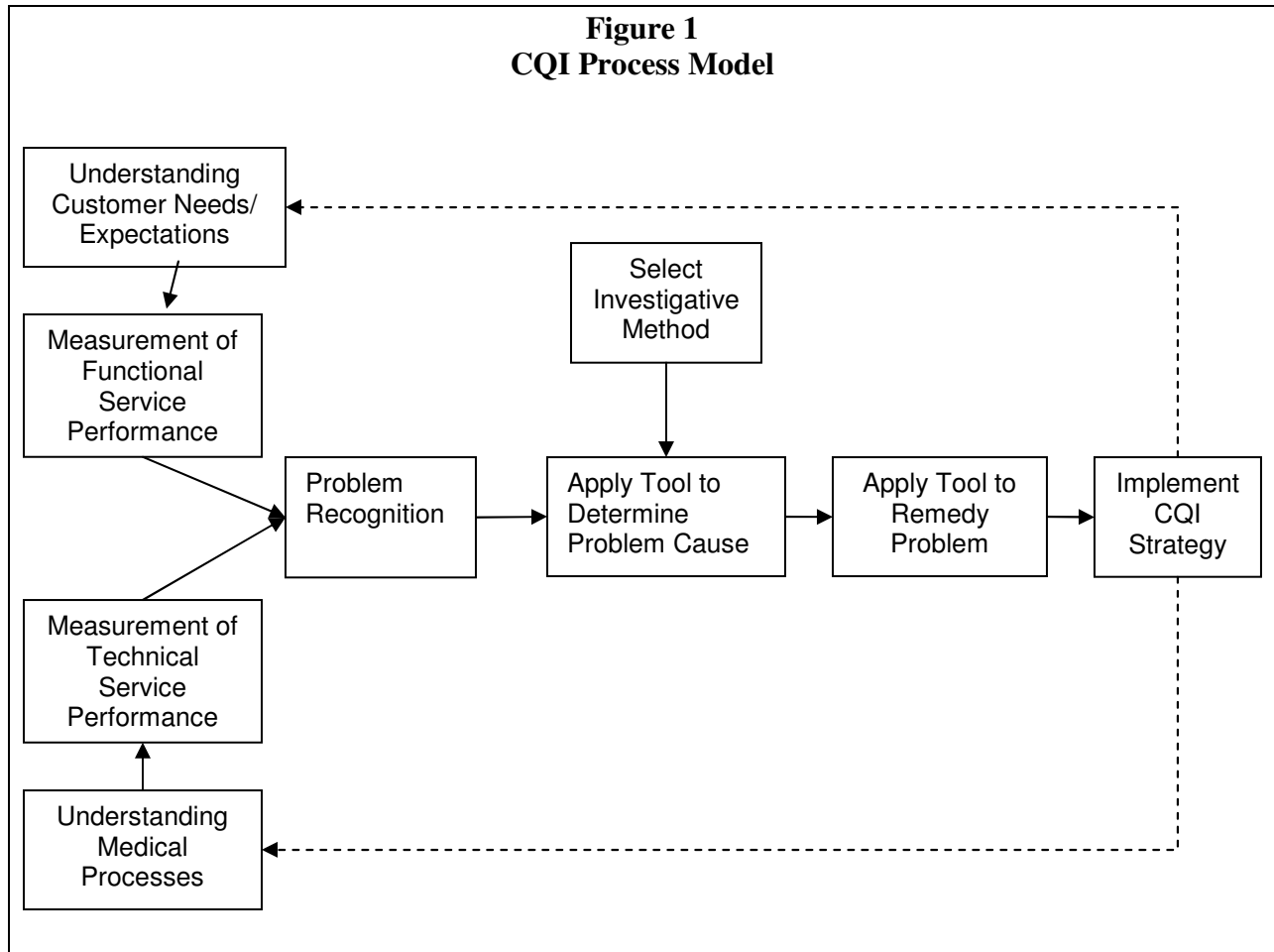

MODEL DEVELOPMENT

For the purpose of this investigation, quality is seen as a journey and not a destination. The Continuous Quality Improvement (CQI) process incorporates a continuous loop which identifies internal and external process variation, determines the cause of the variations, and designs and implements strategies to advance organizational quality performance. In order to successfully design and implement a CQI initiative, there must be a clear understanding of all elements that must be included.

The introduction of a conceptual model of the CQI process is proposed (Figure 1). This model provides a visual perspective of the process elements and their respective role in the CQI process. The conceptual model is designed to be used by CQI teams as a guide in the adoption and implementation of a CQI process in their organization. Additional managerial decision tools for the organizational implementation of the CQI process are introduced in an effort to guide implementation teams through the process.

As the CQI Process Model illustrates, the continuous quality improvement cycle is dependent on several factors in order to function correctly. The health care service provider must be able to correctly identify the problem in need of a solution or the entire process of improvement may focus on inconsequential problem areas that will fail to address the most important issues. In service operations, several factors are important for proper problem recognition. These are the organization's ability to understand and measure both functional and technical service performance, the service processes, and the customer needs and expectation which drive those processes.

Customer/Patient Needs and Expectations

Before an external problem can be measured it is important that service organizations first understand the needs and expectations of their customers. This step is complicated by the fact that in services, customers tend to fall into three categories: (1) customers who frequent the service on a continuous basis, (2) customers who do not use the service continuously but do return over and over and (3) customers who use the service infrequently, perhaps only once.

Figure 1
CQI Process Model

```
┌─────────────────┐
│ Understanding   │ ◄╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌┐
│ Customer Needs/ │                                                   ┊
│ Expectations    │                                                   ┊
└────────┬────────┘                                                   ┊
         │                            ┌─────────────┐                 ┊
         ▼                            │ Select      │                 ┊
┌─────────────────┐                   │ Investigative│                ┊
│ Measurement of  │                   │ Method      │                 ┊
│ Functional      │                   └──────┬──────┘                 ┊
│ Service         │                          │                        ┊
│ Performance     │                          ▼                        ┊
└───────┬─────────┘   ┌───────────┐  ┌─────────────┐  ┌──────────┐  ┌──────────┐
        ╲             │ Problem   │  │ Apply Tool to│  │ Apply Tool to│ Implement │
         ╲────────►   │ Recognition│─►│ Determine   │─►│ Remedy    │─►│ CQI      │
         ╱            │           │  │ Problem Cause│  │ Problem   │  │ Strategy │
        ╱             └───────────┘  └─────────────┘  └──────────┘  └──────────┘
┌───────┴─────────┐                                                      ┊
│ Measurement of  │                                                      ┊
│ Technical       │                                                      ┊
│ Service         │                                                      ┊
│ Performance     │                                                      ┊
└─────────────────┘                                                      ┊
         ▲                                                               ┊
         │                                                               ┊
┌─────────────────┐                                                      ┊
│ Understanding   │ ◄╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌╌┘
│ Medical         │
│ Processes       │
└─────────────────┘
```

Each of these three customer types creates a need for different ways to measure needs and expectations which must be met by the corresponding internal processes.

The most obvious expectation of patients is that they will receive a positive outcome from the medical procedure or interaction. But, what is often overlooked is the patient's emotion-based evaluation of the total experience [6]. The top complaints registered by patients of the National Health Care Service in England and Wales include safety, poor communication/lack of information, ineffective clinical practices and administrative procedures, lack of coordination between inpatient and out patient services, being treated with a lack of respect, poor attitudes of the staff, and poor and often unhygienic environment [8]. A review of these complaints reveals that they are based on patient evaluation of functional quality rather than evaluation of the technical service (actual medical procedure).

Functional Service Measurement

Measuring patients' satisfaction with the medical-based service interaction includes technical and functional service interactions. In many cases, the functional interaction serves to set the stage for the technical service delivery and as such provides the lens through which patients view

the entire interaction. Dependence on receiving unsolicited complaints is not conducive to developing a proactive stance on process improvement upon which CQI is based. The use of exit interviews and surveys to gather information from patients for everything from the appointment process to their meals to the exit process enables healthcare providers to identify issues before they become problems [20]. Analysis of complaints, exit interviews, and surveys must lead to visible changes that meet the expectation of patients.

Understanding Medical Processes

Because of the technical nature of medical procedures their evaluation most appropriately belongs within the scope of medical practitioners. It is customary for performance boards to examine incidences that result in death or other unsatisfactory outcomes. In addition accredited health care providers are subject to periodic review by The Joint Commission [12] to determine their adherence to accepted medical practices and patient-oriented processes and procedures.

Technical Service Processes

While the actual technical procedure may not be within the purview of the patent, the steps in the process, including communication of what patients should expect, do have an impact on patient perceptions of the quality of the process. Patients are very cognizant of clinical practices, safety, and cleanliness. They use these indicators to judge the quality of the actual medical procedure and outcome. Patients make use of the complaint process to let it be known that they are not willing to accept the state quo and expect changes in the health organization's procedures and practices [6].

Once a need for quality improvement is identified, the problem must be matched with an appropriate quality tool in order to effect the change. At this stage of the process, a company's understandings of their internal service processes and their prior experiences with quality programs will help to determine their choices. These variables when considered together can help an organization to assess its readiness for a particular Continuous Quality Improvement intervention and also to estimate the time and effort required for successful implementation.

Continuous quality improvement efforts may take many forms. Of particular interest is the Six Sigma DMAIC process. The DMAIC process was developed at General Electric in the 1990s and has been applied in many types of businesses. Continuous quality improvement in health care will be examined using the DMAIC framework.

Problem Identification

Understanding the process and identifying problems is the first step in DMAIC. Both continuous quality improvement and six sigma methodologies mandate the involvement of employees, management and customers in the processes of understanding the service processes and identifying particular problem areas that should be improved. In health-care services the completion of this step should involve both employees and managers studying the processes in order to clearly understand them and obtaining and studying customer (may include both patient and family members) views of the processes. A number of quality tools might be useful in

promoting a greater understanding of health care processes. For instance brainstorming, tree diagrams, process flowcharts, process maps, and cause and effect diagram (fishbone) diagrams might all be appropriate means of increasing internal understanding of how the processes really work [10] [18]. Patient and family member input might best be gathered by using methods such as on-going customer surveys, regularly scheduled focus groups or intervention surveys or interviews after service failures. Of special concern are service failures in health care because these have the potential to be life-threatening.

Select Investigative Method

The second DMAIC step involves accurate measurement of process performance. It is generally accepted that service operations may have processes that are not as closely controlled or understood as those in manufacturing. There is no reason to suppose that health care services do not have the same problems. Variability in the execution of health care processes might occur because of a number of people related factors. For instance, the nursing staff in a hospital setting changes at regular intervals and this alone might create variability in health care provision. It is also possible that patient behaviors either due to medical reactions or due to patient behaviors might create variability in health care processes. The use of customer surveys and check sheets to monitor process performance might be particularly useful in monitoring variability [18].

Health care providers may be expected to also consider the expectations of those stakeholders whose views have an impact on the health care service provider. For example, the Carolinas Medical Center developed the MED-1 project after the 9-11 attacks as part of a project funded by Homeland Security [5]. This project was designed to handle mass casualties in field settings due to, for instance, terrorist attacks, natural disasters or special event coverage [5]. The mobile hospital is moved by tractor-trailer and can be setup on site to provide a secure sterile hospital setting capable of handling surgical and emergency procedures. It was, for example, deployed to help in the aftermath of Hurricane Katrina to Mississippi for a period of seven weeks [5].

Apply Tool to Determine Problem Cause

In the third step, data is gathered from the process and then analyzed. Once data is gathered from the health care process a number of data analysis methods might be used. For instance, process-flow analysis, value and non-value-added analysis, Pareto charts, histogram, runs charts or scatter plots might be especially useful in a health care setting [10] [18]. It might also be possible to conduct more complex analysis such as tests for statistical significance, correlation analysis or regression analysis [10] [18].

Apply Tool to Remedy Problem

Implementation of the chosen changes is step four in the DMAIC process. Many tools are available to assist in the implementation of the process changes. For instance, project management methods, failure mode and effects analysis, stakeholder analysis, force field diagrams, process documentation and balanced scorecards might be useful [10] [18].

Implement CQI Strategy

In step five, the changes are complete and the process must be controlled. Changes to the health care process must be measured and evaluated by the ongoing gathering of new data from the process to chart the impact of the changes.

DIRECTIONS FOR FURTHER RESEARCH

The challenge for the researchers is to develop process maps for internal and external processes that will be useful for health care CQI project teams as they seek to develop performance indicators and the associated appropriate measures to serve as benchmarks for problem identification and to determine the effect of implementing new CQI strategies. The only way to determine if quality is being continuously improved is to be able to use the current quality standards as a point of reference.

CONCLUSIONS

The results of exceptional levels of health care service delivery may include short term increases in productivity and profits due to reduced costs [29] [31] [13]. Over the long term, exceptional levels of health care service delivery can be used to create a comparative advantage in the marketplace. The creation of a competitive advantage is an increasingly important factor given the increasing costs of health care and the increased governmental oversight and decreased reimbursement [13] [26]. Considered from a customer perspective, good service quality should lead to long-term customer relationships (measured by loyalty and repeat patronage), to customers' willingness to recommend the service to others and to customer's perceptions that the health care organization has a good reputation [9, p. 260].

It is clear that when evaluating quality in the health care setting, attention must be paid to the effect that a marketing orientation, organizational performance, and patients' perceptions and evaluations of the service interaction have on service quality. The synergistic relationships and their impact on the delivery of continuous quality improvements and their effect on the operational and financial health of the health care organization have not been adequately explored and represent an opportunity to further the science of Continuous Quality Improvement. This project focuses on the development of a methodology that utilizes the synergies between marketing orientation, organizational performance, and patients' perceptions and evaluations to facilitate the integration of continuous quality improvement activities and processes into the culture of the health care organization.

REFERENCES

[1]   Anwar, S.A. A factor analytic investigation of the construct of market orientation. *International Journal of Management*, 2008, 25(1), 186-197.

[2]   Benson, G.P., Saraph, J.V. & Schroeder, R.G. The effects of organizational context on quality management: an empirical investigation. *Management Science*, 1991, 37(9), 1107-1124.

[3]   Brady, M.K. & Cronin, J.J. Some new thoughts on conceptualizing perceived service quality: a hierarchical approach. *Journal of Marketing*, 2001, 65(3), 34-49.

[4]   Carman, J.M., Shortell, S.M., Foster, R.W., Edward, F.X., Hughes, H.B., O'Brien, J.L. & O'Connor, E.J. Keys for successful implementation of total quality management in hospitals. *Health Care Management Review*, 1996, 21 (1), 48-60.

[5]   Carolina's Medical Center, available at http://www.carolinasmed-1.org/body.cfm?id=8, 2008.

[6]   Cowan, J. & Anthony, S. Problems with complaint handling: expectations and outcomes. *Clinical Governance*, 2008, 13(2), 164-169.

[7]   Fitzsimmons, J.A. & Fitzsimmons, M.J. *Service Management for Competitive Advantage*, McGraw-Hill, Inc., New York NY, 1994.

[8]   Healthcare Commission Spotlight on complaints: a report on second-stage complaints about the NHS in England.*Commission for Healthcare Audit and Inspection*, available at www.healthcarecommission.org.uk, 2007.

[9]   Gronroos, C. *Service Management and Marketing*, Lexington Books, Lexington MA, 1990.

[10] Hoerl, R. & Snee, R.D. *Statistical Thinking: Improving Business Performance*, Duxbury Press, Pacific Grove CA, 2001.

[11] Holpp, L. Eight definitions of quality in healthcare. *The Journal of Quality and Participation*, 1993, 16(3), 18-27.

[12] Joint Commission, available at www.jointcommission.org, 2008.

[13] Kandampully, J. & Duddy, R. Competitive advantage through anticipation, innovation and relationships. *Management Science*, 1999, 37(1), 51-56.

[14] Kohli, A.K. & Jaworski, B.J. Market orientation: the construct, research propositions, and managerial implications. *Journal of Marketing*, 1990, 54(April), 1-18.

[15] Lovelock, C. & Gummesson, E. Whither services marketing? In search of a new paradigm and fresh perspectives. *Journal of Service Research*, 2004, 7(1), 20-41.

[16] Narver, J.C. & Slater, S.F. The effect of market orientation on business profitability. *Journal of Marketing*, 1990, 54(October), 20-35.

[17] Narver, J.C. & Slater, S.F. Market orientation and customer service: the implications for business performance. *European Advances in Consumer Research*, 1993, 1, 317-321.

[18] Pande, P. & Holpp, L. *What is Six Sigma?* McGraw-Hill, New York, 2002.

[19] Parasuraman, A., Zeithaml, V.A., & Berry, L.L. A conceptual model of service quality and its implications for future research. *Journal of Marketing*, 1985, 49(Fall), 41-50.

[20] Quinn, G., Jacobsen, P.B., Albrecht, T.L., Bell Ellison, B.A., Newmann, N.W., Bell, M. & Ruckdeschel, J.C. Real-time patient satisfaction survey and improvement process. *Hospital Topics*, 2004, 82(3), 26-32.

[21] Raju, P.S. & Lonial, S.C. The impact of quality context and market orientation on organizational performance in a service environment. *Journal of Service Research*, 2001, 4(2), 140-154.

[22] Reeves, S., Matnet, K. & Crane, V. continuous quality improvement as an ideal in hospital practice. *Healthcare Supervisor*, 1995, 13, 1-12.

[23] Ruekert, R. W. Developing a market orientation: an organizational strategy perspective. *International Journal of Research in Marketing*, 1992, 9, 225-245.

[24] Rust, R.T. & Oliver, R.L. Service quality: insights and managerial implications from the frontier. in Rust, R.T. and Oliver, R.L. (Eds.) *Service Quality: New directions in theory and practice*. Sage Publications, Thousand Oaks, CA, 1994.

[25] Salman G.F. Continuous quality improvement in rural health clinics. *Journal of General Internal Medicine*, 2005, 862-865.

[26] Sharma, B. & Gadenne, D. An inter-industry comparison of quality management practices and performance. *Managing Service Quality*, 2002, 12(6), 394-404.

[27] Slater, S.F. & Narver, J.C. Does competitive environment moderate the market orientation-performance relationship? *Journal of Marketing*, 1994, 58, 46-55.

[28] Slater, S.F. & Narver, J.C. Market orientation and the learning organization, *Journal of Marketing*. 1995, 59, 63-74.

[29] Thompson, P., DeSouza, G. & Gale, B.T. Strategic management of service quality. *Quality Progress*. 1985, (June), 20-25.

[30] Wycoff, D.D. New tools for achieving service quality, *Cornell Hotel and Restaurant Administration Quarterly*, 1984, 25(November), 78-91.

[31] Zeithaml, V.A., Berry, L.L. & Parasuraman, A. Communication and control processes in the delivery of service quality. *Journal of Marketing*, 1988, 52(April), 35-48.

REELING IN OUTSOURCING

Marilyn Smith, Winthrop University, Rock Hill, SC 29733 803-323-2697 smithm@winthrop.edu
Roberta S. Russell, Virginia Tech, Blacksburg, VA 24061 540-231-4532   rrussell@vt.edu

ABSTRACT

Companies who sought outsourcing as a panacea to cost pressures and global demand have begun to re-evaluate their outsourcing strategies in light of increased fuel and distribution costs, quality problems, security risks and current economic conditions. This concept paper reviews the literature on reversing supply chain outsourcing and outlines the basis of a model for reshaping outsourcing strategies where risks and returns are explicitly considered.

INTRODUCTION

In the past ten years, volumes have been written in trade magazines, academic journals, and books about supply chain management and global outsourcing. In their recent comprehensive search of the literature Hult and Chabowski (2008) found 72, 003 citations on sourcing with 56, 581 of the citations from 2003-2007. Most of the research has dealt with supply chain strategy, partner selection, and implementation, with only a cursory mention of monitoring performance after implementation. However, outsourcing decisions are highly sensitive to changes in economic, environmental, political and competitive conditions. And the original outsourcing decision may not have adequately assessed the total costs of outsourcing. What happens then? How does an organization reel in outsourcing that is not performing at an acceptable level? Little is written about how to reel in an underperforming outsource decision, perhaps because the loss of re-building the internal capacity would be more expensive than incurring the unexpected extra costs of the outsourcing and/or because firms are reluctant to admit strategic errors. The objective of this paper is to prompt thought and discussion on the use of performance metrics to monitor outsourcing decisions to aid in determining when the outsourcing decision should be altered or reversed. A generic macro model incorporating risk and recovery is proposed for assessing outsourcing decisions.

LITERATURE REVIEW

With the audience of this paper in mind, the literature review begins with the August 2008 *Decision Sciences,* which was a special issue on sourcing decisions and includes Hult and Chabowski's comprehensive literature review. Key points from these articles are given in Table 1. Hult and Chabowski (2008) noted that outsourcing performance appraisal became "stronger" in the articles published in 2003-2007 compared to the articles published 1998-2002. They also suggested future research on managerial "misperceptions in developing supply chain resources," which implies that outsourcing decisions may need to be changed.   As shown in Table 1, only the first three articles explicitly incorporate the concept of performance review. Ang and Inkpen (2008) provide a list of items to measure cultural intelligence. As part of cultural intelligence they suggest the company should have a system for exiting from offshore contracts "with minimum disruption." Salimath, Cullen, and Umesh (2008) explain how the structure (configuration) of entrepreneurial firms can change over time and how firm structure impacts the performance of outsourcing decisions. Performance review is implied in the research by Beugre

and Acar (2008), which discusses the importance of cross-border relationships on understanding and effectiveness.

Table 1. Key Points and Conclusions from Sourcing Literature

Authors	Title	Key Points and Conclusions
Hult and Chabowski	Sourcing Research as an Intellectual Network of Ideas	Grouped previous research into topic clusters and compared changes in cluster from 1998-2003 and 2003-2007. The importance of **performance assessment** increased.
Ang and Inkpen	Cultural Intelligence and Offshore Outsourcing Success: A Framework for Firm-Level Intercultural Capability	Since cultural intelligence is a requirement for successful international outsourcing, they suggest research on firm level cultural intelligence, as well as how cultural intelligence relates to **performance outcomes**.
Salimath, Cullen, and Umesh	Outsourcing and Performance in Entrepreneurial Firms: Contingent Relationships with Entrepreneurial Configurations	The configuration of the firm impacts the benefits of outsourcing, so that as the firm change over time, managers need to **reevaluate their outsourcing strategies**.
Jiang, Yao, and Feng	Valuate Outsourcing Contracts from Vendors' Perspective: A Real Options Approach	This article acknowledges that vendors may accept contracts to cover lost opportunity cost and the renewal process.
Sia, Koh, and Tan	Strategic Maneuvers for Outsourcing Flexibility: An Empirical Assessment	Previous research on ease of **exiting** is expanded, with conclusions that retention of in-house competence and proactive sensing of changes in the industry are key elements.
Beugre and Acar	Offshoring and Cross-Border Interorganizational Relationships: A Justice Model	The justice model helps explain cross-border relationships in a way that can improve effectiveness through better of understanding of different cultures.
Goo, Huang, and Hart	A Path to Successful IT Outsourcing: Interaction Between Service-level Agreement and Commitment	In service-level agreements, the interaction of commitment with functional, strategic, and technological benefits is complex and may reduce the technological benefits.
Rossetti and Choi	Supply Management Under High Goal Incongruence: an Empirical Examination of Disintermediation in the Aerospace Supply Chain	This research looks at a modified supply chain where tier one or tier two suppliers provide replacement parts directly to maintenance facilities, by passing the original equipment manufacturer.
Levina and Su	Global Multisourcing Strategy: The Emergence of a Supplier Portfolio in Services Offshoring	This case focuses on the firm's sourcing strategy and suggests that having a smaller number of suppliers may negatively impact the expected benefits of multisourcing.
Tangpong, Michalisin, and Melcher	Toward a Topology of Buyer-Supplier Relationships: A Study of the Computer Industry	When trust and cooperation (relationalism) are high, then high supplier dependence can result in operational efficiencies, but low supplier dependence can result in higher innovation.

Sia, Koh and Tan (2008) address the concept of exiting from an outsourcing arrangement. Using an empirical study of 171 outsourcing projects in Singapore, they expand on previous search by Tan and Sia (2006) concerning flexibility in outsourcing. Their dimensions of flexibility are robustness, modifiability, new capability, and ease of exit, with ease of exit including moving outsourced services to another vendor or bringing them back in-house. The factors that they found to positively impact ease of exit were enhancing product maturity, retaining in-house competence, multiple sourcing (see also [11]), vendor inoperability (see also [9]), and proactively sensing flexibility and new capability (see also [1]). In addition, they found that while a strong relationship with the supplier enhanced robustness, modifiability, and new capability, it had a negative impact on the ability to exit. The paper appears to be groundbreaking in addressing the exit issues, but the authors recognize the limits of the study and suggest more empirical work, especially in the United States.

In addition to the articles reviewed by Holt et.al., other pertinent research includes a recent paper by Bengtsson and Berggren (2008) comparing the outsourcing decisions of Nokia and Ericsson. The authors used interviews with several managers over a four year period, as well as internal information and public information about the companies. Both companies had followed the telecom industry trend of outsourcing. First, the paper presents two outsourcing models. The horizontally integrated model has the original equipment manufacturer (OEM) retaining some of its processes in-house. The vertically divided model has all of its production transferred to contract manufactures. Nokia followed the vertically divided model by getting rid of all of its manufacturing capacity. Ericsson intended to follow the vertical divided model, but a downturn in the industry in 2005-2006 caused Ericsson to re-evaluate the decision. They decided to let their outsourcing contracts expire and "insource" or bring the work back inside the company. Some of the key components in the decisions to insource were miniaturization and automation, transfer costs, lead times, and logistics issues, reduced product standardization, and supply chain control. This case is a landmark work that provides insight into the pitfalls of outsourcing and provides an example of how one company successfully changed their strategy.

Simchi-Levi, et. al. (2008) report that the cost of logistics, which increased 52% from 2002 to 2007, is forcing many companies to revisit their outsourcing decisions. The article predicts that companies will move manufacturing closer to their markets, reverse course from a pull to a push system of production, ship in bulk on slower modes of transportation (with a resulting increase in inventory levels), and bring home low profit margin/mature products or those that are heavy, large, bulky or expensive to move and inventory.

Capell (2008) describes the rapid-fire supply chain of Inditex's Zara chain of retail clothing. Zara's niche on the leading edge of fashion is reinforced by a supply chain that moves new merchandise from the designer's sketch pad to stores in less than two weeks. To reach this speed to market, they produce half of their merchandise in Spain, Portugal, and Morocco, and then pay air freight for the small shipments to the European stores. The additional money for labor and shipping is recovered by not having leftover merchandise that is discounted. However, they do outsource the production of basics, such as T-shirts, to Eastern Europe, Africa, and Asia.

Goel, Moussavi, and Srivatsan (2008) with McKinsey & Company have recently suggested that due to rising oil costs, currency valuations and shifting wage rates, organizations should rethink their offshore production decisions. They used data gathered from company web sites,

Economist Intelligence Unit, FedEx, and their internal organizational data to develop a breakeven analysis for four products -- a high-end server, a mid-range server, a mid-range copier, an assembled television, and an Ethernet switch. Then they considered whether to produce each product in the U.S., Mexico, or China. Surprisingly, the assembled television and mid-range copier would be cheaper to produce in the U.S. The study ends with a recommendation for a more precise estimate of supply chain costs to include the cost of the raw materials, inventory costs, managing product returns, reworking errors, incremental financing, and exchange-rate risks.

PROPOSED MODEL

The decision tree in Figure 1 captures some of the concepts discussed above to begin to develop a model for production outsourcing. The tree depicts three main sourcing options, insourcing, nearsourcing or global outsourcing, each with several optional branches. Insourcing is bringing production back in-house. This does not have to be an all or nothing decision, just as Ericsson [2] maintained some of its capabilities, while it outsourced some production. Similarly, a university could maintain all the facilities and equipment associated with food services for the campus, but outsource the actual food preparation process. For smaller organizations, the options may only be outsource all production or outsource labor.

Nearsourcing refers to the decision to use local suppliers or suppliers within the home country or neighboring region for part or all of production. There is a renewed interest in bringing the supply chain closer to home in the current economic downturn for the following reasons. Companies faced with drastic cost cutting may liquidate their in-house production assets and labor in favor of contracting out production to a supplier who would assume the risks of a shaky economy. While this would seem to be an ideal solution, the cost economies of smaller orders (due to weak consumer demand) may erase some of the labor advantages of outsourcing, and the distance of an extended supply chain may create other problems. As leadtime and variability increase, so do inventory levels and other buffers of demand and supply uncertainty. Tying up cash in inventory may not be financially possible when lines of credit are more difficult to obtain, and additional inventory may not be advisable when demand is tentative. Fluctuations in currency exchange rates may also be hard to predict with disastrous results in a cash-starved economy. Table 2 lists these issues and others in outsourcing during an economic downturn. The nearsourcing trend is already evident in the shift of production from Asia to Central America by such companies as Wal-Mart, Dell, IBM, P&G, and Sara Lee. [19]

In the decision tree, national or regional companies are distinguished from global companies because it is assumed that the risks would be higher if the outsourcing were global, and the cost of reeling in outsourced activities would be greater. The empirical research by Sia, et al. (2008) found that maintaining some in-house competence made exit from a supplier easier. This is related to the recent finding of Levina and Su (2008) that a larger number of suppliers may provide a better fit with strategic objectives than limited supply base.
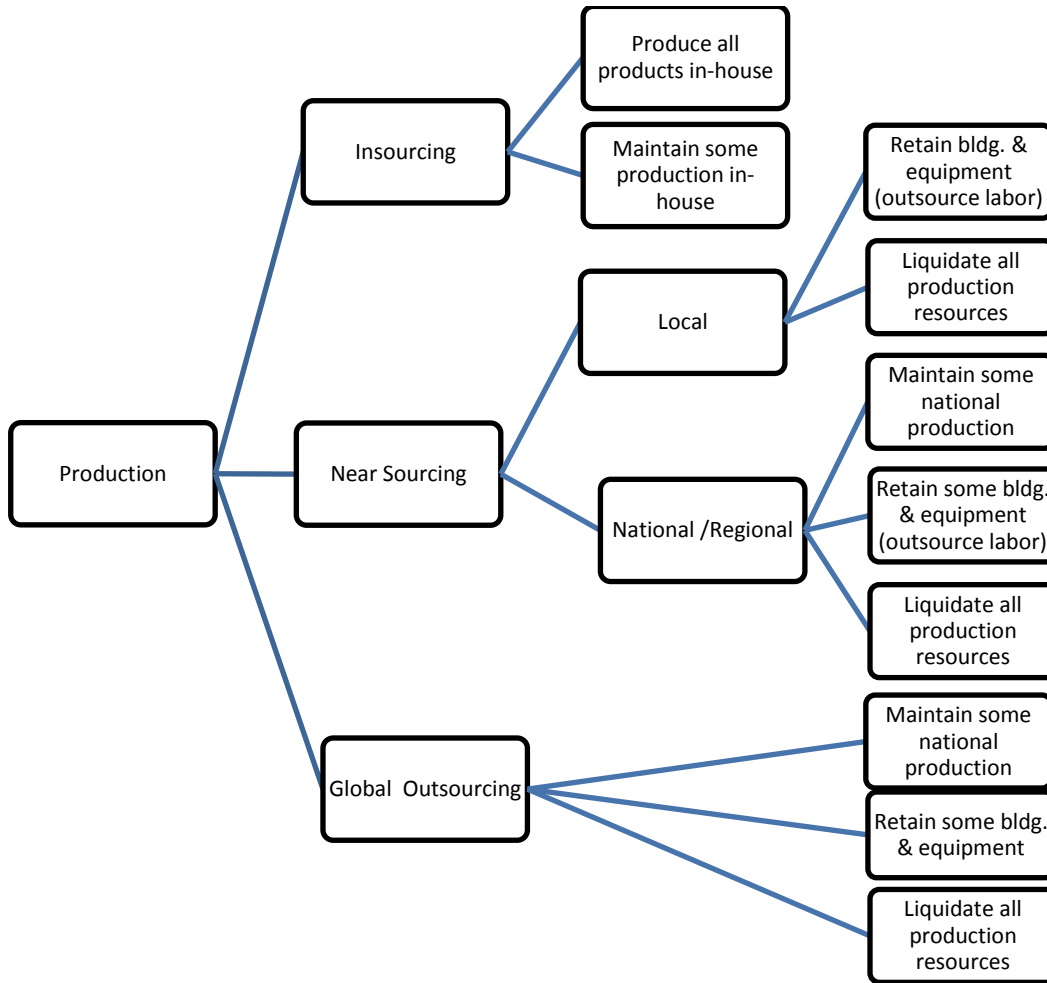
Figure 1.   Outsourcing Decision Tree

Table 2. Outsourcing Issues and Trends in an Economic Downturn

- Weak and unpredictable demand (supply chain flexibility important)
- Limited windows of demand opportunity (supply chain speed-to-market important)
- Reduced cash for investment in inventory (difficulty in obtaining loans or lines of credit)
- Increased transportation costs (higher or unpredictable gas prices, smaller more frequent orders, shorter supply chain important)
- Increased cost of outsourced production (due to reduced economies of scale associated with smaller orders)
- Unpredictable currency exchange rate fluctuations (hedge with multiple locations, more stable economies)
- Long term viability of suppliers at risk (i.e., bankruptcies)
- Government interventions in economic crisis which may penalize offshore production
- Need to share risks of economic downturn
- Less money to verify quality of goods produced (at the same time cost pressures may induce suppliers to cut corners)
- Cash flow problems (suppliers may ask for payment before goods are delivered; banks may not have monies to lend)
- Long-term contracts renegotiated
- Spread risk among multiple suppliers; shorter more precise contracts

If a firm uses global sourcing for production, they also have the same option of maintaining some national production, retaining some facilities, or outsourcing all production. Recent reports that Dell is developing plans to sell all of its manufacturing facilities would place it in the box at the bottom of the decision tree. [18] Russell and Taylor (2009) summarized the various decisions and changes in strategies that New Balance has made, including keeping some production in the U.S., cancelling an international manufacturing contract after the supplier was caught producing and selling counterfeit products, and the company's continuing efforts to "balance" foreign and domestic production.

While no probabilities are given in this paper, it can be assumed that the alternative at the top is the lowest risk, and the level of risk increases as the alternatives move down the decision tree. from local to global and more of the firm's capacity is outsourced. At a more tactical level, moving to a global supplier may make it more difficult to accurately check references and verify the capacity of the supplier, hence making the risk greater (see [19]). Also, the issues of cultural intelligence become more significant and more difficult moving from local to global outsourcing (see Ang and Inkpen, 2008). The challenges that Beugre and Acur (2008) presented in their assessment of cross-border inter-organizational relationships also increase the risk in global outsourcing. It should be noted that the decision tree is single tier, and does not capture the multiple levels and complexity of Dell outsourcing production to Solectron, and Solectron producing the product at a facility that it owns, but using outsourced labor.

The decision tree has risks at every branch, which need to be defined and assessed in the completed model. Assessing supply chain risk is problematic for many companies. Aberdeen (2006) found that 82% of businesses in its survey were concerned about supply chain risk, but

only 11% were managing risk. A survey of worldwide executives of larger firms by McKinsey Quarterly (2006) indicated that 28% used rough quantitative estimates to assess risk, 34% used qualitative or intuitive methods, and 24% had no formal assessment of supply chain risk at all. Only 15% indicated that they use detailed cash flow models to assess supply chain risk. The survey also asked about corporate standards for mitigation of supply chain risk and the enforcement of the standards. Only 46% of the respondents have standards in place, but only 23% reported that these standards were enforced very well.

SUMMARY

While AMR Research reports that 90% of manufacturers surveyed outsource at least some of their production, over half of those experienced an *increase* rather than decrease in cost. This is in part due to underestimated costs of transportation, holding costs for extra inventory, unplanned air freight, and other hidden costs due to variable quality, counterfeiting, obsolescence, security problems, and management complexity. A more realistic assessment of the costs of outsourcing must include an evaluation of risk.

Incorporating risk in outsourcing decisions and the cost to alter or reverse that decision into an overall sourcing model would help the organization make better long-term decisions. The risk could then be incorporated into a comprehensive cost model that would track shifts in the global economy to indicate when changes in outsourcing should be made. In this paper, we presented a generalized decision tree to begin the evaluation of sourcing options from insourcing to nearsourcing to global outsourcing.

Uncertain economic times and volatile markets demand a higher level of scrutiny and due diligence of outsourcing agreements. While exiting an outsourcing arrangement may involve penalties, both company and vendor may benefit from a re-negotiation of terms that frees up resources and either reduces or increases commitment levels (Murti, 2009). Profit-sharing, risk-sharing, re-structured financing and performance incentives may be on the table. The tendency of businesses to react by either "freezing" new initiatives of any type or rushing headlong into "slash and burn" outsourcing should be avoided in favor of developing a sourcing strategy that explicitly considers costs, risk and flexibility. We are already starting to see reshaped supply chain strategies with multisourcing (smaller contracts between several suppliers), shorter contracts, near-sourcing, and network reconfigurations.

REFERENCES

[1] Ang, S., & Inkpen, A. C. (2008). Cultural Intelligence and Offshore Outsourcing Success: A Framework of Firm-Level Intercultural Capability. *Decision Sciences*. 39(3), 337-358.
[2] Bengtsson, L. & Berggren, C. (2008). The integrator's new advantage – the reassessment of outsourcing and production competence in a global telecom firm. *European Management Journal.* 26, 314-324.
[3] Beugré, C. D., & Acar, W. (2008). Offshoring and Cross-Border Interorganizational Relationships: A Justice Model. *Decision Sciences*. 39(3), 445-468.
[4] Capell, Kerry. (2008). Zara Thrives by Breaking All the Rules. *Businessweek.* October 20, 2008.
[5] Enslow, B. (2006) "Global Supply Chain Benchmark Report," *Aberdeen Group*, June 2006.

[6] Goel, A., Moussavi, N., & Srivatsan, V. (2008) Time to rethink offshoring? *The McKinsey Quarterly,* September 2008.

[7] Goo, J., Huang, C. D., & Hart, P. (2008). A Path to Successful IT Outsourcing: Interaction Between Service-Level Agreements and Commitment. *Decision Sciences*. 39(3), 469-506.

[8] Hult, G. T. M., & Chabowski, B. R. (2008). Sourcing Research as an Intellectual Network of Ideas. *Decision Sciences*. *39*(3), 323-336.

[9] Jiang, B., Yao, T., & Feng, B. (2008). Valuate Outsourcing Contracts from Vendors' Perspective: A Real Options Approach. *Decision Sciences*. 39(3), 383-406.

[10] Krishnan, M. & Shulman, J. (2007) Reducing supply chain risk. *McKinsey Quarterly*, 1, 10-13.

[11] Levina, N., & Su, N. (2008). Global Multisourcing Strategy: The Emergence of a Supplier Portfolio in Services Offshoring. *Decision Sciences*. 39(3), 541-570.

[12] Murti, M. (2009), "Making Sourcing Decisions in an Economic Downturn," *Financial Post*, PricewaterhouseCoopers, January 5, 2009.

[13] Rossetti, C. and Choi, T. Y. (2008). Supply Management Under High Goal Incongruence: An Empirical Examination of Disintermediation in the Aerospace Supply Chain. *Decision Sciences*. 39(3), 507-540.

[14] Russell, R. & Taylor, B. (2009). *Operations Management: Creating Value Along the Supply Chain* . Hoboken, N.J.: John Wiley & Sons, Inc.

[15] Sadlovska, V., M. Spinks, and R. Shecterle (2008) "Supply Chain Risk Management: Building a Resilient Global Supply Chain," *Aberdeen Group*, July 2008,

[16] Salimath, M. S., Cullen, J. B., and Umesh, U.N. (2008). Outsourcing and Performance in Entrepreneurial Firms: Contingent Relationships with Entrepreneurial Configurations. *Decision Sciences*. 39(3), 359-382.

[17] Sia, S. K., Koh, C., and Tan, C. (2008). Strategic Maneuvers for Outsourcing Flexibility: An Empirical Assessment. *Decision Sciences*. 39(3), 407-444.

[18] Scheck, J. (2008) Dell plans to sell factories in effort to cut costs, *The Wall Street Journal,* Sept 5, 2008.

[19] Schwartz, E. (2008, August 25). Painful lessons from IT outsourcing gone bad. *Infoworld.com.* Retrieved September 2, 2008 from http://0-infotrac.galegroup.com.library

[20] Shister, N. "Near-Sourcing," *World Trade*, January 1, 2008.

[21] Simichi-Levi, D., Nelson, D., Mulani, N. and Wright, J. (2008). Crude Calculations. *Wall Street Journal*. September 22, 2008.

[22] Tan, C. and Sia, S.K.(2006). Managing flexibility in outsourcing. *Journal of the Association for Information Systems,*7(4), 179-206.

[23] Tangpong, C., Michalisin, M. D., and Melcher, A. J. (2008). Toward a Typology of Buyer-Supplier Relationships: A Study of the Computer Industry. *Decision Sciences*. 39(3), 571-594.

INFORMATION TECHNOLOGY AND DEMAND-DRIVEN SUPPLY CHAINS

Richard W. Monroe, Coastal Carolina University, Wall College of Business, Conway, SC.
29528 USA, Email: rmonroe@coastal.edu; (843) 349-2527
Jay M. Teets, Coastal Carolina University, Wall College of Business, Conway, SC, 29528
USA, Email: jayt@coastal.edu; (843) 349-2852

ABSTRACT

Information technology is vital to supply chain management in the areas of integration and information sharing. Demand-Driven is a characteristic in Lean and Agile supply chains. Based on recent developments, we suggest that there is a new demand-driven strategy emerging for supply chain management. This new form of demand-driven strategy is information technology intensive and is becoming a distinct strategy all to itself.

Introduction

Leading organizations have recognized the importance of information systems for success in managing the supply chain [6]. Taken to the ultimate application level "there is a dimension to information that enables supply and demand to be matched in multiple markets, often with tailored products, in ever-shorter time-frames" [6].

Organizations have worked on their internal integration through information technology (IT) initiatives, especially enterprise systems (ES), with some success [9]. For those that have achieved a measure of success with internal integration, they have now turned their focus externally to the supply chain [10]. "The supply chain, with all its transaction and information-intensity, offers substantial opportunity for inventory and working capital reductions. It also offers the possibility of closer relationships with suppliers and customers" [10].

Another viewpoint continues to express the desired future state. Kumar states that "Supply chain management in a dynamic, demand-driven environment requires ICT-enabled [information computer technology] connectivity, cooperation, and coordination between players within an industry (horizontal coordination) and across industry and firms (vertical coordination). … efforts to create ICT-based infrastructures to enact such coordination are currently in their beginning stages. … systems that integrate whole dynamic supply chains on the fly and provide instant visibility across the supply chain are likely to emerge. The supply chains successful in creating and using such systems are more likely to achieve competitive advantage over the ones that do not" [15, p.61]. This is a highly idealized description of how IT can be exploited.

The natural assumption is that these same leading organizations mentioned above will leverage Information Technology to achieve a competitive advantage through outstanding supply chain performance. The success as reported in the literature is somewhat sketchy. In fact much of the research indicates a lack of substantial evidence of IT-enabled supply chain success. For example, Singh, Lai and Cheng [21] quote a Capital Consulting Management Services study which reported that "fewer than 20% of companies believe SCT [supply chain technology] has shown a favorable return on investment" [21]. The authors suggest that the "low success rate" can be attributed to "a lack of alignment between SCT and organizational processes" [21].

The potential for IT-enabled supply chains is not in question. Actual successful results are the main concern based on the unfavorable results found in the literature and the scarcity of successful examples in this same literature. In this paper we will explore a variety of sources to surface some examples to begin to validate the success of IT-enabled supply chains. We also hope to document a more explicit connection between IT-enabled supply chains and the newly emerging strategy of 'demand driven'.

Information Technology for Supply Chain Management
The primary benefit of implementing information technology components for supply chain management is the [real-time] sharing of information between and among supply chain members both internal and external to the organization. These IT components must be aligned with the policies, procedures, and goals of the organization and/or industry at hand in order to be successful across the entire supply chain [22]. We will provide empirical evidence that those companies which are viewed as having successful demand driven supply chains are those that have properly aligned their IT components to support their organizational objectives.

IT components for successful supply chain management range from simple information sharing applications such as e-mail, EDI, and document sharing such as Google Docs, to decision making and decision enhancing applications such as artificial intelligence/expert systems, virtual "dashboards" and/or information portals, and data warehousing/mining. We will attempt to demonstrate that those organizations that have been able to successfully integrate their IT components into both their internal and external supply chains are those who have reaped the most benefit from IT-enabled supply chain management. The following sections highlight some examples of specialized supply chain IT applications.

The Demand Driven Model
AMR Research has developed the Demand Driven Model which is divided into four segments: Supply, Product, Demand and Information. These are further divided into three sub-categories for each of the four major segments. The categories and sub-categories are as follows:
- Supply
    - Manufacturing
    - Supply Management
    - Supply Chain Execution
- Product
    - Innovation
    - Launch
    - Lifecycle Management
- Demand
    - Demand Shaping
    - Demand Sensing
    - Service Management
- Information
    - Sales and Operations Planning (S&OP)
    - Application Tech & Infrastructure
    - Performance Management
Source: [3]

For our purposes in this paper we are primarily interested in the Information segment and we will explore the three sub-categories for that segment in more detail.

Information Segment of Demand Driven Model
The following three sub-categories describe AMR Research's Information segment of the demand driven model in more detail.

Sales and Operations Planning – Sales and Operations Planning (S&OP) is described as "a critical process for matching global demand and supply" [17][18]. S&OP serves as the intersection where information flows from the demand side to the supply side of the organization's supply chain [16]. Three primary plans are the product of the S&OP process – "the operational plan, the demand plan, and the financial plan" [17]. All three of these plans are critically important to successful performance in any supply chain.

"Originally focused on matching supply and demand, S&OP now facilitates organizational alignment between business goals and plans, while enabling quick responses to continuously changing business conditions" [13]. This statement is consistent with one of our earlier observations regarding the alignment of IT with the company's business goals.

Application Technology & Infrastructure – One company name that appears often among the discussion of the AMR Top 25 Supply Chains is "i2 Technologies". Not because they are one of the Top 25 but because they are a leading information technology company that assists the leading supply chain companies by providing systems and applications that dramatically improve information technology capabilities to enhance the company's supply chain.

Among the variety of applications offered by i2 Technologies are:
- Supply Management
- Inventory Management
- Demand Management
- Performance Management
- Supply Chain Planning and others

[12][14].

Performance Management – Supply chain performance management is the key to monitoring and maintaining high levels of customer service. Metrics also help to identify improvement opportunities and then validate improvements that are achieved.

Again citing the solutions from i2 Technologies, "i2 Performance Manager provides package business intelligence (analytics and reporting) for i2 solutions. Performance Manager is designed to provide a way to create a multi-perspective view of i2 planning and execution data, as well as the ability to "drill down" to a detailed level in order to do a root-cause analysis" [14].

Supply chain solutions offer the ability "for complete data visibility, frequent analytics and rapid decision making thereby ensuring that operations are consistently aligned with the financial plan" [13]. The new generation of S&OP develops the plan and assists with executing of the plan to deliver profit on a consistent and continual basis. One way that organizations employing supply chain solutions accomplish this is by "establishing performance metrics that are tied to financial metrics at each level of the organization" [13]. These examples have focused on i2 Technologies solutions but there are many other companies such as: AspenTech, ICON-SCM, Logility, Oracle and IBM [24] offering similar IT applications for supply chain management.

For one additional viewpoint from the group of solution providers we turn to IBM with the following observations. "Supply chain planning – specifically, sales and operations planning

(S&OP) – is one of the most prevalent topics in the supply chain community today"[4]. Based on the results of the 2006 Global CEO study conducted by IBM in conjunction with ASPC, the following observations were reported. "Supply chain leaders establish formal S&OP processes within their supply planning organizations to create an integrated planning process while extending the effectiveness of overall performance. More than 70 percent of the respondents have a formal S&OP process in place" [4]. "An integrated approach among planning, logistics and finance functions, result in higher performance but also alignment in rapidly resolving supply chain issues" [4]. These comments give us some indication of the consistency for the objectives when companies use S&OP and the desire to improve responsiveness to supply chain issues.

Internet Applications
In addition to the factors described by AMR Research in their detailed demand driven model we must also consider the significant impact that the Internet has made on some company's supply chains. The transactions conducted on the Internet range from providing product/service information for customer's to processing a majority of customer orders. This will be very evident in our discussion of successes later in the paper as described in the discussion of Cisco Systems.

Demand Driven
AMR Research has publicized the term "demand-driven supply network" in the course of their research dating back to 2003 [5]. They also use the term within the criteria for determining the Top 25 Supply Chains on an annual basis [1][2].

A demand-driven supply network (DDSN) "is a system of technologies and business processes that sense and respond to real-time demand across a network of customers, suppliers and employees" [2]. "DDSN leaders are 'demand sensing,' have more efforts for 'demand shaping,' and focus on a profitable 'demand response' [5].

Demand Driven in Practice
There are examples where the description "demand driven" is associated with various supply chain strategies, thus it is possible to be both demand driven and lean. It is also possible to be both demand driven and agile. We propose a third alternative where it is possible to be demand driven without being any one of several other dominant strategies in the supply chain literature. First we will discuss demand driven combined with other strategies and lead up to the discussion of demand driven as a stand alone strategy.

Lean – A 'lean' organization can be said to be demand driven. But there are many lean characteristics that focus on waste in other areas and do not have a direct linkage to demand. The ideal lean environment is one where there is "predictable demand" [7] which also means that responsiveness is not a primary characteristic of lean.

We will use AMR's Top 25 Supply Chains as our main examples throughout the paper. From that list we can point to Dell Computer and Toyota as example companies that describe themselves (or are described by others) as Lean [27]. By virtue of being in the Top 25 list the companies have also been identified as having a "demand driven supply network" (or DDSN) by AMR Research [1][2].

Agile – Agile is another supply chain strategy where IT-enabled processes are critical for success. Several characteristics are present in the "agile supply chain" [7]. "The agile supply chain is market sensitive. … The use of information technology to share data between buyers and suppliers is … creating a virtual supply chain. … Shared information between supply chain partners can only be fully leveraged through process integration. … The idea of the supply chain

as a confederation of partners linked together as a network provides the fourth ingredient of agility" [7]. To shorten those four elements, they are market sensitivity, the virtual nature of the supply chain, process integration and the network based arrangement of supply chain partners. IT plays an important role but there are other aspects to the Agile supply chain such as contingency planning and risk management which do not depend heavily upon IT.

Nokia is one example company among the Top 25 that has been described as Agile [12] in a publication other than the AMR Research materials. This gives us an example for this combination of Agile [12] and demand driven [1][2][20].

AMR's Top 25
Related to the Top 25 Supply Chains AMR states: "The report identifies the top 25 manufacturers and retailers that exhibit superior supply chain capabilities and performance. Supply chain leaders are able to shape demand, instantly respond to market changes, and crush their competitors. According to AMR Research benchmarking data, leaders carry 15% less inventory, are 60% faster-to-market, and complete 17% more perfect orders. These advantages separate predators from prey" [1].

The criteria for selection to the Top 25 list are as follows: "The first component of the ranking is publicly available financial data and is weighted at 60% of the total score, with return on assets and inventory turns each accounting for 25%, and trailing 12 months growth accounting for 10%. The second component of the ranking is AMR Research's opinion, which is weighted at 40% of the total score. The opinion component is based on a structured voting methodology across AMR Research's team of analysts" [1].

For 2008, the voting has now incorporated "peer opinion" as 20% of the score while the voting by AMR panelists has been reduced to 20% from 40% [2]. The Top 5 Companies in the Top 25 for four years are listed in Table 1.

Table 1. **AMR Research Top 25 Supply Chains (Top 10 only)**

Rank	2004	2005	2007	2008
1	Dell	Dell	Nokia	Apple
2	Nokia	Procter & Gamble	Apple	Nokia
3	Procter & Gamble	IBM	Procter & Gamble	Dell
4	IBM	Nokia	IBM	Procter & Gamble
5	Wal-Mart Stores	Toyota Motor	Toyota Motor	IBM
6	Toyota Motor	Johnson & Johnson	Wal-Mart Stores	Wal-Mart Stores
7	Johnson & Johnson	Samsung Electronics	Anheuser-Busch	Toyota Motor
8	Johnson Controls	Wal-Mart Stores	Tesco	Cisco Systems
9	Tesco	Tesco	Best Buy	Samsung Electronics
10	PepsiCo	Johnson Controls	Samsung Electronics	Anheuser-Busch

Sources: [1][2][19]

From these lists we will identify other examples where "demand driven" is the main strategy and also appears to be a stand alone strategy separate from either Lean or Agile.

Examples of Success
Samsung Electronics – Samsung has been rated as #10 in 2007 and #9 in 2008 in the AMR Top 25 Supply Chains. "Samsung's processes leverage technology brilliantly" [23]. "The company's [Samsung's] outstanding use of sales and operations planning (S&OP) and forecasting allowed its

supply chain to set aggressive pre-stocking inventory targets in advance of the holiday season, helping to lift volumes" [26].

Technology also played a major role in other performance accomplishments. "Samsung moved to the No. 1 position in the US mobile handset market during 3Q08. In a period in which US consumer spending is volatile, Samsung's supply chain helped grow its shipments by 6.2%" [26]. "Samsung now owns 22.4% of the market and is No. 1 in the world's largest handset market, due in most part to the supply chain leadership" [26].

Also note that while Samsung ranks among the Top 10 Supply Chains, Sony Electronics does not appear in the Top 25 or even the Top 50 Supply Chains. Sony's financial performance is the primary reason given for their absence from the list [11].

Cisco Systems – Leading technology companies are naturally expected to also lead in the use of technology in the supply chain. Cisco Systems lives up to this expectation but has accomplished a high degree of success despite some stumbles along the way. The major stumble occurred in 2001 when Cisco found itself holding $2.5 billion in inventory that it could not sell and ultimately wrote that amount off [21]. This was the result of unfounded optimism about the market on the part of Cisco's CEO John Chambers and led to Cisco's first ever decline in revenues for the first quarter of 2001 [6].

From that lesson, Cisco took control of their supply chain and did so through extensive use of technology. Cisco's efforts are viewed as an outstanding example of "business transformation … using Internet technology to integrate its core processes and culture." These are some of the results that indicate Cisco's leadership in supply chain management and their ability to leverage the Internet:

- "90 percent of orders [are] taken online.
- Monthly online sales exceed $1 billion.
- 82 percent of support calls [are] now resolved over the Internet.
- Customer satisfaction has increased significantly" [21].

As further evidence, Cisco also won the 2008 Supply Chain Innovation Award given by the Council of Supply Chain Management Professionals (CSCMP) in cooperation with *Global Logistics & Supply Chain Strategies* magazine [2]. Cisco was evaluated based on a case study about their efforts to improve performance in their reverse logistics segment of the supply chain. "Cisco has been working collaboratively with partners to eliminate waste from the reverse logistics process. … Cisco reduced capital investment in inventory and eliminated waste by sharing forecasts and streamlining business processes to the mutual benefit of Cisco and its partners" according to comments by Mike Burkett, AMR Research analyst [2]. Information sharing and the associated information systems appear to be a key element for this achievement and recognition.

Nokia – Nokia excels at speed-to-market for new product introductions. To deliver their new products they utilize rapid-response manufacturing and quick ship logistics [16]. In each

instance, information technology plays a key role. "As a pioneer in value chain strategy, Nokia has led in supplier development, S&OP, and collaborative product development" [23]. A similar comment accompanied the 2008 Top 25 list: Nokia "Leads the way in supplier collaboration practices, design for supply chain and embedded innovation" [25].

IBM – IBM is unique because they have appeared in the top five of the Top 25 Supply Chains each of the four years as released by AMR Research [1][2][20]. They are also a provider of supply chain applications/solutions [4]. The summary comment from AMR acknowledges that IBM is a "Pioneer in supply chain management with a track record of sharing its learnings" [25].

The four companies presented here are just a sampling of the demand driven companies that are among the AMR Top 25 Supply Chains. Table 2 provides a brief summary for these four companies showing the financial measures used by AMR Research in determining the Top 25 Supply Chain rankings.

Table 2. Financial Performance for Four Companies

2007 Top 25 Performance (2006 Fiscal Year)	Ranking	ROA	Inventory Turns	Revenue Growth
Nokia	1	19.0%	17.9	20.2%
IBM	4	9.2%	18.9	0.3%
Samsung Electronics	10	13.7%	13.2	6.3%
Cisco Systems	11	12.9%	7.1	14.5%

Source: [23]

Old Dominion Freight Lines – We offer one example of supply chain success that does not appear in the AMR Top 25 list. Founded in Richmond, Virginia in 1934, Old Dominion Freight Lines (ODFL) has grown from a one-truck operation between Richmond and Norfolk to a super-regional carrier with over 4000 trucks and 15,000 trailers serving 44 states. They have positioned themselves as a worldwide solutions provider in single-source value added transportation services. Supply chain visibility and information sharing is critical to the success of ODFL and the company has considerable investment it information technology [8].

The various IT components embraced by ODFL include a customer management portal known as a "shipping dashboard" (odfl4me.com) for real-time order tracking and confirmation as well as significant investment in freight processing technology, operations technology, and freight transaction management systems to allow for the optimization of freight flow [8]. The company uses various third-party IT solutions providers such as Brainware, Inc. for automated document processing such as invoices and payload documentation. Drivers carry handheld devices in their trucks thus allowing route changes, road conditions, and customer interactions to be available in real time. The result is a dynamic and interactive supply chain for both the customer and ODFL which can react quickly to demand-driven changes [8].

Future Research
This paper represents a first attempt to explore Demand Driven in a very explicit manner and was suggested by prior research by one of the authors [19]. The authors feel that the "Demand Driven" strategy has not been thoroughly researched and is limited primarily to the publications from AMR Research. Companies utilizing the Demand Driven approach need to be explored in

greater depth to create a better understanding of the successful approaches. In this paper we have focused on IT as one of the main elements that we believe contributes to the success of those companies with a DDSN. Future research can expand upon this and consider other factors in combination with IT.

Summary

Some of the research for this paper indicates that Demand Driven either overlaps or is partially embedded within both Lean and Agile. When we add the AMR Research viewpoint, Demand Driven does appear to be separate due to the intense information technology applications that are utilized by companies with successful DDSNs. We believe that the evidence in this paper suggests that the success of DDSN is clearly enabled by information technology more so than the Lean or Agile successes.

At this time, the broader literature does not indicate a clearly distinct Demand Driven strategy that can be separated from Lean and/or Agile. But based on the AMR Research materials [1][2][5] we believe that there is a growing distinction among companies that subscribe to the DDSN approach. Companies employing the DDSN strategy are dealing more directly with the end customer, a significant number are consumer product companies, and they have utilized leading edge technology applications in an optimal way to enhance their DDSN capabilities. We believe that this trend will continue and that DDSN (or Demand Driven) will become a more prominent strategy going forward.

REFERENCES

[1] AMR Research. Online, 2006:
<http://www.amrresearch.com/Content/View.asp?pmillid=18895&nid=2558&rid=1104301503>

[2] AMR Research. Online, 2008:
<http://www.amrresearch.com/supplychaintop25/>

[3] AMR Research Online, 2008:
<http://www.amrresearch.com/supplychaintop25/DDVC_Model.asp>

[4] Butner, Karen, Hüttner, Heino with contributors Spade, David and LaRoche, Michael. 2006. IBM Global Business Services. IBM Institute for Business Value, IBM Corporation, Somers, NY.

[5] Cecere, L., Hofman, D., Martin, R. and Preslan, L. 2005. The Handbook for Becoming Demand Driven. AMR Research, Inc.

[6] Christopher, Martin. Logistics and Supply Chain Management, 3e, 2005, Prentice-Hall, Financial Times, London.

[7] Christopher, Martin. 2000. The Agile Supply Chain: Competing in Volatile Markets. *Industrial Marketing Management*, 29, 1: 37-44.

[8] Congdon, D. 2005. "Delivering New Solutions", Presentation by David Congdon, President and CEO of Old Dominion Freight Lines at the NEXUS 2005 Supply Chain Conference (November 3, 2005).

[9] Davenport, Thomas H. 2000. *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business School Press, Boston, MA.

[10] Davenport, Thomas H. and Brooks, Jeffrey D. 2004. Enterprise Systems and the Supply Chain. *Journal of Enterprise Information Management*, 17:1, 8-19.

[11] Hofman, D. 2008. Posting on <http://chainreactionblog.com>, Nov. 25, 2008, AMR Research.

[12] I2 Technologies. 2008a. <http://www.i2.com/solutions/

[13] I2 Technologies. 2008b. <http://www.i2.com/supplychainleader/issue2/html/SCL2_sop_best_practices.cfm>

[14] I2 Technologies. 2008c. <http://www.i2.com/solutions/tim/>

[15] Kumar, Kuldeep. 2001. Technology for Supporting Supply Chain Management. *Communications of the ACM*, June, 44:6, 58-61.

[16] Lee, Hau L. 2004. "The Triple-A Supply Chain," *Harvard Business Review*, October, 2004.

[17] Mentzer, J.T., Myers, M.B. and Stank, T.P. (editors). 2007. *Handbook of Global Supply Chain Management*, Sage Publications, XXXXX.

[18] Mentzer, J.T. and Moon, M. 2004. Understanding Demand: Effective demand management can produce major savings for all partners in the supply chain. *Supply Chain Management Review*, 8, 4: 38-45.

[19] Monroe, R.W. 2008. Lean, Agile and Demand Driven Strategies for Enhancing Supply Chain Performance, *Proceeding of SEINFORMS*, Myrtle Beach, SC, Oct. 2-3, 2008.

[20] Purchasing Magazine online, Supply Chain's Top 25, January 13, 2005. <http://www.purchasing.com/article/CA497322.html>

[21] Schroeder, Roger G. 2008. *Operations Management: Contemporary Concepts and Cases*, Fourth Edition, McGraw-Hill/Irwin: New York.

[22] Singh, Nitin, Lai, Kee-hung, and Cheng, T.C.E. 2007. Intra-Organizational Perspectives on IT-Enabled Supply Chains. *Communications of the ACM*, January, 50:1, 59-65.

[23] Supply Chain Standard, 2007: <http://www.supplychainstandard.com/assets/getAsset.aspx?liAsset=324>

[24] Tohamy, Noha and McNeill, William. 2008. S&OP Technology Landscape: Evolution to Integrated Business Planning is a Work in Progress. Supply Chain Planning and Execution, 2008 Landscape Series. AMR Research: Boston.

[25] Wailgum, Thomas. 2008. Study: Apple, Nokia, Dell Tops Among Global Supply Chains. <http://www.cio.com/article/print/373563>, May 29, 2008 downloaded December 30, 2008.

[26] Wehlage, C. 2008. Quoting in posting by Kevin O'Marah on <http://chainreactionblog.com>, November 11, 2008, AMR Research.

[27] Womack, James P., Jones, Daniel T. and Roos, Daniel. 1990. *The Machine that changed the world*. HarperCollins Publishing: New York.

A COMPARISON OF REGRESSION MODELS FOR FORECASTING A CUMULATIVE VARIABLE

Joanne S. Utley, School of Business and Economics, North Carolina A&T State University, Greensboro, NC 27411, (336)-334-7656 (ext. 4026), Sulek@ncat.edu

J. Gaylord May, Department of Mathematics, Wake Forest University, Winston-Salem, NC 27109, (336)-758-5338, mayg@wfu.edu

ABSTRACT

This paper examines the relative performance of four regression models for forecasting total demand when historical time series data for past sales and partial demand data for future orders are available. Two of the models were based on ordinary least squares (OLS) regression while the other two models used least absolute value (LAV) regression. Data from an actual manufacturing firm were used to test the models. The OLS model that utilized a demand ratio approach produced the most accurate forecasts for the planning horizon.

INTRODUCTION

As managers try to accurately predict demand in today's complex business environment, they should consider using partial demand data in the forecast process. While many managers currently use historical time series data to mathematically forecast future demand, they often fail to exploit partial order data that are available to them. Past research has shown that quantitative models can be used to combine historical time series data for a product with data from advance customer orders to produce more accurate demand forecasts for a planning horizon. However, many of these quantitative models are complex, may require a level of expertise most managers do not possess and thus may be quite difficult to implement in practice. [2] [8] Needed are straightforward forecast models that allow a manager to use both historical demand data and advance order data to forecast total demand for future time periods. In response to this need, this paper will examine four such models which are based on simple linear regression.

This paper is organized as follows. The next section will provide an overview of the literature on the use of partial demand data for forecasting total demand. Particular emphasis will be given to the relative ease with which regression models can incorporate both historical demand data and advance order data in a single forecast model. Section three includes a case study in which four regression based models are applied to actual order data from a manufacturing shop. The paper concludes with a discussion of results of the study and suggestions for future research.

OVERVIEW OF THE LITERATURE

Although regression models for forecasting total demand with advance order data have been discussed in the literature for nearly twenty years, they constitute a relatively recent approach to forecasting a cumulative variable. The earliest models for forecasting demand with partially

accumulated order data were devised over forty years ago and utilized Bayesian solutions. (See, for example, [7] and [11]) Guerrero and Elizondo (1997) have observed that these early studies relied on a Bayesian approach because the amount of advance order data available to the forecasters was quite limited. Guerrero and Elizondo (1997) also noted that the Bayesian methods can prove difficult to implement in practice because they require a rather high level of mathematical expertise from the manager. Other researchers have voiced similar criticisms of complex forecasting techniques for cumulative variables and have proposed the use of simpler forecasting methods. [2] [9]

Two of the most straightforward and widely used techniques involve: 1) the multiplicative model, which was first discussed in the forecasting literature by Bestwick (1975) and 2) the additive model, which was compared to the multiplicative model by Kerke, Morton and Smunt (1990). The following notation will be useful in reviewing these two basic models and in formulating the regression models that represent a combination these two basic approaches.

Regression Model Notation
Let:
t = a particular time period
L = the maximum customer designated lead time
h = a specific customer designated lead time where $h \leq L$.
D(t,h) = the partially accumulated demand for period t occurring h or more periods in advance of t. (or the sum of orders for period t for which customer supplied lead time $\geq$ h)
D(t) = the total demand for period t = D(t,0) = the accumulated demand for period t occurring 0 or more periods in advance.
F(t) = forecast for total demand in period t
C(h) = the ratio of partially accumulated demand known h periods prior to period t to total demand for period t.
R(t) = D(t)/D(t-1) = the ratio of total demand for period t to total demand for period t-1.
FR(t) = the forecast for the ratio of total demand in period t to total demand in period t-1.
A(t,h) = D(t,h)/D(t-1,h) = the ratio of partially accumulated demand for period t known h or more periods in advance of t to partially accumulated demand for period t-1 known h or more periods in advance of period t-1.

The basic multiplicative model states that the partially accumulated demand for period t occurring h or more periods in advance is the product of total demand for period t and the cumulative proportion C(h). Given this relationship, a forecast F(t) for total demand in period t can be found by dividing D(t,h) by C(h):

F(t) = D(t,h)/C(h) (1)

For example, if a manager knows that h periods in advance of period t 25% of total demand for period t will already be known, and if the sum of advance orders for period t = 100 units, then the forecast for period t will be 100/.25 = 400 units. [9]

The simplest form of the multiplicative model assumes that the cumulative proportions remain constant. However, in practice, the C(h) values may drift over time. In this case, exponential

smoothing can be used to update the cumulative proportions and improve forecast accuracy. [3] Working with simulated booking and shipment data, Bodily and Freeman (1990) showed that the multiplicative model with smoothed C(h) values outperformed alternative models based on Bayesian analysis and also models based on smoothed shipments.

In contrast with the multiplicative model, the simple additive model assumes that total demand for period t is the sum of the known component of total demand and the unknown component of total demand. [9] If S(t,h) represents the smoothed value of this unknown component of total demand, then:

$$F(t) = S(t,h) + D(t,h) \qquad (2)$$

It should be noted that the additive model does not assume that known portion of total demand provides information about the unknown component whereas the multiplicative model assumes proportional change in the known and unknown components. Kekre et al. (1990) studied the relative performance of these two models and found that the multiplicative model outperformed the additive model for one period ahead forecasts while the additive model was more accurate for a forecast horizon of 2-5 periods. Kekre et al. (1990) also noted the multiplicative model outperforms the additive model when there is a correlation between the known and unknown portions of total demand.

While both of these models are fairly easy to understand and implement in practice, they both fail to make direct use of the historical time series for total demand. [3] To improve the performance of two these models, Kekre et al. (1990) suggested combining them so that

$$F(t) = a + b \cdot D(t,h) \qquad (3)$$

The values of a and b are estimated from historical data. They [9] noted that the multiplicative model assumes that $a = 0$ while the additive model assumes that $b = 1$. Using Kekre et al.'s suggestion as a starting point, Guerrero et al. (1997) defined the following set of L simple linear regressions to model total demand as a function of partially accumulated demand for h = 1,2,…L:

$$D(t) = b_0 + b_1 D(t,h) + e_t \qquad (4)$$

While Guerrero et al. (1997) used OLS regression to forecast total demand, May and Sulek (2007) suggested using OLS regression to forecast total demand ratios. Since it is common in many business applications that demand for a particular time period increases or decreases by a percent of the previous period's demand rather than by a fixed amount [1], the increases or decreases in the total demand ratio (or R(t) value) should be related to the increases or decreases in the partially accumulated demand ratio (or A(t,h) value), where $R(t) = D(t)/D(t-1)$ and $A(t,h) = D(t,h)/D(t-1,h)$. For a given h, a linear relationship between the partially accumulated demand ratio A(t,h) and the total demand ratio R(t) can be modeled via ordinary least squares (OLS) regression:

$$R(t) = b_0 + b_1 A(t,h) + e_t \qquad (5)$$

This model can be used to generate a forecast FR(t) for R(t) for a given h as long as partial demand data (i.e., D(t,h) and D(t-1, h)) are available for periods t and t-1. Once the ratio forecast FR(t) is computed, F(t), the forecast for total demand in period t, can be found with the formula:

F(t) = D(t-1)][FR(t)]   **(6)**

if h $\geq$ 1, or

F(t) = [F(t-1)][(FR(t)]   **(7)**

if h $\geq$ k, for any designated lead time k > 1.
If the lead time is any value greater than 1, the actual total demand for period t-1 is not yet known and F(t-1) will replace D(t-1) in the forecast formula.

In contrast to OLS regression which minimizes the sum of the squares of the forecast errors, LAV regression minimizes the sum of the absolute values of the error terms. Past research in the forecasting literature which compared the relative accuracy of the OLS and LAV methods for small sample sizes has shown that the LAV technique is often the more robust technique in practice, particularly when normality assumptions are not met. [5] Given these findings, one could replace the OLS based approach in Guerrero et al.'s (1997) and May et al.'s (2007) regression models with an LAV approach. In the next section of this paper a case study in which all 4 types of regression models – OLS, LAV, OLS Ratio and LAV Ratio – were applied to actual manufacturing data.

CASE STUDY

The research setting for this study was an electronics component company located in the southeast United States. Although this company manufactured a variety of components, data for only one product will be used to compare the regression based forecasts. Nine months of historical data were available. The data included a requested delivery date (or customer designated lead time) for each customer order as well as the order quantity per customer. Customer designated lead times varied from 1 month to 4 months, although customers occasionally requested a lead time of 5 or 6 months. The customer's order quantity and designated lead time varied with each order rather than remaining stable over time.

The manufacturer needed to forecast demand for this component for a 4 month planning horizon (months 10-13).The company wanted to use the partial order data it already possessed at the end of month 9 to generate these forecasts. The authors utilized 4 regression models to make use of both the partial data available for months 1-13 and the total demand data for months 1-9 in preparing the forecasts. The forecast process consisted of the following stages:

Stage One: Data Preparation

Total demand data from months 1-9 were used to compute R(t) = D(t)/D(t-1), the ratio of total demand in month t to total demand in month t-1. Eight such ratios were calculated. In addition, for each h (h =1,2,3,4), partial demand data from months 1-9 were used to calculate a time series of 8 partial demand ratios A(t,h) = D(t,h)/D(t-1,h). The 5 time series are shown in Table 1.

TABLE 1
Total Demand Ratios and Partial Demand Ratios

Month (t)	R(t) = D(t)/D(t-1)	A(t,1) = D(t,1)/D(t-1,1)	A(t,2) = D(t,2)/D(t-1,2)	A(t,3) = D(t,3)/D(t-1,3)	A(t,4) = D(t,4)/D(t-1,4)
2	.83	.831	.717	.857	.702
3	.98	.985	.969	1.09	1.72
4	.74	.754	.756	.697	.703
5	1.31	1.24	1.27	1.41	1.55
6	.76	.78	.775	.781	.89
7	.94	.9	.898	.843	.759
8	1.15	.965	.934	.71	.596
9	1.25	1.45	1.32	1.53	.589
10		.8	.816	.679	1.34
11			1.74	1.72	.901
12				.321	.281
13					.5

At the end of month 9 it was also possible to calculate some of the partial ratios corresponding to the planning horizon. Since partial data were available for months 10-13, it was possible to compute A(10, h) for all 4 values of h. Similarly, it was possible to calculate A(11, h) for h = 2,3,4 and A(12,h) for h = 3,4. Finally, A(13,h) could be calculated only for h = 4. These partial ratios are also shown in Table 1.

Stage 2: Development of the Regression Models

The authors considered four separate regression models for this forecasting problem. The first model was the standard OLS approach [8] which describes a linear relationship between the total demand D(t) and partial accumulated demand D(t,h) for each h (h=1,2,3,4). This model is given by equation (4). Partial demand data and total demand data for months 1-9 were used to establish this model. Table 2 lists the estimated regression lines generated by this approach as well as the corresponding error measures. As Table 2 shows, forecast accuracy (as measured by the MAD) decreases as h increases. This outcome should be expected since the partial demand data for the D(t,h) values become more limited as the length of the customer designated lead time increases.

TABLE 2
OLS Regression Results

Dependent Variable	Independent Variable	Intercept	Beta	MAD
R(t)	A(t,1)	37.0814	.8937	10.008
R(t)	A(t,2)	51.7565	.8551	14.7902
R(t)	A(t,3)	102.0647	.7004	26.794
R(t)	A(t,4)	243.122	-.0389	38.497

The second model used Least Absolute Value (LAV) regression to estimate the relationship between total demand D(t) and partially accumulated demand D(t,h). Table 3 lists the estimated regression lines and associated error measures for this approach. Table 3 also shows that the accuracy of the individual regression models decreases as h increases.

TABLE 3
LAV Regression Results

Dependent Variable	Independent Variable	Intercept	Beta	MAD
R(t)	A(t,1)	16.755	.972	8.73
R(t)	A(t,2)	19.575	.973	12.21
R(t)	A(t,3)	38.84	.918	25.312
R(t)	A(t,4)	253	0.0	36.78

The third and fourth models used OLS and LAV regression, respectively to model the relationship between R(t), the ratio of total demand for period t to total demand for period t-1 and A(t,h), the ratio of partially accumulated demand for period t known h or more periods in advance of t to partially accumulated demand for period t-1 known h or more periods in advance of period t-1. Table 4 and Table 5 list the estimated regression models and error measures for the OLS approach and LAV approach, respectively. As before, the accuracy of the individual regression models tends to diminish as the value of h increases.

TABLE 4
OLS Ratio Regression Results

Dependent Variable	Independent Variable	Intercept	Beta	MAD
R(t)	A(t,1)	.1884	.8163	.0751
R(t)	A(t,2)	.1466	.8885	.0637
R(t)	A(t,3)	.4778	.5225	.1046
R(t)	A(t,4)	.886	.1161	.1836

TABLE 5
LAV Ratio Regression Results

Dependent Variable	Independent Variable	Intercept	Beta	MAD
R(t)	A(t,1)	.021	.974	.067
R(t)	A(t,2)	.280	.735	.0706
R(t)	A(t,3)	.313	.612	.086
R(t)	A(t,4)	.908	.042	.1701

Stage 3: Calculation of the Non-Ratio Based Forecasts

For each h (h = 1,2,3,4), the non-ratio OLS and LAV models described in Table 2 and Table 3, respectively, were used to model the relationship between D(t) and D(t,h). The resulting forecasts for months 10-13 are presented in Table 6 and Table 7.

TABLE 6
Error Measures
OLS Ratio Model versus OLS Model

Month	Actual Total Demand	OLS Ratio Forecast	Error Terms OLS Ratio Model	OLS Forecast	Error Terms OLS Model
10	235	220	15	207	28
11	405	372	33	302	103
12	264	231	33	146	118
13	206	218	-12	242	-36
MAD			15.75		71.25
MSE			636.75		6653
MAPE			8.22%		24.87%

TABLE 7
Error Measures
LAV Ratio Model versus LAV Model

Month	Actual Total Demand	LAV Ratio Forecast	Error Terms LAV Ratio Model	LAV Forecast	Error Terms LAV Model
10	235	210	25	201	34
11	405	326	79	405	100
12	264	166	98	97	167
13	206	154	52	253	-47
MAD			63.5		87
MSE			4793.5		10313
MAPE			18.18%		31.3%

Stage 4: Calculation of the Ratio Based Regression Forecasts

Both OLS regression and LAV regression were used to generate ratio based forecasts for the 4 month forecast horizon. This section will illustrate the OLS ratio based approach [10] by applying the OLS regression models found in Table 4 to the forecast problem. A similar procedure was used to implement the LAV ratio approach.

For each month in the planning horizon, $F(t)$, the forecast of total demand $D(t)$ was found by first estimating the ratio $R(t)$ with $FR(t)$ and then multiplying either the actual $D(t-1)$ value or its forecasted value, $F(t-1)$, by $FR(t)$. For example, Table 1 shows that $A(10,1) = .8$ and Table 4 shows that the regression model corresponding to $h \geq 1$ is $FR(t) = .1884 + .8163[A(t,h)]$. According to the historical data for months 1-9, the actual total demand for month 9 was 262. Thus,
$FR(10) = .1884 + .8163(.8) = .8414$, and
$F(10) = D(9)[FR(10)] = 262(.8414) = 220.44 \approx 220$.
Similarly, Table 1 shows that $A(11,2) = 1.74$ and Table 4 shows that the regression model corresponding to $h \geq 2$ is $FR(t) = .1466 + .8885[A(t,h)]$. There is no actual value for $D(10)$ but $F(10) = 220$. Thus,
$FR(11) = .1466 + .8885(1.74) = 1.693$, and
$F(11) = F(10)[FR(11)] = 220(1.693) = 372.46 \approx 372$.
The forecasts for months 12 and 13 can be found in a similar manner and are listed in Table 6.

As noted earlier, the LAV ratio based procedure is very similar to the OLS approach. The LAV approach used the LAV ratio regression models listed in Table 5 to predict the $R(t)$ values. The LAV ratio based forecasts for months 10-13 are shown in Table 7.

Step 5: Model Comparison

The mean absolute deviation (MAD), mean square error (MSE) and mean absolute percent deviation (MAPE) for each model were computed for the 4 month planning horizon. These error measures are presented in Table 6 and Table 7. Table 6 shows that the OLS Ratio model outperformed the standard OLS approach on all three error measures. Table 7 reveals that the LAV ratio method outperformed the non-ratio LAV model on all error measures. In addition, the OLS ratio method had the greatest forecast accuracy for the months 10-13 on all three error measures.

DISCUSSION

The results from this study suggest that a ratio-based regression approach to forecasting with partial demand data may prove more effective in practice than the conventional regression models that use actual demand levels. The LAV ratio method outperformed the non-ratio LAV method while the OLS ratio approach was more accurate than the non-ratio OLS method. The

use of demand ratios – instead of actual demand values – resulted in a smoothing effect on the data, which enhanced overall accuracy over the forecast horizon.

The purpose of this study was to compare the relative accuracy of 4 types of regression models; however, there are other models that could be used for comparison. In particular, the smoothing models described by Bodily et al. (1988) could be included in future analysis. These models are not as complex as the Bayesian models mentioned earlier so it would be interesting to compare their accuracy with that of the regression models. It would also be interesting to test the regression models examined in this paper in other research contexts, especially if larger data sets were available.

REFERENCES

[1] Benton, W.K., *Forecasting for management.* Wesley, MA: Addison-Wesley, 1972.

[2] Bestwick, P. A forecast monitoring and revision system for top management. *Operational Research Quarterly.* 1975, 26, 419-429.

[3] Bodily, S. and Freeland, J. A simulation of techniques for forecasting shipments using firm orders-to-date. *Journal of the Operational Research Society.* 1988, 39, 833-846.

[4] Chang, S. and Fyffe, D. Estimation of forecast errors for seasonal style goods. *Management Science.* 1971, 18, l89-96.

[5] Dielman, T, A comparison of forecasts of least absolute value and least squares regression. *Journal of Forecasting.* 1986, 5, 189-185.

[6] Fildes, R. and Stevens, C. Look- no data: Bayesian forecasting and the effects of prior knowledge. In *Forecasting and Planning*. (R.Fildes and D. Woods, Eds.) New York: Prager, 1978.

[7] Green, M. and Harrison, P. Fashion forecasting for a mail order company using a Bayesian approach. *Operational Research Quarterly.* 1973, 24, 193-205.

[8] Guerrero, V. and Elizondo, J. Forecasting a cumulative variable using its partially accumulated data. *Management Science.* 1997, 43(6), 879-889.

[9] Kekre, S., Morton, T. and Smunt, T. Forecasting using partially known demands. *International Journal of Forecasting.* 1990, 6, 115-125.

[10] May, G. and Sulek, J., The use of advance order data in demand forecasting. *Proceedings of the DSI National Conference.* 2007.

[11] Murray, G. and Silver, E. A Bayesian analysis of the style goods problem. *Management Science.* 1966, 12(11), 785-797.

ADDRESSING SUPPLY CHAIN RISKS THROUGH AGILE STRATEGIES

Richard W. Monroe and P. Richard Martin, Wall College of Business, Coastal Carolina University, Conway, SC 29528, (843) 349-2527, RMonroe@coastal.edu

ABSTRACT

In recent years 'supply chain design' has been a primary research topic. Another important topic is 'supply chain risks'. This paper proposes a framework for supply chain design taken from a risk perspective. Once the supply chain is viewed from the risk perspective we offer agile supply chain approaches as prescriptive strategies for mitigating supply chain risks.

Introduction

Today's global business environment is characterized by shorter product life cycles, more demanding customer requirements and a variety of supply chain risks. In this environment, organizations seek new strategies to address risks and to enhance supply chain performance. The supply chain is characterized by many exchanges that occur in the overall process of planning, sourcing, making and delivering products, services and the related supply chain information. As these exchanges occur and the material moves through a series of providers and ultimately reaches consumers, the efforts of several parties need to be aligned – this is referred to as the supply chain [26].

The following definition for "supply chain management" offers further clarification: "Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders" [10].

By viewing supply chains from a systems perspective, many of the observations from Jay Forrester will become very relevant. According to Forrester [8], a complex system is a "high order, multiple loop, nonlinear feedback structure." Feedback and nonlinearity are important keys that may result in "counter intuitive behavior" in the complex system [8].

Today, most supply chains are global in nature which makes them large and complex systems by virtue of the way they have evolved. Conklin [5] concludes that in today's global marketplace, it is beyond any single company ability to realize or adjust to market opportunities in a timely manner due in part to a lack of experience and skill sets. As large, complex systems, global supply chains share many of the characteristics associated with global systems models from social and economic research such as those developed by Forrester and his associates [8][9]. Among these characteristics are concerns regarding the modeling of global systems. Morgan and Henrion offer a list of five shortcomings:

- "inadequate and incomplete understanding of the systems being modeled and a concomitant lack of attention to model verification;

- failure to be sufficiently specific about the objectives of the modeling project;

- failure to examine carefully the implications of uncertainty in input variables and model time constraints;

- inability to deal with the stochastic elements in the systems being modeled; and

- difficulties arising from the ideological perspectives of the analysts" [23, p. 297].

The stochastic nature of global systems is further subdivided into:

- the problem of variability and

- major changes in the operating environment [23, p. 299-300]

"… although a good model of the system may tell you how it will respond to any hypothetical set of events or changes in the operating environment, predicting such events is generally impossible" [23, p. 300].

We believe that the systems observations are entirely appropriate for global supply chains. Supply chain agility is needed to address the complexity of these global supply chain systems and more specifically agility is needed to mitigate (1) problems with variability and (2) major environmental changes which are event-based. This characterization corresponds with the modeling challenges from the global systems perspective as described by Morgan and Henrion [23]. The other lesson we take from systems thinking is the use of risk management which will be discussed further later in the paper. First we look at the literature related to supply chain design and supply chain agility.

Supply Chain Design and Agility

The concept of Design for Supply Chain Management (DFSCM) and its use by Hewlett-Packard (HP) was first introduced by Lee and Billington [12] and further explained by Lee [13]. Based on these references, the idea of DFSCM was well-established at HP in the early 1990s. The primary issues that were addressed dealt with inventory issues and were based on a global supply chain inventory model [12][14][15]. Embedded within DFSCM at Hewlett-Packard were many different supply chain strategies aimed at various supply chain issues that HP was attempting to address. Included among the list of supply chain strategies are:

- Delayed product differentiation

- Commonality

- Standardization

- Process steps switching

- And Postponement [11][12][13][14][15][16][17][18].

Many of these strategies or principles are aimed at flexibility, agility and logistics cost reduction. First among the issues addressed by HP were the combined factors of product design, inventory placement and design for localized markets [14].

DFSCM is also characterized by the formation of analysis teams and the use of academic researchers to guide or to supplement the resources within HP [17]. One DFSCM team is described as being composed of members from "finance, marketing, manufacturing, distribution and engineering" [17]. This cross-functional collaboration is a key factor for achieving internal integration within supply chain functions. Internal integration is suggested as a key requirement to support supply chain agility. Allowing sufficient time for analysis is another significant factor which makes the HP DFSCM approach unique [17][11]. Among the academic participants, Dr. Hau Lee from Stanford University has been the most prominent participant in the various HP initiatives but other academics have also participated. The benefits from this industry-academia collaboration should not be underestimated. The academic may bring a particular expertise in one or more analytical technique and more importantly the academic may bring lessons learned from other business organizations which may not be accessible by HP management. Those examples are the main benefits anticipated while individual cases may lend other benefits from industry and academia working together.

While the intent of many of these supply chain initiatives at HP has been to provide flexibility and to move towards being more agile, the success of agility tends to be exposed when there is an adverse condition related to either supply or demand. There are several excellent examples of supply chain agility where the agile firm succeeded while the firm that lacked agility failed. Nokia and Ericsson were faced with a supply chain disruption due to a fire at a facility a radio frequency (RF) chip in New Mexico in March 2000. Nokia executed design changes, quickly worked with alternate suppliers and implemented their contingency plan within a five day period after the fire. Ericsson was caught without a plan and was in the midst of eliminating alternate suppliers. They lacked a coherent contingency plan, experienced drastically reduced production levels for months and delayed a new product introduction. Nokia gained market share through their agile response and at the expense of Ericsson [19].

In 1999, an earthquake in Taiwan disrupted the supply of computer components to the United States and significantly impacted major computer makers including Apple, Gateway and Compaq. While those companies were unable to make computers, Dell changed prices and altered their offerings to promote those computer configurations that could be made without the components sourced from Taiwan. This agile response to the disruption by Dell also led to an increase in market share at the expense of the competitors who were not agile [19].

Lee offers the following list of characteristics or "six rules of thumb" for designing agility into the supply chain:

- "Provide data on changes in supply and demand to partners continuously so they can respond quickly. … Ensuring that there are no information delays is the first step in creating an agile supply chain.

- Develop collaborative relationships with suppliers and customers so that companies work together to design or redesign processes, components, and products as well as to prepare backup plans.

- Design products so that they share common parts and processes initially and differ substantially only by the end of the production process. I call this strategy "postponement." … This is often the best way to respond quickly to demand fluctuations because it allows firms to finish products only when they have accurate information on consumer preferences.

- Keep a small inventory of inexpensive, non-bulky components that are often the cause of bottlenecks.

- Build a dependable logistics system that can enable your company to regroup quickly in response to unexpected needs. (this can be accomplished through an alliance with a third-party logistics provider).

- Put together a team that knows how to invoke backup plans" [19].

We agree with Dr. Lee's suggestions but we believe that there needs to be a few additions to this list. From our research and synthesis of many sources we offer the following supplemental ideas:

- Foster and reinforce internal integration through cross-functional teams working on supply chain issues. This is based on the HP DFSCM teams and this may supplement or overlap with the team for "backup plans" suggested by Dr. Lee. We suggest this because we believe that firms that lack agility are very likely to lack internal integration.

- Rationalize and select the method for integration with key suppliers. Potential options for external integration include: Information Sharing, New Product Development or Relationship [21]. The nature of the supplier-buyer relationship requires very different resource involvement and very different approaches to achieve the desired integration.

Agility and Risk

Agility in the supply chain is described as being able to "respond to sudden and unexpected changes in markets. Agility is critical, because in most industries, both demand and supply fluctuate more rapidly and widely than they used to. Most supply chains cope by playing speed against costs, but agile ones respond both quickly and cost-efficiently" [19]. Clearly, a one dimensional response by an organization is not acceptable and does not constitute agility. Common sources of supply chain risk to performance have previously been investigated; location, logistics, order processing, purchasing, quality, supply lead time, supply availability, and demand [3][2][15].

Competitiveness from an agility perspective, depends upon companies be able to adapt their supply chains efficiently while building strong relationships with customers and suppliers quickly [28]. Supply chain agility becomes the key to adapting to market variations more efficiently by integrating with suppliers more effectively [20]. As more companies pursue production capability ability by outsourcing or off-shoring, explicit risk factors increase.

The connection between agility and risk is implied in many different references. We suggest that the use of agility as a response to risk needs to be addressed in a more explicit manner. We also suggest that many of the scenarios in existing supply chain agility research can be more appropriately characterized as risk management. Extended supply chains increase the risk factor for operational and inter-firm linkages. Companies attempt to manage this risk by agile practices. A case can be made that the selection, management, and coordination of these suppliers take on the standard problems associated with project management. Olsson [25] addresses aligning projects with the company's business strategy through internal and external flexibility where external flexibility is more related to the definition of agility presented by Baker (1996). Extended supply chains need the ability to respond to risk from market and economic changes by choosing the most effective resource (supplier) at the appropriate time just as projects match resources to requirements by becoming temporary extended organizations.

Supply disruptions from the various examples constitute what we believe is a greater magnitude of "fluctuation" that goes beyond the fundamental supply fluctuations [10] that are described in the definition of supply chain agility. The need for backup plans to deal with supply disruptions is one indication of the risk management for the supply chain. We think the risk aspect should be given greater emphasis. Supply chain events are the situations where supply disruptions occur and these events require those backup plans or detailed contingency plans. Some of the details for the planning that is required are provided by Lee [19], Collin and Lorenzin [4] and Engelhardt-Nowitzki and Zsifkovits [6].

For the purposes of developing a model for supply chain agility we suggest that risk management is the appropriate framework with sublevels for variability and event-based changes of greater magnitude. The details of the proposed model are presented in the following section.

Supply Chain Agility and Risk Model

In order to design agility into the supply chain, the cross-functional design team must consider the full range of risks. The full range of risk includes Complexity; Demand fluctuation; Supply fluctuation; and major SC Events (contingency planning and SC event preparedness). This description and earlier discussions in this paper are combined to develop the following model for SC Agility and Risk.
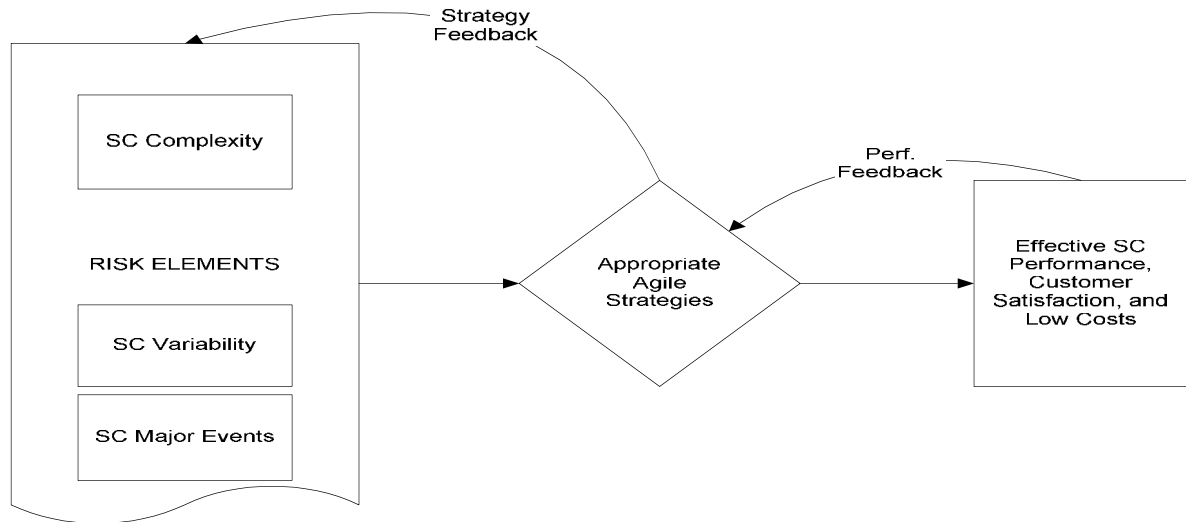
Figure 1. Design for Supply Chain Risk Model
Source: adapted from Monroe and Martin (22)

This model differs from most of the basic supply chain agility discussions in the literature. The various strategies that HP has employed are among the "Appropriate Agile Strategies" but they are primarily "appropriate" only for "SC Variability." So the proposed model involves drawing strategies from other sources and expanding the risk elements beyond the commonly used definition of the environment where supply chain agility is needed. "SC Major Events" require specific agile strategies and require significant planning, scenario analysis and cross-functional teams to prepare the needed contingency plans. "SC Complexity" is another large risk element that needs to be addressed in a different manner from "SC Variability" and "SC Major Events." Supply chain rationalization, strategic alliances, long-term "evergreen" contracts are just a few examples of strategies that may be employed to address "SC Complexity" [24].

By subdividing risk and then matching each risk element category with appropriate agile strategies we believe that supply chain issues will be addressed in a more effective manner. This approach of using agility to proactively address the full spectrum of supply chain risk is what we suggest is a framework that we might also call 'design for supply chain agility.'

Conclusions

This paper proposes a "risk-agility" model of the supply chain which takes a very definitive view from a risk management perspective. The model incorporates "Risk Elements" which are further specified as "Supply Chain Complexity"; "Supply Chain Variability"; and "Supply Chain Major Events". These different categories of Risk require Agile Strategies which must be developed and implemented in a proactive manner. Using this model as a prescriptive approach for supply chain design is suggested as a way to achieve better SC performance, meet customer requirements and do so at a lower overall supply chain cost.

The proposed model is strongly influenced by the Six Sigma "Design for X" approach [27]. The model is labeled as "design for supply chain risk" but has also been described as "design for supply chain agility" in previous research [22]. The idea is that any perspective can be substituted for "X" depending on the researcher's/company's preference.

Future research should be developed to investigate the practicality and application of this model in actual organizations. This may also be combined with Action Research where the model is first employed to assist the organization when developing strategies for providing greater supply chain agility. Results of such research should validate the usefulness of this model.

REFERENCES

[1]. Baker, J. 1996. "Agility and Flexibility: What's the Difference?" working paper, Cranfield School of Management.

[2]. Baramichai, M., Zimmers, E.W., Marangos, C.A. 2007. " Agile supply chain transformation matrix: an integrated tool for creating an agile enterprise", Supply Chain Management: An International Journal, 12, 5, 334-348.

[3]. Christopher, Martin and Lee, Hau. 2004. "Mitigating Supply Chain Risk through Improved Confidence," *International Journal of Physical Distribution &Logistics Management,* 34, 5: 388-396.

[4]. Collin, Jari and Lorenzin, Dennis. 2006. "Plan for supply chain agility at Nokia: Lessons form the mobile infrastructure industry," International Journal of Physical Distribution & Logistics Management, 36, 6, 418-430.

[5]. Conklin, J.M. 1994. "Extending capabilities through contract manufacturing", Electro Internatiaonl Conference Proceedings, pp. 145-153.

[6]. Engelhardt-Nowitzki, Corinna and Zsifkovits, Helmut E. 2007. "Creating Adaptive Supply Chain Networks," International Journal of Agile Manufacturing, 10, 1, 37-45.

[7]. Fetzinger, Edward and Lee, Hau L. 1997. "Mass Customization at Hewlett-Packard: The Power of Postponement," Harvard Business Review, January-February, 116-121.

[8]. Forrester, J.W. 1969. Urban Dynamics, MIT Press, Cambridge, Massachusetts.

[9]. Forrester, J.W. 1971. World Dynamics, Wright-Allen Press, Cambridge, Massachusetts.

[10]. Lambert, Douglas M., Cooper, Martha C., and Pugh, Janus D. Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, 9:2, p. 1, 1998.

[11]. Laval, Claude, Feyhl, Marc and Kakouros, Steve. 2005. "Hewlett-Packard combined OR and expert knowledge to design its supply chains," Interfaces, 35, 3, 238-247.

[12]. Lee, Hau L. and Billington, Corey. 1992. "Managing supply chain inventory: Pitfalls and opportunities," Sloan Management Review, 33, 3, 65-73.

[13]. Lee, Hau L. 1993. "Design for supply chain management: Concepts and examples," In R. Sarin (editor) Perspectives in Operations Management, Kluwer, Boston, pp. 43-65.

[14]. Lee, Hau, Billington, Corey, and Carter, Brent. 1993. "Hewlett-Packard gains control of inventory and service through design for localization," Interfaces, 23, 4, 1-11.

[15]. Lee, Hau L. and Billington, Corey. 1993. "Material management in decentralized supply chains," Operations Research, 41, 835-847.

[16]. Lee, Hau L. and Tang, C. S. 1997. "Modelling the costs and benefits for delayed product differentiation," Management Science, 43, 1, 40-53.

[17]. Lee, Hau L. and Sasser, Marguerita M. 1995. "Product universality and design for supply chain management," Production Planning & Control, 6, 3, 270-277.

[18]. Lee, Hau L. and Billington, Corey. 1995. "The evolution of supply-chain-management models and practice at Hewlett-Packard," Interfaces, 25, 5, 42-63.

[19]. Lee, Hau L. 2004. "The Triple-A Supply Chain," Harvard Business Review, October, 2004.

[20]. Mason, S.J., Cole, M.H., Ulrey, B.T., Yan, L. 2002. "Improving electronics manufacturing supply chain agility through outsourcing", International Journal of Physical Distribution & Logistics Management, 32, 7, 610-620.

[21]. Monroe, Richard W. and Martin, P. Richard. 2008. "Achieving supplier integration for the agile enterprise," 2008 ICAM Conference.

[22]. Monroe, Richard W. and Martin, P.Richard. 2008. "Designing Agility into the Supply Chain," ICAM International Conference on Agile Manufacturing Proceedings, Kalamazoo, MI.

[23]. Morgan, M.G. and Henrion, Max. 1990. Uncertainty: A guide to dealing with uncertainty in qualitative risk and policy analysis, Cambridge University Press, Cambridge, UK.

[24]. Monczka, R., Trent, R. and Handfield, R. 2001. Purchasing and supply Chain Management, 2nd edition, Southwestern Publishing, Cincinnati, Ohio.

[25] Olsson, N.O.E. 2008. "External and internal flexibility – aligning projects with the business strategy and executing projects efficiently", International Journal of Organization and Management, 1, 1, 47-64.

[26]. Stock, James R. and Lambert, Douglas M. Strategic Logistics Management, Fourth Edition, McGraw-Hill/Irwin: New York, 2001.

[27]. The Certified Six Sigma Black Belt Primer. Quality Council of Indiana, 2001.

[28]. Tolone, W.J. 2000. " Virtual situation rooms: connecting people across enterprises for supply chain agility", Computer Aided Design, 32, 2, 109-117.

REDUCING TECHNOLOGY LEARNING CURVE IN INTRODUCTORY STATISTICS COURSE USING VISUAL INTERACTIVE STATISTICAL ANALYSIS

Dmitriy Shaltayev,
Christopher Newport University, Newport News, VA, USA
Phone (757)-594-8914, e-mail: dmitriy.shaltayev@cnu.edu

Harland Hodges,
College of Charleston, Charleston, SC, USA
Phone: (843) 953-4810, e-mail: hodgesh@cofc.edu

Robert B. Hasbrouck,
Christopher Newport University, Newport News, VA, USA
Phone: (757) 594-7174, e-mail: rhasbro@cnu.edu

ABSRACT:

This empirical study compares student performance under two different teaching methods in introductory business statistics course. Two classes were instructed in the computer lab, and one took place in the regular classroom. Visual Interactive Statistical Analysis, an Excel-based analysis software package was used for instructions in class. Data indicate that student performance was not affected by presence of the software in classroom. We conclude that VISA is an intuitive enough tool without a major learning curve, and can be mastered by students with minimal supervision. Second, we conclude that technology availability in classroom does not affect learning efficiency if "teaching-friendly" software is used for instruction.

INTRODUCTION

The present research is an attempt to assess easy-to-learn software tools in teaching of statistics in an undergraduate business program. The introductory business statistics course is a standard element of the curriculum in undergraduate business programs. For most students, this may be the only statistics course they will ever take. The content and topical coverage may vary from one institution to another, but usually the course starts with elementary descriptive concepts (such as mean, standard deviation, percentile, etc.), and evolves to the more complex inferential concepts. Because statistical theory is based on mathematical principles, the course traditionally presents a challenge to students and requires one or more prerequisite courses in relevant mathematical disciplines. At Christopher Newport University, for example, students cannot enroll in the business statistics course unless they have taken two courses offered in the mathematics department, an introductory statistic course and calculus for business applications. Students, therefore, come to the class prepared to learn the business applications of material, most of which they already seen in mathematical form.

Since a significant amount of statistical concepts are abstract in nature, teaching an undergraduate statistical business course is challenging. Another problem in teaching undergraduate statistics course is the choice of software tools, if instructors choose to use software in the class. The complexity of most statistical procedures is such that "by-hand" computations are prohibitively long (take, for instance, computing F-statistic for ANOVA test). With that in mind, a lot of instructors have adopted software tools to perform statistical computations and tests. Different instructors may adopt different tools (such as Excel, SAS, SPSS, Minitab, etc.) based on personal or textbook preferences.

Our personal experience indicates that sometimes the software tool selected to teach statistics course might present a limitation on the teaching quality. If the tool is comprehensive enough, and designed for professional use, substantial part of the course can be spent just learning the menus and options of the software. In these cases, students' comments indicate that they view such use of class time as counterproductive. They feel that the time that they spend in class learning how to do the procedures in the software package could be better used learning statistical concepts and applications instead. The issue, therefore, is to minimize the learning curve for the software used in class as much as possible.

In teaching business statistics to undergraduate students we have used the Excel-based tool called VISA (Visual Interactive Statistical Analysis), see [5]. The tool contains a collection of Excel-based templates to perform descriptive and inferential statistical procedures. The VISA user interface is common and consistent across different spreadsheets, which removes substantial part of learning curve. We will discuss the specifics of the VISA package later in this paper.

The purpose of the present research is multifold. First, we would like to argue that teaching business statistics to undergraduate students should concentrate more on understanding the role of decision making using statistical results and its application to business problems rather than trying to communicate the intricate details of specific statistical tests. In our view, the objective of an introductory business statistics course is to educate students to be informed and intelligent users of a statistical toolbox that is focused on objective decision making. Second, we propose

that the use of VISA can help reduce the learning curve of understanding statistical concepts, principles, and applications. Third, we demonstrate that students can learn how to use VISA with minimal supervision.

The rest of the paper is organized in the following way: in section II we provide a literature overview, section III contains the methodology and experimental design. The VISA software tool used in this study is described in section IV, class grades and students evaluations of the course are discussed in sections V and VI correspondingly. Section VII concludes with results, practical implications, and future research ideas.

LITERATURE REVIEW

A number of researchers have addressed the use of software in undergraduate statistics course. In [1] an experiment is reported, which compares the impact of instructional software on student performance. The authors investigated the use of two different types of multimedia packages on course performance. They hypothesize that different software packages used in a course result in different pedagogies, and eventually influence student course performance. Moreover, [1] have investigated if the impact of different software packages would differ for females and males.

Study [3] describes a survey addressing the status of first courses in statistical thinking. The findings revealed major positive changes, especially in the use of technology and course revisions. They describe major efforts in courses by "there was a common theme among many instructors who stated that they focus more on concepts and big ideas and on data analysis and interpretation and less on computation, formulas, and theory" [3, p. 8]. With respect to developing statistical reasoning, the authors "believe that appropriate content, a focus on data analysis and real problems, and careful use of high technological tools will help better achieve the suggested course goals and outcomes. However, no one as yet has yet demonstrated that a particular set of teaching techniques or materials will lead to the desired outcomes" [3, p. 10].

In this research we demonstrate that our experience using VISA as teaching tool allows instructors to concentrate more on understanding statistical methods and applications, and minimizes to a significant degree the software learning curve. Unlike [1], we have used the same software package in this research across all course sections. We hypothesized that if the software used for instructions is intuitive enough so that it does not require a major learning curve and can be mastered with minimal supervision, then the availability of the software for instructional purposes in the classroom does not affect the student performance in the course. Such approach allows to spend less time in classroom explaining details of the software package, and to place more emphasis on statistical concepts and ideas.

CLASSROOM SETTINGS

The findings reported in this paper are based on teaching *Statistical Thinking*, a business course taught in Spring 2006 at Christopher Newport University (CNU) by one of the authors. Statistical Thinking course at the CNU is an introductory statistical course required for pre-business undergraduate students. Normally, students take this course in their sophomore year after having MATH 125 and MATH 135 courses (Introductory Statistics and Calculus for

Business) taught in the Department of Mathematics. The textbook used for the business statistics course is Gerald Keller's *Statistics for Management and Economics*. The textbook contains a substantial number of examples of statistics applications to accounting, management, economics, marketing, and finance. Every chapter of the text contains practice problems, most of which have fairly large datasets that resemble "real-life" problems.

The topical coverage of the material adopted in the *Statistical Thinking* course is fairly comprehensive. The standard syllabus includes an introduction to the subject of statistics, basic statistical concepts, graphical and numerical descriptive techniques, concepts of discrete and continuous distributions, sampling distribution, one population inference (both confidence interval and hypotheses testing), comparison of two populations for independent samples and matched pairs, comparison of multiple populations using ANOVA analysis, simple and multiple regressions, model building, and non-parametric statistics. Considering that the course meets three hours per week, and some of the time is devoted to exams, exams reviews, and homework reviews, students perceive this course as content-intensive.

It is our philosophy that business statistics at the undergraduate level should emphasize the application of statistical methods, rather than attempt to teach the internal workings of specific computations and formulae. Therefore, in teaching of *Statistical Thinking* we completely abandon the "pencil and paper" methods. Students are informed at the beginning of the semester that for the application purposes, various statistical methodologies and procedures can be viewed as a toolbox. For any business problem that has dataset attached to it, finding the appropriate solution/decision for the question posed in the problem is a matter of performing several standard steps:

    (i) translating a question posed in the problem from "business" terms into "statistical" language,

    (ii) choosing the right statistical tool (procedure) from the toolbox,

    (iii)applying the statistical tool chosen, and finally

    (iv)interpreting the "statistical" answer in "business" terms.

The third step, applying the statistical tool chosen, is done in form of the software package. Since our objective in teaching this course is to concentrate on statistical concepts and applications, this step is viewed mostly as mechanical. Our goal is to deemphasize the mechanical/computational component of the course and concentrate on the value-added steps of the business problem solution. With that in mind we wanted to use the software tool in this course which (i) is easy to learn, (ii) has consistent user interface between different procedures, and (iii) is intuitive to use. The choice was done in favor of VISA (Visual Interactive Statistical Analysis), an Excel template, customized to perform certain statistical procedures and tests. We will discuss VISA specifics in the next section.

In spring 2006 one of the authors taught three sections of the *Statistical Thinking* course. Two sections of the course were taught in a computer lab, so that students could follow and practice the statistical analysis of examples shown in the class on the computers. The two sections hosted 24 and 27 students, correspondingly. The third section was taught in a regular classroom, equipped only with podium computer and an LCD projector. The students, therefore, did not have the capability to receive the hands-on learning experience in the classroom, but rather could

only passively observe instructor performing analysis on the podium computer. This class hosted 26 students. Such setting of the course teaching environment was not established by design, but rather was due to the limited availability of the computer labs for scheduling purposes. Students did not receive any prior information regarding the need for the computer equipment, so registration for the different section of the course resulted in three independent samples of students taking introductory business statistics course.

Testing of students' understanding of statistics in *Statistical Thinking* class was performed using a combination of homework problems, quizzes, and tests. The material of the course was roughly broken down into four modules. About half-way into each module a quiz was given. Closer to the end of the each module, a homework was assigned. Each assignment required solving several problems. Each problem had a description of the business setting, and attached dataset to model a "real-life" scenario. With each problem students were required to answer series of questions, leading to a problem solution. Students were given a week to complete the homework. Completion of the homework required that VISA templates have to be used by students to perform statistical computations. Upon submission of the homework, they were graded, returned back to students, and discussed in detail in class. When each module of the course was completed, and a corresponding quiz and homework were collected and graded, an exam was given. To ensure comprehensive coverage of the material discussed in class, the exam contained multi-part problems offered from different topics or chapters covered in the lectures. Most of the problems offered on the tests assumed analysis of the business scenario, which had a downloadable data file attached to it. Students, therefore, were to use VISA Excel templates on exams to perform the analysis, and tests had to take place in the computer lab. The section of *Statistical Thinking* which was scheduled in the regular classroom with no computers was scheduled in a computer lab during the exam days. Three of the exams contained the material relevant to the corresponding sections or chapters of the course. The fourth and final exam was cumulative and included the material of the last, fourth part of the course, as well as the inferential analysis topics from other three exams. The following weights were used to assess students' progress in the course: quizzes – 15%, homework – 10%, first three exams – 15% each, final exam – 20%. Class participation and attendance accounted for the remaining 10% of the grade.

VISA OVERVIEW

In this section we would like to describe structure and organization of the VISA software package used in BUSN 231 course.

In [7] it is proposed that relevant objectives of a statistics course, aimed at non-statisticians, should include (1) ability to link statistics and real-world situations, (2) knowledge of basic statistical concepts, and (3) ability to synthesize the components of a statistical study and communicate results in a clear manner. The author proposed to "revamp the traditional course design together with the creation of a new software tool that is currently unavailable." He states that although the use of software is common today in teaching statistics, typical software is meant for computations and not for teaching. Among software characteristics, the author mentions ease-of-use, and consistent graphical interface. Capabilities of such software should be similar to such of most popular statistical software packages (Minitab, SPSS, etc).

Study [2] "defines statistical reasoning to consist of (a) what a student is able to do with statistical content (e.g., recalling, recognizing, and discriminating among statistical concepts), and (b) the skill that the student demonstrates in using statistical concepts ins specific problem-solving steps." [2, p. 18]. The authors further propose that the process of statistical reasoning consists of three stages: I – Comprehension; II – Planning and Execution; and III – Evaluation and Interpretation.

The **VISA** software discussed in this paper incorporates many of [7] suggestions and is based on [2] stages combined with data oriented visual interactive statistical analysis software to facilitate the learning experience. It uses keywords to help students with scenario recognition which guide them to the appropriate analysis procedure. Once, keywords have been identified, they use menu driven, visually interactive Excel® worksheets to view the data, complete the statistical analysis and interpret the results. The steps in the **VISA** model are discussed below:

Comprehension: Identify key words and phrases. **VISA** characterizes the keyword process by the following:

- Identify the data type – Qualitative (Nominal/Ordinal) or Quantitative (Interval/Ratio)
- Identify the number of variables (populations) being investigated
- Identify the type of analysis that is required: descriptive, comparison, or relationship and whether it is parametric or non-parametric
- Identify whether the data is dependent or independent
- Identify how the data is organized for analysis (e.g. is it stacked or in columns)

Planning and Execution: The results of the classifications made in the comprehension stage are used to select the appropriate **VISA** analysis menu option. For example, if the student has identified the keywords in an analysis as --- quantitative data; 2 populations; parametric comparison; independent observations; in 2 columns --- they merely select the **VISA** menu item for **Quantitative by Column, 2 Columns Independent**. **VISA** organizes the comparison tests and all the pre-requisite "required condition procedures" and graphical data analysis in one place. The student does not have to traverse a textbook or use independent computer procedures to complete the analysis. They merely, interact with the sequentially presented **VISA** worksheet. **VISA** allows students to visualize data and concentrate on analysis rather than waste time on elementary manual calculations.

Evaluation and Interpretation: **VISA** presents results in terms that can be easily translated into the context of the problem being investigated. Color coded and clearly labeled calculations are easily identified. **VISA** provides key numerical statistics such as the p-value and students are continually reminded by comments, such as: p-value $< \alpha$, implies that the Null hypothesis is rejected. In addition, **VISA** also provides verbally descriptive phrases which help the student make the transition from computer output to "layman's presentation".

VISA is an Excel® based educational software package built on a big picture view of statistical analysis and has been developed without using Excel's built in procedures. This allows **VISA** to develop complete integrated worksheets presenting a straight forward and seamless flow for performing statistical analyses. There is no multiple data entry or highlighting data multiple times for different independent analytical procedures, and pre and post hoc analyses are included in the same workbook. Once the data is entered, all other calculations (with the exception of a few background macros) are made automatically. This eliminates the independent nature of statistical analysis packages (including Excel® and Minitab®) which are introduced in the majority of contemporary introductory textbooks.

When designing work methods, industrial engineers consider several factors: environmental working conditions, unnecessary motions, combining activities, the arrangement of the workplace, tools and equipment). The **VISA** concept presented herein addresses many of these factors. A somewhat sequential course delivery combined with the **VISA** toolkit organizes statistical procedures and their pre-requisite conditions all in one place. **VISA** provides memory pegs and eliminates the requirements for memorizing complicated formulae and definitions. **VISA** is very easy to learn and requires very little computer knowledge with the exception of a few basic Excel® commands (such as the ability to copy and paste ranges of data). It also eliminates the need for multiple independent computer analyses with different hard to read outputs. The visual, interactive design of **VISA** allows the student to become more actively involved in the process of analysis. It also, reinforces the appropriate procedural steps without having to flip back and forth through pages in a textbook. In addition, **VISA** provides both numerical and verbal output. The verbal presentation assists with student's ultimate interpretation in "layman" terminology. In short, the **VISA** concept bridges the gap between calculations and interpretation which creates a more pleasurable environment for learning.

Figure 1 show the **VISA** organization. When the CD is inserted, an Excel® **VISA Data Base** (**Data.xls**) is launched. Students manually enter or import saved **VISA** data files into the **Data.xls** workbook which serves as the driver for all **VISA Procedures** and utilities. When a procedure is selected, another workbook is opened which accesses the data and column information in the **Data Base**. In addition to a PowerPoint demonstration, printable .pdf instructions, file options (**Import Saved VISA File**, Save **VISA File**, and **Exit VISA**), and data options (**Clear Data**, **Multi-level Sort**, and **Un-stack Data**) are provided. Each procedure has a .pdf help document, which shows a detailed example of how it works, and each worksheet has instructions and callout comments.
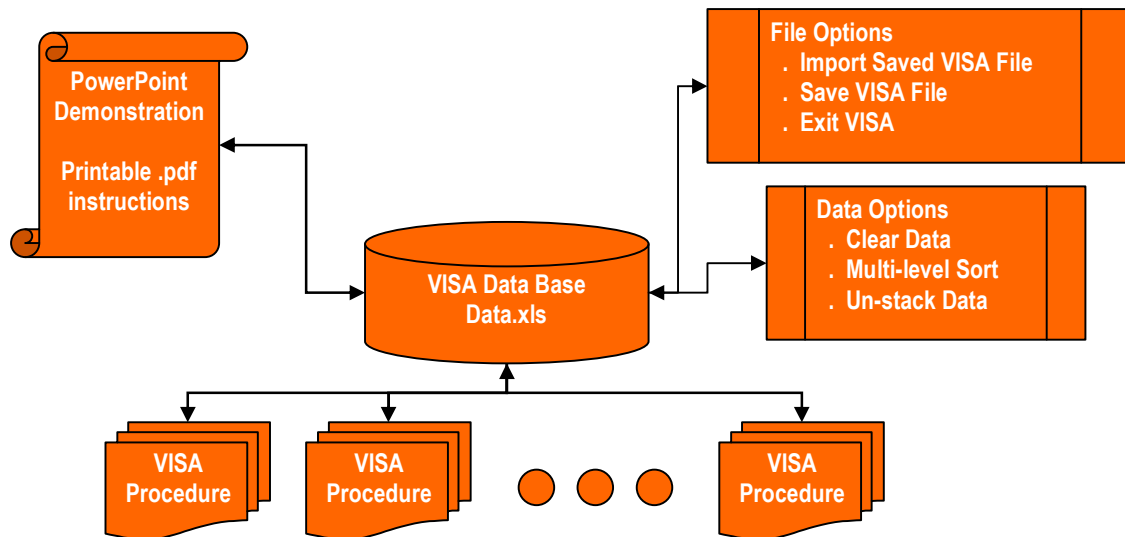
VISA provides statistical analysis both stacked and un-stacked data for the following:

- Exploratory data analysis for both qualitative and quantitative data – graphical and numerical

- 1 population qualitative data – graphical displays of proportion by classification and Z test

- 2 population qualitative data – graphical displays of populations proportions by classification and Z test for difference in two population proportions

- Chi-square analysis – observed classification proportions compared to hypothesized classification proportions

- Chi-square cross tabular contingency tables – tabular and interactive graphical display of cross tabular relationship with Chi-square hypothesis test results

- 1 population quantitative data – dot plot, box & whisker plot, histogram, verification of normality assumption, t-confidence intervals and hypothesis test for means, and Chi-square confidence intervals and hypothesis test for variance

- 2 population independent quantitative data – dot plots, box & whisker plots, histograms, verification of normality assumptions, t confidence interval and hypothesis test for difference of means, and F-test for equality of variance

- 2 population dependent data – verification of matched difference normality, t confidence interval and hypothesis test

- 1 Factor ANOVA – dot plots, box & whisker plots, treatment scatter diagram, Bartlett's test for equality of variances, ANVOA table, pooled variance graphs of treatments on the same graph, and Fisher's LSD analysis

- Blocked 2 Factor ANOVA – treatment scatter diagram, ANVOA table, and pooled variance graphs for both factor treatments

- Complete 2 Factor ANOVA – ANOVA table, pooled variance graphs for both factor treatments, and graphical display of treatment interaction relationship

- Simple Linear Regression – summary regression output, ANOVA table, coefficients table, regression equation, significance tests, post-hoc residual analysis, Durbin-Watson test for autocorrelation, and graphical display of the original data with the regression equation with prediction and confidence interval bands
- Multiple Regression – graphical display of all XY relationships with significance test results, Pearson's coefficient of correlation table for all XY relationships, best one variable model, highly correlated X variables, interactive selection of variables to include in regression model with immediate feedback for summary regression output, ANOVA table, coefficient table, regression equation, significance tests, post-hoc residual analysis, Durbin-Watson test for autocorrelation, and graphical display of each XY plane showing original and regression data points
- Pearson's Coefficient of Correlation – correlation table, significance test results, and graphical scatter plots of the XY relationships
- Non-parametric procedures for both qualitative ordinal and quantitative data showing graphical displays of data with the corresponding hypothesis test results
  - Spearman Rank Correlation
  - Sign Test
  - Wilcoxon Signed Rank Sum
  - Wilcoxon Rank Sum
  - Kruskal-Wallis
  - Friedman

In addition, **VISA** also includes procedures for the following:

- Probability Distributions – discrete (Binomial and Poisson) and continuous (Exponential, Normal, Standard Normal, Student's t, F, and Chi-square) showing graphical representations and automatic table look-up values
- Statistical Process Control – range and mean charts for both known and unknown variation, proportion, and c (defectives per unit) charts with above/below (A/B) and up/down (U/D) runs test
- Forecasting and Smoothing Methods – naïve, moving average, weighted moving average, exponential smoothing, linear trend, and seasonal relative models with forecast control charts

Since **VISA** was designed as an educational package for introductory statistical analysis, data set size is limited. The majority of **VISA** procedures handle up to two-thousand data observations for up to sixty columns. Qualitative procedures handle up to twenty numerically coded classifications (1 to 20). Some notable exceptions are: Blocked 2 Factor ANOVA handles only fifty blocking treatments for up to 5 factor treatments; Complete 2 Factor ANOVA is limited by 5 column factor treatments and one-hundred and fifty row observations.

Figure 2, shows an example of the **VISA** Data Base with the drop-down menu selection to analyze a scenario with: <u>quantitative data</u>, <u>2 populations</u>, <u>parametric comparison</u>, <u>independent observations</u>, with <u>data organized in 2 columns</u>.

FIGURE 2: VISA Analysis Pull Down Analysis Options
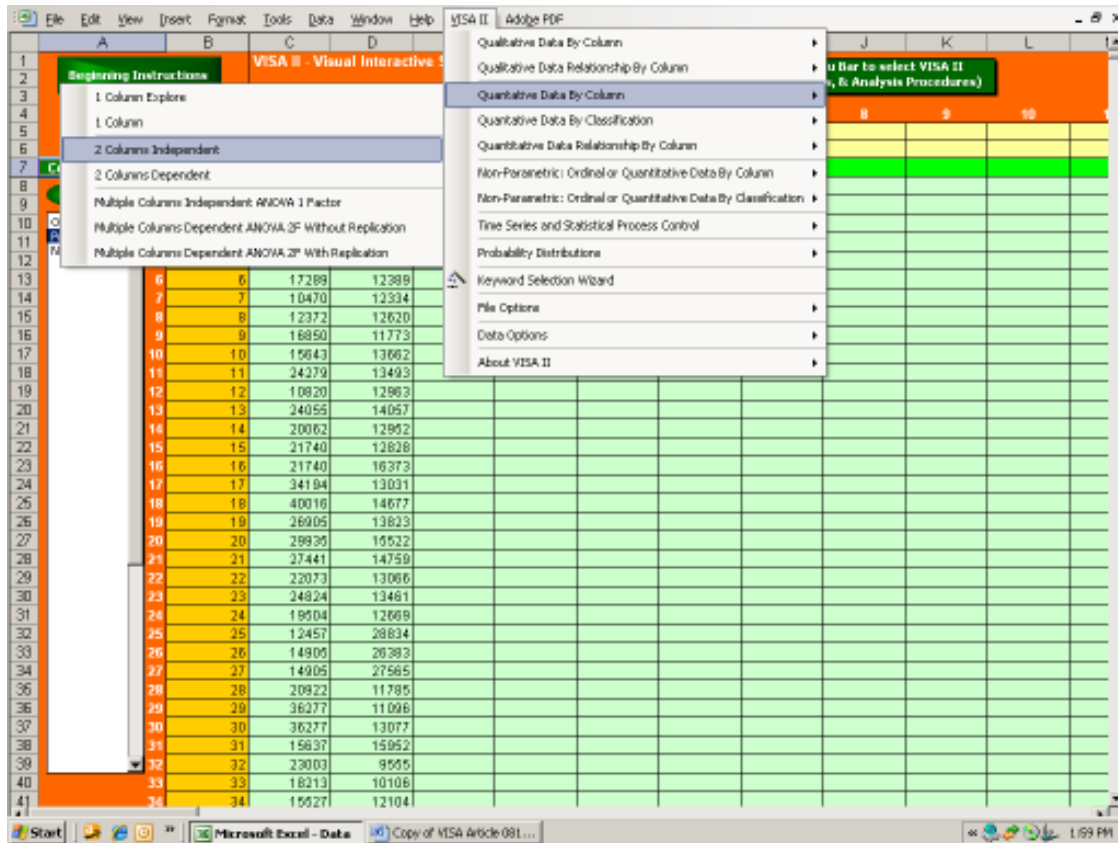
The Quantitative: 2 Columns Independent workbook for the analysis is automatically opened and linked to the **VISA** data base. The menu options for the 2 population analysis is shown in Figure 3: select data (**SD**), graphical analysis for both populations - dot plots and box & whisker plots (**DP**) and histograms (**HIST**); numerical descriptive calculations (**NDS**), comparison histograms of both populations on the same graph (**HISTB**); checks for normality (**COMP1, and COMP2**), check for equality of variances (**CHKVAR**); confidence interval calculations (**CI**); and hypothesis test calculations (**HT**). Comments for each menu selection are displayed by a cursor mouse-over.

FIGURE 3: Analysis Menu Options
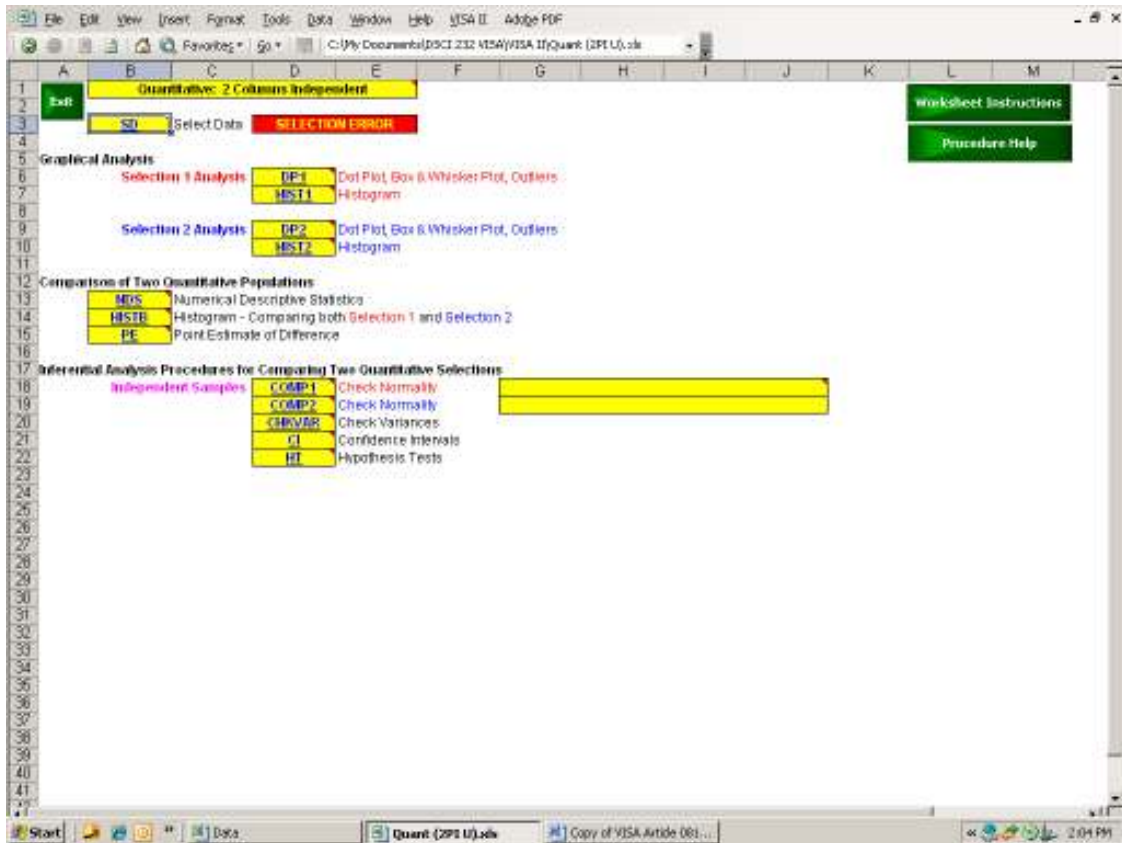
Figure 4 shows the box & whisker plot which identifies two outliers (in the graph and in the table at the left of the workbook). This allows students to see that the observations are slightly skewed to the right and think about reasons why the two outliers exist. The statistical reasoning process is reinforced as students consider whether or not the outliers should be deleted from the analysis.
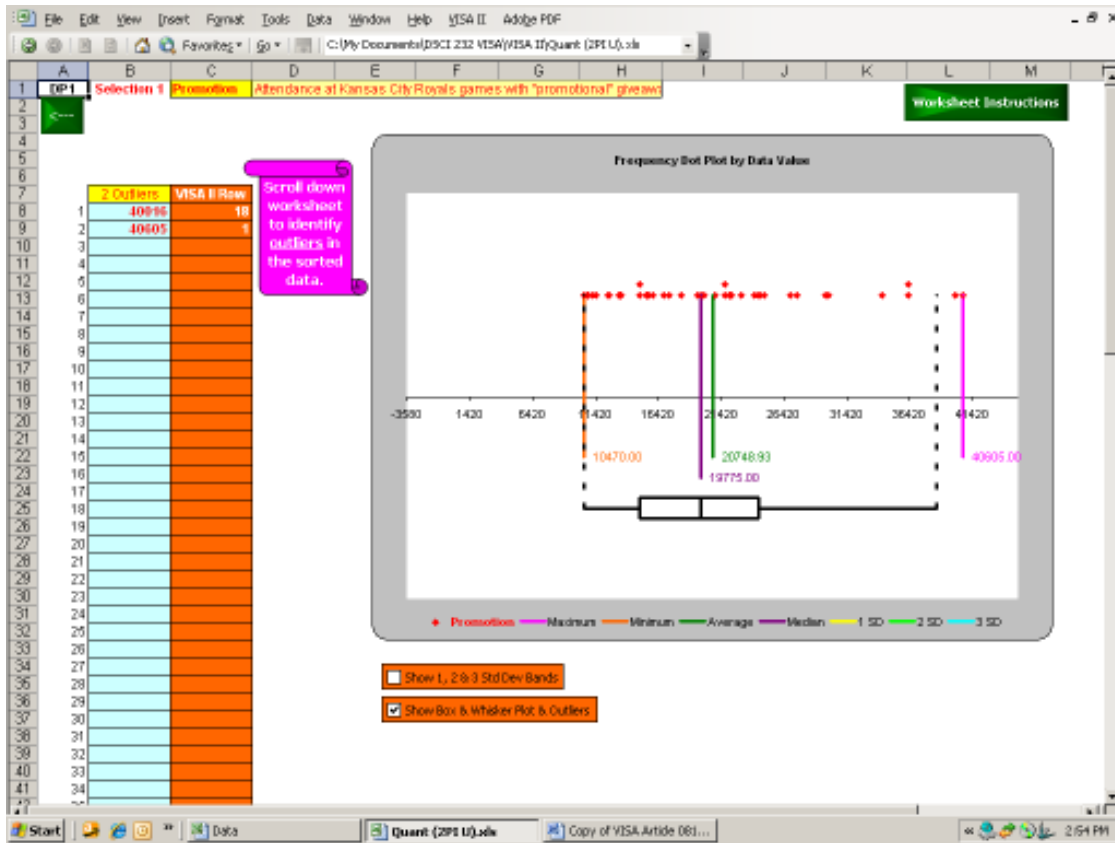
FIGURE 4: Box & Whisker Plot

Figure 5 shows a visual and Chi-square test for the comparison of the data distribution to the standard normal distribution. Here we see that there is not enough evidence ($\alpha = .01$) to suggest the sample does come from a normally distributed population. In the event the Chi-square test indicates the data is not statistically normal, students are encouraged to evaluate whether the data is "extremely" non-normal. In this case, they conclude that the data is not extremely non-normal and because the difference of means test is robust, they can proceed with the analysis. **VISA** uses the Chi-square test for normality rather one of the many others because it is typically included in introductory statistics texts.

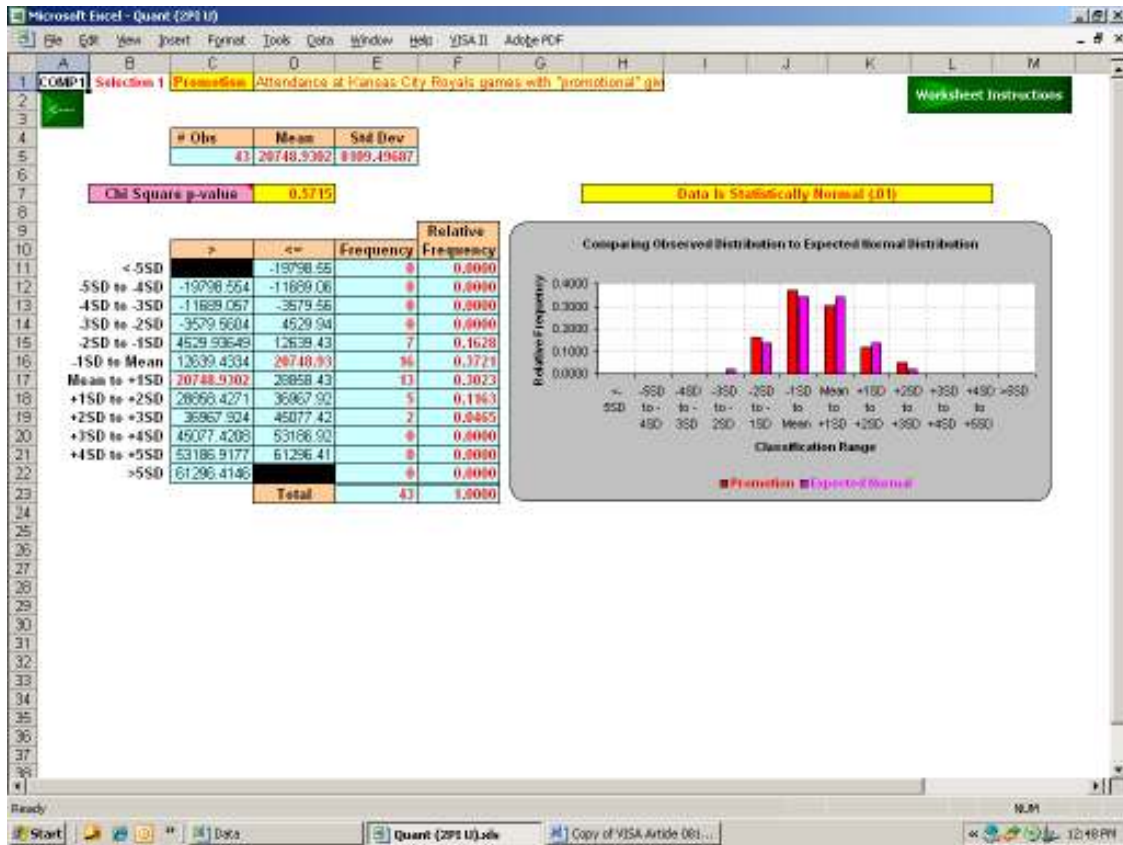**FIGURE 5: Sample Data Distribution Comparison to Standard Normal Distribution**

Figure 6 shows the hypothesis test for a selected significance level and hypothesized difference. Selecting the alternative hypothesis ("greater than") the hypothesis test is reaffirmed in the bright green cells in the middle of the worksheet. The hypothesis test p-value, test statistic, and degrees of freedom are automatically calculated with a verbal descriptive of what the p-value means with respect to whether the null or alternative hypothesis is statistically true. Again, eliminating the elementary calculations gives students more time to concentrate on the analysis and develop an understandable conclusion similar to: "the evidence suggests, at the 5% level of significance, that there is a difference in the two population means".

FIGURE 6: VISA Hypothesis Test Selection
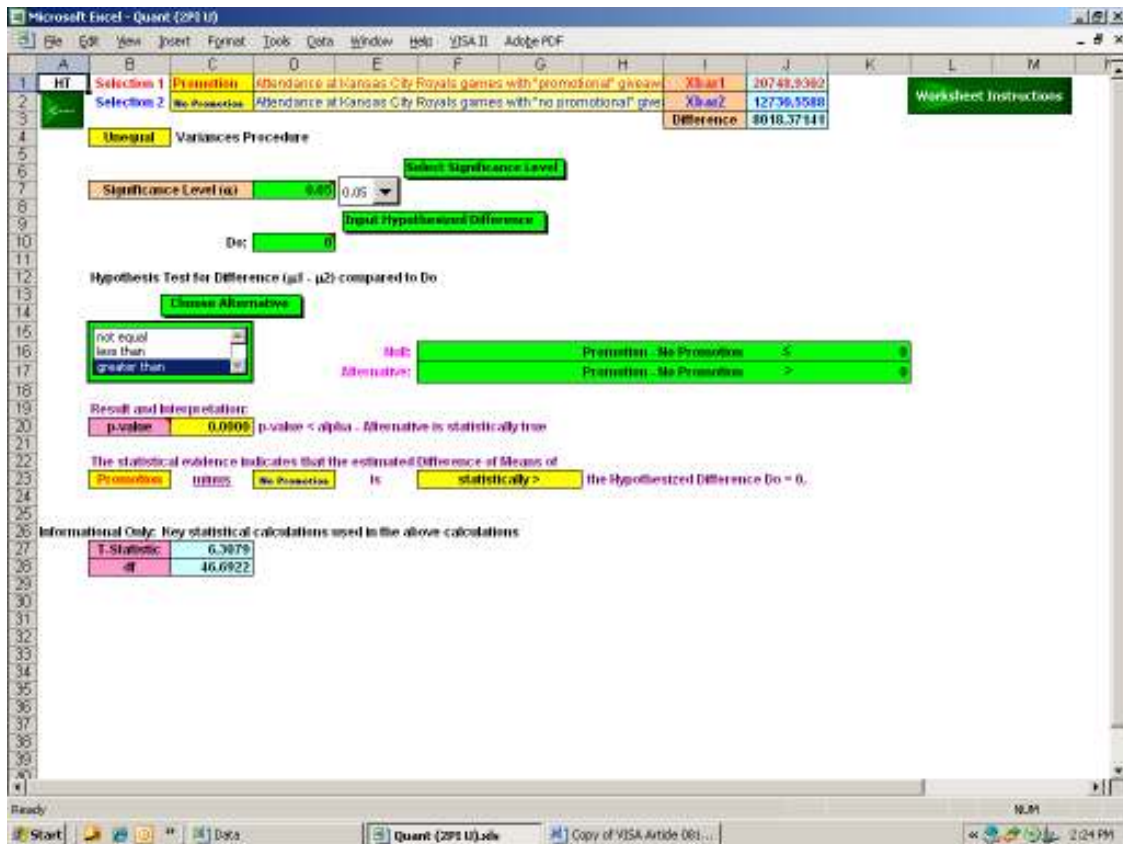
GRADES ANALYSIS

Student grades were used to compare performance in the three sections described above. We utilized the Kruskal-Wallis test to compare performance of different sections on quizzes, homework assignments, and exams. The final course scores were computed for each section based on a weighted average of quizzes, homework assignments and exams grades with weights discussed above in section 3. The final course scores serve as the basis for final course grade determination and indicate the overall cumulative performance of students throughout the semester. The hypotheses tested are:

H_0: distribution of grades have same locations for all three sections of BUSN 231

H_1: at least two sections of BUSN 231 differ in the distribution of grades locations

The results of the tests performed for exams and final course scores are summarized in the table 1 below:

TABLE 1: Statistical Analysis of Grades Distribution

	Exam 1	Exam 2	Exam 3	Final Exam	Course score
p-value	0.8822	0.2202	0.6942	0.8087	0.5303

The Kruskal-Wallis test p-values indicate that the three sections demonstrate the same performance level in the course. Several conclusions can be made drawn from these findings.

First, the absence of computers for students in the classroom was not a limiting factor on performance. Students, who were not taught in a computer lab, were challenged to learn the workings of the software by themselves. Nevertheless, these students were expected to perform the analysis analogous to the other two sections which were taught using computers in the classroom. Every exam given in the course normally contains 3 to 4 problems, each with multiple parts. A typical problem poses a business question and asks a student to perform relevant analysis, provide brief interpretation of results whenever appropriate, and formulate the conclusion of the analysis in plain, non-statistical terms. If the software used in the course is complicated to the extent that students cannot learn its capabilities by themselves, then it is reasonable to assume that substantial part of a 50-minute exam would be spent looking for the right statistical tool, rather than concentrating on analysis of problems. This would result in worse performance for students taking a course in regular classroom without computers. Our results indicate that performance was uniform across all three sections, regardless of availability of in-class computers and analysis software for instructions. This leads us to conclude that VISA is a statistical learning software tool which is simple enough so that it does not impose limitations on student learning. Students are able to learn this tool with minimal supervision on their own time.

Second, we claim that if a software tool is intuitive to the point that it does not require a substantial learning curve, then having classes in a computer lab does not promote better understanding of statistics. This claim is demonstrated by the fact that the student course performance across the three sections was statistically the same regardless of availability of software. As was previously discussed, our approach to teaching statistics is geared towards understanding what tools are available for data analysis in "statistical toolbox" and ability of students to correctly recognize problem's statistical characteristics and pick the appropriate statistical tool. Selecting the correct statistical tool or procedure is based on answering series of questions about the problem and characteristics of data for the problem. The questions are as follows:

(i) What data type(s) are used in the problem?
(ii) How many populations are being analyzed?
(iii) What is the objective of the problem: to describe a single population, to analyze single population sample, to compare two populations, to compare more than two populations, or to analyze relationship between variables?
(iv) Is distribution of the data normal or not? This question applies to interval data only, and it drives the selection between parametric and non-parametric tests to be used with the problem's data.
(v) How were the data collected? This question applies to experimental design when comparing two or more populations. Students are supposed to understand the difference between various experimental designs and argue why they believe the specific design applies to the problem in hand.

After these questions are answered, the selection of the appropriate statistical test can be made. As one can see in the VISA description in the section above, the overall structure of the software

interface is consistent with this approach, integrating seamlessly with pedagogical approach instituted in the course.

STUDENTS EVALUATIONS AND COMMENTS

CNU uses the IDEA (Individual Development and Educational Assessment) student rating system to assess quality of teaching, see [6]. IDEA evaluations analysis is administered Kansas State University (the IDEA Center). Students are asked to evaluate academic standards of the course, quality of teaching, and their progress in the class. The scores in different areas being evaluated are reported on a 5-point rating scale with 5 points being the highest. The overall index of teaching effectiveness (progress on relevant objectives) combines and summarizes ratings of progress on the course objectives identified by the instructor as important (weighted "1") or essential (weighted "2"), (the IDEA Center). The IDEA Center regards this measurement as the single best estimate of teaching effectiveness. The IDEA evaluations of the three sections of BUSN 231 described in this study bear the teaching effectiveness indices of 3.9 and 4.2 for the two sections taught in the computer lab, and 4.1 for the section which was instructed without computers in the classroom. These ratings indicate that students' perceived progress on the relevant course objectives was rated similarly in different sections regardless of software availability in the classroom. The IDEA evaluation forms filled by students also contain space where students can leave written comments. Comments left by students taught in the regular classroom indicate that they would have preferred having classes in a room equipped with the computers, because this caused them to work harder in this class. But, as we have elaborated above, this circumstance did not represent limitations on the quality of teaching and students' progress in class.

RESULTS, CONCLUSIONS AND PRACTICAL IMPLICATIONS

In this research we have demonstrated that VISA can be used as an effective teaching tool in introductory statistics course. The software is intuitive, easy-to-learn, and user-friendly. Results indicate that students are capable to learn the software with minimal supervision from instructor, allowing reduction of learning curve as to how to use the software. This, in turn, allows more time for teaching important statistical concepts, rather than explaining details of different menus and software capabilities.

The practical implication of our findings is that VISA software is a learning tool, which facilitates better understanding of the statistical procedures and their applications. Study [3] states that about 25% of all instructors require students to learn a spreadsheet like Excel in statistics course. VISA is based on Excel and does not require students to learn Excel built-in menus, and functions. It allows seamless integration with the existing course syllabus without curricular changes, as it supports all standard tests and procedures normally covered in the undergraduate statistics course. VISA is well-documented and contains tutorials explaining how different tests and procedures should be used.

The importance of developing statistical reasoning is stressed in [4]. The author states that "most instructors tend to teach concepts and procedures, provide students opportunities to work with data and software". However, "it appears that reasoning does not actually develop this way",

and "students can often do well in a statistics course,…, yet still perform poorly on a measure of statistical reasoning such as the Statistical Reasoning Assessment". It is interesting, therefore, to investigate how students instructed with VISA software perform on the Statistical Reasoning Assessment.

REFERENCES

[1] Alldredge, J., and Brown, G. (2006). Associations of Course Performance with Student Beliefs: An Analysis by Gender and Instructional Software Environment, *Statistics Education Research Journal*, 5, pp. 64 - 77.

[2] Chervany, N. L., Collier, R. O. Fienberg, S. E., Johnson, P. E., and Neter, J. (1977). A Framework for the Development of Measurement Instruments for Evaluating the Introductory Statistics Course, *The American Statistician*, 31, pp. 17-23.

[3] Garfield, J., Hogg, R. V., Schau, C., and Whittinghill, D. (2002). First Courses in Statistical Science: The Status of Educational Reform Efforts*, The Journal of Statistics Education*, Vol. 10, 2.

[4] Garfield, J. (2002). The Challenge of Developing Statistical Reasoning, *Journal of Statistics Education* Vol. 10, 3.

[5] Hodges, H. E. (2008). Considerations for Introductory Statistics Courses: A Model for Developing Statistical Reasoning Using Excel® Worksheets, Visual Interactive Statistical Analysis (VISA), in *Proceedings of the 37th Annual Meeting, Western Decision Sciences Institute*.

[6] The IDEA Center http://www.idea.ksu.edu/.

[7] Yilmaz, M. R. (1996). The Challenge of Teaching Statistics to Non-Specialists, *Journal of Statistics Education* Vol.4, 1.

EMPHASIZING ONE-SIDED INTERVAL ESTIMATION
IN INTRODUCTORY BUSINESS STATISTICS COURSES

Penny Verhoeven and Victor Wakeling
Department of Economics and Finance, Kennesaw State University
1000 Chastain Rd. MD0403, Kennesaw, GA 30144-5591
pverhoev@kennesaw.edu, 770-423-6537, vwakelin@kennesaw.edu, 770-423-6092

ABSTRACT

We recommend including instruction in one-sided interval estimation of a population mean and proportion. This paper illustrates how common textbook exercises on one-sided hypothesis testing can be readily augmented to afford students practice in one-sided interval estimation. Such information is relevant for many business cost-benefit decisions.

INTRODUCTION

The primary goal of a course in Business Statistics is to promote the student's ability to obtain, summarize, and analyze data to address real-world information needs and inform decision-making. Given that businesses routinely consider and make changes (e.g., to their processes) in pursuit of reduced cost or improved product/service quality, students are well served by instruction in inferential procedures that can inform a decision as to whether or not a change is worthwhile. Often, a change is evaluated on the basis of one or more performance metrics (e.g., proportion of satisfied customers, mean product lifetime). Business statistics textbooks invariably address testing hypotheses about and obtaining two-sided confidence intervals for means and proportions. However, coverage of one-sided interval estimation of a mean or proportion (see the Appendix) in business statistics texts is typically absent (as in [1], [3], [4], and [5]) or limited (as in [2], which addresses only an "at least" one-sided confidence interval for a proportion). Below, we take a rhetorical approach to demonstrating the usefulness of one-sided interval estimation by referencing textbook exercises having as the implied or explicit purpose deciding whether or not a change is beneficial, yet relying solely on a one-sided hypothesis test to do so.

ONE-SIDED INTERVAL ESTIMATION OF A MEAN

Consider the following exercise (from [5], p. 343) to assess the effect of an additive on the shelf life of chlorine:

> The liquid chlorine added to swimming pools to combat algae has a relatively short shelf life before it loses its effectiveness. Records indicate that the mean shelf life of a 5-gallon jug of chlorine is 2,160 hours (90 days). As an experiment, Holdlonger was added to the

chlorine to find whether it would increase the shelf life. A sample of nine jugs of chlorine had these shelf lives (in hours):

2,159 2,170 2,180 2,179 2,160 2,167 2,171 2,181 2,195

At the .025 level, has Holdlonger increased the shelf life of the chlorine?
Estimate the p-value.

In testing $H_0 : \mu \le 2160$, there is very strong evidence (t = 3.98, p < .005) that, with Holdlonger, the mean shelf life is increased. However, in evaluating whether it is worthwhile to henceforth add Holdlonger to chlorine given cost and time involved in so doing, would not one want to assess **how much** Holdlonger increases the shelf life? The above hypothesis test does not address that question.

The exercise could be augmented by requesting a 90% (say) one-sided confidence interval to estimate how *large* is the mean shelf life with Holdlonger. Then the known cost of the additive could be compared to the amount of benefit to the product's shelf live. The appropriate confidence interval formula is

$$\ge \ \overline{x} - t_\alpha \frac{s}{\sqrt{n}} \tag{1}$$

the application of which yields $\ge \ 2172.444 - 1.397 \dfrac{9.382}{\sqrt{9}}$ = 2168 and enables concluding with

90% confidence that the mean shelf life with Holdlonger is at least 2168 hours. Thus, we are 90% confident the mean shelf life would be increased by at least 8 hours (i.e., from 90 days to at least 90 1/3 days). From a practical standpoint, at anything more than a negligible cost, insufficient benefit arises from adding the Holdlonger to the chlorine.

The following exercise (from [2], page 367) addresses evaluating a new delivery process intended to reduce delivery times:

> You are the manager of a restaurant that delivers pizza to college dormitory rooms. You have just changed your delivery process in an effort to reduce the mean time between the order and completion of delivery from the current 25 minutes. A sample of 36 orders using the new delivery process yields a sample mean of 22.4 minutes and a sample standard deviation of 6 minutes….at the .05 level of significance, is there evidence that the population mean delivery time has been reduced below the previous population mean value of 25 minutes?

In testing $H_0 : \mu \ge 25$, there is strong evidence (t = -2.60, p < .01) that the new delivery process reduces the mean delivery time. However, the hypothesis test does not provide an estimate of the reduction in delivery time to compare against any new process implementation costs. The manager lacks insight whether the new delivery process is cost-justified. The exercise could be augmented by requesting a 95% (say) one-sided confidence interval to estimate how much *lower* the mean delivery time is with the new process.

The appropriate confidence interval formula is

$$\leq \ \overline{x} + t_\alpha \frac{s}{\sqrt{n}} \tag{2}$$

the application of which yields $\leq \ 22.4 + 1.69 \frac{6}{\sqrt{36}} = 24.1$ and enables concluding with 95% confidence that the mean waiting time under the new system is reduced by at least $.9 \approx 1$ minute.

ONE-SIDED INTERVAL ESTIMATION OF A PROPORTION

In some situations, a change is evaluated on the basis of whether a particular percentage is appreciably increased (or, alternatively, appreciably decreased). In the following exercise (from [2], page 371), for example, an insurance company has developed a new system for paying medical claims with the intention of increasing the percentage of claims paid in full when first submitted:

> ….An article…reported that for one insurance company, 85.1% of the claims were paid in full when first submitted. Suppose the insurance company developed a new payment system in an effort to increase this percentage. A sample of 200 claims processed under this system revealed that 180 of the claims were paid in full when first submitted. a. At the .05 level of significance, is there evidence that the population proportion of claims processed under this new system is higher than the article reported for the previous system? b. Compute the p-value and interpret its meaning.

In testing $H_0 : p \leq .851$, there is evidence ($z = 1.95$, $p \approx .025$) that under the new system, the percentage of claims paid in full when first submitted is increased. However, in evaluating the new system, would not the company want to assess the extent to which the new system increases that percentage? To address that question, the exercise could be augmented by requesting a 95% (say) one-sided confidence interval to estimate how *large*, under the new payment system, is the percentage of claims paid in full when first submitted. The appropriate confidence interval formula is

$$\geq \ \overline{p} - z_\alpha \sqrt{\frac{\overline{p}(1-\overline{p})}{n}} \tag{3}$$

the application of which yields $\geq \ .90 - 1.645 \sqrt{\frac{(.90)(.10)}{200}} = .865$ and enables including with 95% confidence that under the new system, the percentage of claims paid in full when first submitted would be increased by at least 1.4 percentage points. The savings or benefit of this improvement can be compared to the cost of the new payment system.

The following exercise (from [3], p. 322) addresses whether switching to a just-in-time system is associated with a reduction in the percentage of late materials shipments:

A large manufacturing company investigated the service it received from suppliers and discovered that, in the past, 32% of all materials shipments were received late. However, the company recently installed a just-in-time system in which suppliers are linked more closely to the manufacturing process. A random sample of 118 deliveries since the just-in-time system was installed reveals that 22 deliveries were late. Use this sample information to test whether the proportion of late deliveries was reduced significantly. Let $\alpha = .05$.

In testing $H_0 : p \geq .32$, there is very strong evidence ($z = -3.12$, $p \approx .001$) that the just-in-time system reduces the percentage of late shipments. In evaluating the just-in-time system, it's worthwhile to know by how much it can be expected to reduce the percentage of late deliveries. To assess that reduction, the exercise could be augmented by requesting a 95% (say) one-sided confidence interval to estimate how *small* is the percentage of late deliveries under the just-in-time system.

The appropriate confidence interval formula is

$$\leq \overline{p} + z_\alpha \sqrt{\frac{\overline{p}(1-\overline{p})}{n}} \qquad\qquad (4)$$

the application of which yields $\leq .186 + 1.645\sqrt{\frac{(.186)(.814)}{118}} = .24$ and enables concluding with 95% confidence that the just-in-time system will reduce the percentage of late shipments by at least 8 percentage points. From a practical standpoint, the just-in-time system can be concluded to substantially reduce the percentage of late shipments, allowing the determination of the associated cost savings.

INFORMATION CONTENT OF ONE-SIDED INTERVAL ESTIMATION VERSUS ONE-SIDED HYPOTHESIS TESTING

The above exercises illustrate that obtaining a one-sided confidence interval for a mean or proportion provides more information than a traditional test of a one-sided hypothesis about the mean or proportion. In general, to test, say, the null hypothesis $H_o : \mu \leq \mu_0$ at significance level α, one may use as the decision rule: reject the null hypothesis if and only if the $100(1-\alpha)\%$ "at least" confidence interval for μ does not contain μ_0. Yet, obtaining that confidence interval goes beyond deciding whether or not to reject the null hypothesis by providing an interval estimate of just how large μ actually is. Analogously, obtaining an "at most" confidence interval for μ is more informative than testing $H_o : \mu \geq \mu_0$, obtaining an "at least" confidence interval for p is more informative than testing $H_o : p \leq p_0$, and obtaining an "at most" confidence interval for p is more informative than testing $H_o : p \geq p_0$.

CONCLUSION

As an outcome of introductory business statistics, students need to be able to assess, based on sample data, whether a treatment or change is worthwhile, within a cost-benefit framework. In many situations, one-sided interval estimation of a mean or proportion is central to that assessment. We recommend more emphasis on instruction in one-sided interval estimation in business statistics courses.

REFERENCES

[1] Anderson, David R., Sweeney, Dennis J., and Williams, Thomas A. *Essentials of Statistics for Business and Economics*. Mason, OH: Thomson South-Western, 2009.

[2] Berenson, Mark L., Levine, David M., and Krehbiel, Timothy C. Basic Business Statistics: Concepts and Applications. Upper Saddle River, NJ: Prentice Hall, 2009.

[3] Black, Ken. *Business Statistics for Contemporary Decision-Making*, 5th edition. Wiley, 2008.

[4] Doane, David P., and Seward, Lori E. Essential Statistics in Business and Economics. Boston, MA: McGraw-Hill, 2005.

[5] Lind, Dougas A., Marchal, William G., and Wathen, Samuel A. *Statistical Techniques in Business and Economics*, 12th edition. Boston, MA: McGraw-Hill, 2005.

APPENDIX

One-sided confidence intervals for μ

Information need	Appropriate confidence interval when σ known[a]	Appropriate confidence interval when σ unknown[a]
How large is μ ?	$\geq \bar{x} - z_\alpha \dfrac{\sigma}{\sqrt{n}}$	$\geq \bar{x} - t_\alpha \dfrac{s}{\sqrt{n}}$
How small is μ ?	$\leq \bar{x} + z_\alpha \dfrac{\sigma}{\sqrt{n}}$	$\leq \bar{x} + t_\alpha \dfrac{s}{\sqrt{n}}$

[a]It is further assumed that the population is normally distributed or n is large.

One-sided confidence intervals for p

Information need	Appropriate confidence interval when n large
How large is p ?	$\geq \bar{p} - z_\alpha \sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}}$
How small is p ?	$\leq \bar{p} + z_\alpha \sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}}$

A B S T R A C T

An Interactive Pedagogy
for
Integrating the Theory and Calculations
Of the Weighted Average Cost of Capital

by

Sam G. Berry, DBA
Visiting Professor of Finance
The Citadel

and
Tanveer Singh, MBA
Senior Engineer
Robert Bosch Corporation
Charleston, SC

A B S T R A C T

An Interactive Pedagogy

for

Integrating the Theory and Calculations
Of the Weighted Average Cost of Capital

Overview: This work presents an interactive model that integrates the theory and

requisite calculations necessary to determine the weighted average cost of capital,

WACC. The student user will develop proficiency in calculations of WACC as

he takes the firm through a six step sequence in which the firm moves from a

modest to a heavy use of debt in its capital structure. Upon completion of the

iterative calculations, the model then graphs WACC versus stock price. The user

can then observe the impact of his capital choices on the WACC and value of the

firm. He can note which mixture of debt and equity led to the minimum WACC

and the highest stock price. The user actually "drives the company" and have his

identifiable impact on the value of the firm.

Inputs: Inputs are required for the following components of corporate capital in

each iteration of the process.

Abstract   WACC Pedagogy   page 2

Bonds: The user enters a dollar amount of long term debt, an interest rate for the debt and a

       corporate tax rate.

Preferred Stock: The user enters a dollar amount if preferred stock, the current price and the

       current dividend.

Existing Common Stock: The user enters the following current data: dollar amount of existing

  common stock, overall market return on common stock, risk-free rate on long term government bonds, and the common stock beta.

Retained Earnings: The dollar amount of retained earnings is entered at the same component cost as common stock. When new securities are sold, provision is made for flotation

 costs.

Equations: The customary equations seen in most finance texts are used, where:

  $WACC = r_D w_D + r_{PS} w_{PS} + r_S w_S + r_{RE} w_{RE}$

For instructional purposes, the costs of common stock and retained earnings are calculated separately; they can easily be combined into the one entry of common stock equity. Flotation costs can be added as required.

The debt equation is, $r_D(1-T)$

The preferred stock equation is, $r_{PS} = Dividend/Price$

The common stock equation is $r_S = r_{RF} + (r_m - r_{RF})b_S$ where r_M is the overall market return and r_{RF} is the risk free return.

Retained earnings, r_{RE}, will have the same required rate of return as existing

common stock.

Abstract   WACC Pedagogy   page 3

Numerical Results: The numerical results appear on the exhibit. For each of six time periods in the exercise, the cost of each component of capital is calculated and then weighted-averaged into WACC. A calculated stock price for each time period is obtained by the use of the Gordon Constant Growth Model, where $P_0 = D_1/(r_S - g)$, with D_1 is the next expected common dividend and g is the dividend growth rate. The model user is able to observe the impact on WACC and stock price of the increasing use of debt as the six step scenario unfolds. The WACC will decline for two time periods, then begin to rise as additional debt is employed. As the firm becomes debt heavy, the WACC will increase dramatically.

Graphical Results: The graphical results appear on Exhibit One. They were calculated and compiled using Excel spreadsheets. The graph on the right side of the exhibit depicts the WACC curve and the stock price curve. The bar graph on the left side shows the total dollar size and the composition of capital structure for each time period. The top of the bars also depict up a another form of WACC curve. At time period, the optimal capital structure is achieved, with a minimum WACC of 6.731% associated with the maximum stock price of $45.83. All other capital combinations are sub-optimal.

Conclusion: This interactive pedagogical model is suggested for use in teaching and demonstrating the salient features the theory and practice of capital structure

and the value of the firm. It provides the student user with ample practice in the

WACC calculations and displays the

Abstract   WACC Pedagogy   page 3

results in useful graphical form. The student can experiment with alternative

combinations debt and equity capital (financial leverage) and observe the impacts

on the value of the firm.

Exhibit One: WACC Results and Graphs
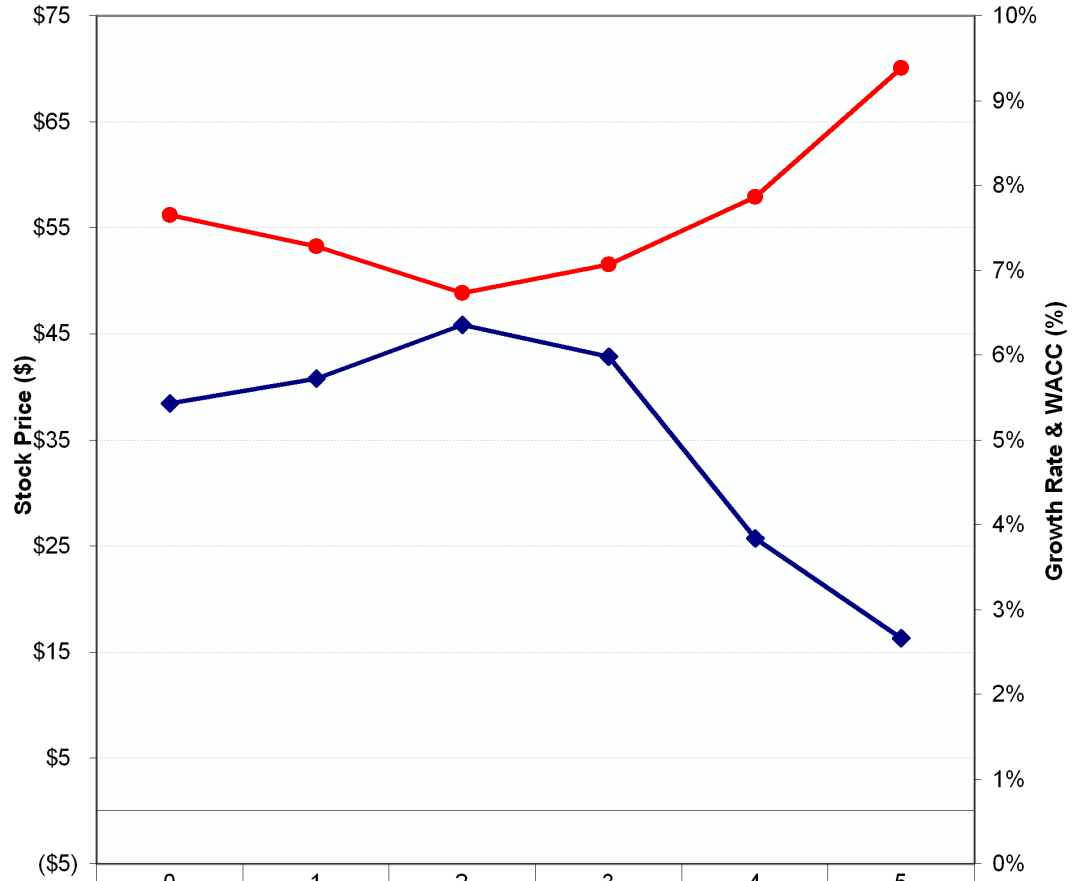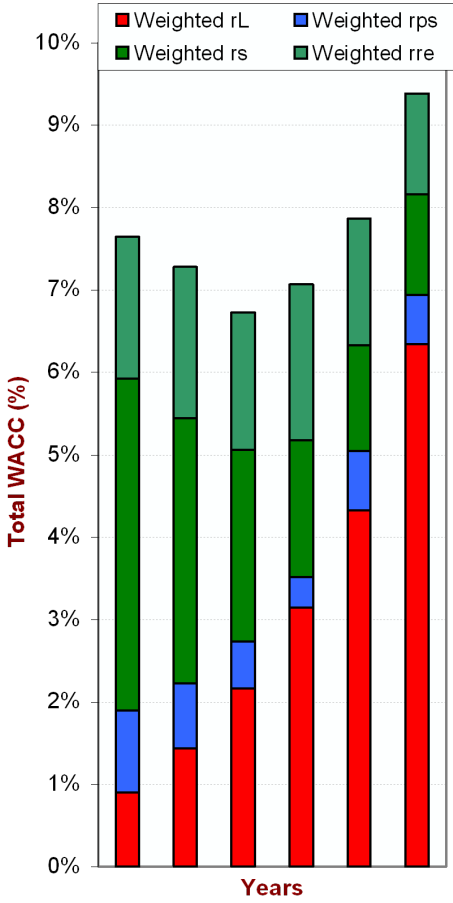
	0	1	2	3	4	5
WACC (%)	7.650%	7.284%	6.731%	7.066%	7.867%	9.385%
Stock Price ($)	$38.46	$40.77	$45.83	$42.86	$25.71	$16.30

A STUDENT TERM PAPER EVALUATING BUY AND SELL SIGNALS IN THE STOCK MARKET

Craig G. Harms, The University of North Florida, 4567 St. Johns Bluff Road So.
Jacksonville, Fl 32224, 1-904-620-2780, charms@unf.edu

ABSTRACT

This paper presents the methodology and pedagogy of a term paper used to grab student interest and throw them into the world of predicting the price of a stock, when to buy and sell that stock, and maximizing future wealth using quantitative buy and sell signals. The goal is to forecast the expected price of a stock over a planning horizon of 65 weeks using a time series analysis model. A timely example is presented to aid in the development of the case using a variety of buy and sell trigger points. Topics: time series, Bollinger Bands, and basic accounting. Track: Experiential Learning.

INTRODUCTION

During the first class of the term students are presented with the expectation that they will not collect any social security. Either the social security fund will be fully depleted by the time they retire or they will be means tested out of the possibility of receiving any social security because of their college degrees and expectation of good jobs and comfortable incomes.

It is further stated that since this is "their lot in life", they must have a method of making enough money to retire comfortably without any expectation of government help. They could be professional athletes, invent a new computer language, or learn to "slow trade" in the stock market. There are at minimum three methods of using the stock market. The most used by "normal" people is to <u>invest</u> in stocks--buy a stock or many stocks and keep them "forever." The other end of the spectrum is "day-trading." This method is for the experts (or crazies) who buy and sell the same stock at least two times per day. This has an official name from the Securities and Exchange Commission--"patterned day trader." The third method is "slow trading" which includes buying and selling of the same stock over a number of weeks or months totaling as few as two or as many as ten times over a one year period. This method takes advantage of stocks "highs" and "lows."

Few expect to be the next Brett Farve or Bill Gates. Therefore they are left with the exciting prospect of making money in the stock market--and not by merely investing money from every paycheck. Learning to slow-trade stocks is exciting and extremely interesting to students in the 21st century and they jump at the opportunity to learn the ropes.

BACKGROUND

John Bollinger developed the concept of "Bollinger Bands" in the early 1980's as a means to have a relative definition of a "high price" and "low price" of a stock or really a "too high price" and a "too low price" of a stock and thus is developed the concept of a "buy" and "sell" signals using the Bollinger Band technique.[3] Bollinger developed his technique using a simple

moving average over time and with the addition of the use of a 95% confidence interval quantified the "too high" and "too low" price of a stock. Bollinger showed that volatility is dynamic and not static and thus the width of the Bollinger Band changes with the volatility of the stock price over time. He has become wealthy and is well spoken around the world from this simplistic beginning.

The model used in this research is a Time Series Model with Seasonal Indices (13 weekly indices) to forecast the price of a stock. Every 13 weeks a company releases earnings per share information and thus it is possible that there is a 13 week seasonal pattern. The confidence intervals are determined by using a time series decomposition model to determine a forecast and then the end points are determined by adding and subtracting different numbers of standard deviations, two (Z-score = 1.96) for example, to create different interval widths, a 95% confidence interval for example. Using different values for the Z-score create the interesting research project for this case.

GOALS OF THIS PROJECT

Several goals are important in developing this case for junior/senior level students.
      1)   It is important to use statistical analysis that has been taught in the course so that students see a real application of the technique--Time Series Analysis;
      2)   It is important to use software that students have learned in other courses--Excel;
      3)   It is important to assign unique tasks (stocks) to each group so that information transfer is limited or eliminated;
      4)   It is important to make the case "meaty"; and
      5)   It is important to make the case meaningful and repeatable by students later in life.

STUDENT RESEARCH SETTING

Students are allowed to form two or three person teams or complete the project individually. The goal of the project is to maximize their wealth over a 65 week planning horizon. Each team starts with $100,000. Each team picks a stock from a group of stocks that the faculty member approves. These stocks in the acceptable pool are known as "blue chip" stocks such as Johnson and Johnson, McDonalds, and Wal-Mart. Buy and Sell triggers are set by the use of a time series model with trend and seasonal indices and the use of the "Bollinger Bands" as the trigger points. Buy and Sell triggers are set by the use six different Z-score values--the width of the confidence interval. The overall goal is to determine what level of Z-score (width of the confidence interval) will maximize the wealth of the team.

Ideally, the planning horizon of 65 weeks would be forecasted individually each week using the following process:
      1) forecasting for the first week into the future,
      2) setting the buy/sell triggers,
      3) buying or selling the stock if the trigger is crossed, and finally,
      4) updating the dataset by adding the newest or latest week of actual price data and
            removing the oldest week of data.

This would continue for 65 weeks.

This form of simulation is easy to execute in Fortran. Setting up a nested Do loop is an easy process. However, in Excel, there is no Do loop and a simplification must be made. Therefore the case includes the last 65 weeks of data, ending June 20, 2008. The team calculates the end points of the given interval for the previous 65 weeks, starting on March 30, 2007. The team then determines when the Bollinger Band or buy/sell triggers are penetrated. A buy or sell occurs at that point. The team proceeds through the 65 weeks ending June 20, 2008.

SPECIAL CONSIDERATIONS

- Six level of Z-scores are used: 2.0, 1.75, 1.5, 1.25, 1.0, and 0.75.
- Trade Commission: $7.00 to buy the stock (price at Scottrade).
  $8.95 to sell the stock (price at Schwab).
  [Faculty member uses both companies and talks about both in class.]
- There is no SEC tax paid. There is no interest paid on cash levels in account.
- You can buy only whole shares.
- You buy when the price of the stock crosses the lower Bollinger Band (BB).
- You sell when the price of the stock crosses the upper Bollinger Band (BB).
- Although the stock may go lower (or higher) than the respective Bollinger Band (BB) trigger point, you already bought (or sold) the stock.

HOW TO EXECUTE BUYS AND SELLS

Start: The team may buy stock at the closing price of the first week or may wait until the stock price hits the lower BB. This seems a little unrealistic because the trader is going to make that first decision (what to do during week #1) by looking into a future that theoretically has not happened. However, you need to start somewhere and this is a method of making the simulation "fair." If the stock is going up from the first week toward the upper BB, the trader would want to buy at the close of the first week to take advantage of the increasing price. If the stock is heading down toward the lower BB, the trader would want to wait until the stock price hits the lower BB.

Future buys and sells: If the stock price hits the upper BB during the week, using the high of the week, and you own the stock, you would sell all of your shares at the value of the upper BB. If the stock continues to a higher value, you already sold it (sorry). If the stock price hits the lower BB during the week, using the low of the week, and you did not own the stock, you would buy to the limit of your available cash (remembering that you must buy whole shares and have $7.00 to pay the commission). You buy at the value of the lower BB. If the stock continues to go lower, you already own it (sorry).

How to determine the exact price of the BB's: The team must forecast the price of the stock for each week of the 65 week planning horizon. Remembering that this is a static model, not a dynamic model, makes this process very easy. The forecast is derived by using a Time Series

model with 65 weeks of closing prices starting on Friday, March 30, 2007, and ending Friday, June 28, 2008. Exhibit One displays the Excel graph for the sample stock--Charles Schwab and Company, ticker symbol: SCHW, used for sample purposes in this paper.

Noting the legend at the bottom of the plot, the additive model is used in this example because of the three seasonal models presented, the additive has the lowest standard deviation. The upper and lower Bollinger Bands show the sell and buy triggers. To execute a trade, the graph is used as an estimate. The template contains that actual numeric value of the upper and lower Bollinger Band and these numbers are used to compare with the respective stock price high (for a sell trigger) or stock price low (for a buy trigger).

Table One presents an accounting chart that lists the buys and sells that are made during the 65 weeks of the planning horizon for Schwab stock using the triggers of a Z-score of plus and minus 2.0 (classic 95% confidence interval). Stock purchases are made in week #21 and #52 (stock low for the week crossing the lower Bollinger Band). The only sell took place in week #36 (stock high for the week crossing the upper Bollinger Band). At the end of the 65th week, the stock is still owned by the team and the value of the stock at the closing price on June 20, 2008 is added to the small cash in the account.

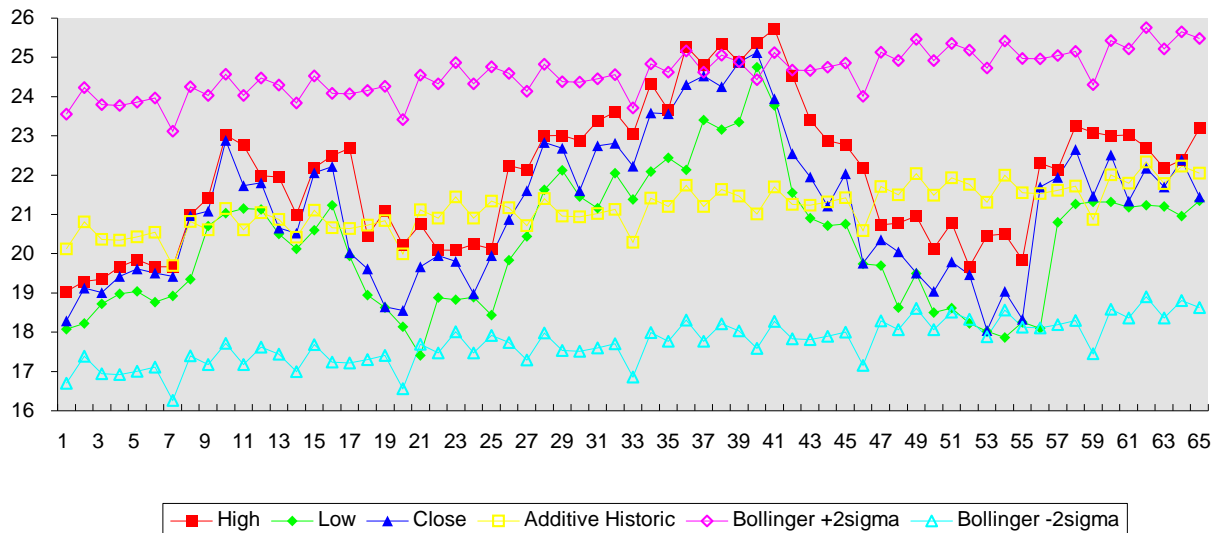**EXHIBIT ONE**

Weekly HILOCL+F(t)+AddBB

TABLE ONE

Week#	BuyPr	#shares	$Cost	SellPr	#Shares	$Proceed	$cash
0							100000

Week#	BuyPr	#shares	$Cost	SellPr	#Shares	$Proceed	$cash
21	17.69	5651	99973.19				26.81
36				25.16	5651	142170.21	142197.02
52	18.33	7757	142192.81				4.21
65	21.45	7757					166391.86

Thus after starting with $100,000 and using the classic Bollinger Bands as buy and sell triggers, the team gained slightly over 66% in 65 weeks of "slow trading." Before moving to the next simulation, it is critical to look at the "control investment." The team could buy the stock at the close of week #1 and simply keep the stock the entire 65 weeks--a true investment--and calculate the net value of the fund at the end of the 65th week. With a price of $18.29, 5467 shares would be purchased at a cost (plus commission) of $99,998.43. At the end of 65 weeks of investing (really, sitting still and doing nothing) the stock would be valued at $21.45 per share for a total of $117,268.72 (adding in the cash balance of $1.57). It should be noted that over 65 weeks the stock price increased 17%. That is not a bad return. However, the slow trading method performed much better.

Each of the other five Z-scores are simulated in the same manner as just described. Included in this paper are the accounting sheet (Table Two) and the graph (Exhibit Two) for a Z-score of 1.25.

TABLE TWO

Week#	BuyPr	#shares	$Cost	SellPr	#Shares	$Proceed	$cash
0							100000
2	18.66	5358	99987.28				12.72
11				22.74	5358	121831.97	121844.69
19	18.69	6518	121828.42				16.27
31				23.16	6518	150947.93	150964.2
48	19.35	7801	150956.35				7.85
59				23.01	7801	179492.06	179499.91
65							179499.91

EXHIBIT TWO

Weekly HILOCL+F(t)+AddBB
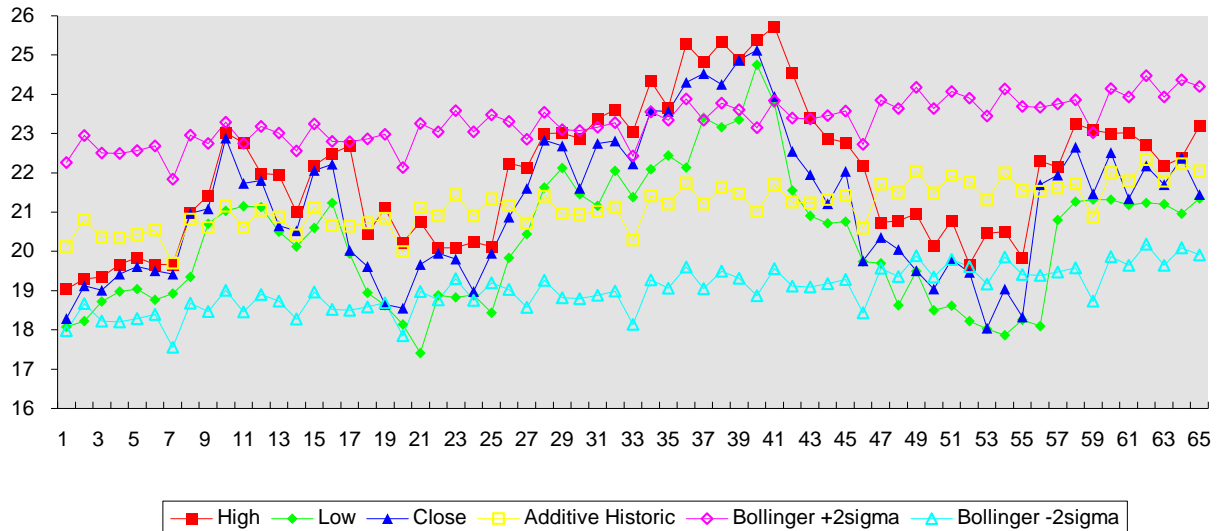
Looking at the graph in Exhibit Two and comparing it to the graph in Table One, it is easy to see the difference. The Bollinger Bands are "pinched" toward the mean with the Z-score of 1.25. Thus as the stock price increases or decreases, it will hit the trigger points sooner and the purchase or sale will occur more often. This is both good and bad. There is a chance of more gains with more trades. However, it is disappointing when the buy is made and the stock price continues to go higher, sometimes much higher. The other situation is also as frustrating. The stock price crosses the Z-score of -1.25 trigger and the purchase is made. However, it is quite possible that the stock price continues to go down, sometimes a lot more. It is important to remember the theory of Normal Curves. There is only a 2 1/2% chance that the value of the dependent variable will be above the upper Bollinger Band and only a 2 1/2% probability that the stock price will be below the lower Bollinger Band at the classic Z-score of 2.0.

When a smaller Z-score is used, the probability that the stock prices goes above and continues to go higher than the 1.25σ trigger point is quite high. So, although the team may trade more often, they miss the best timing of the buy or sell. Because of these conflicting happenings, a mathematical equation cannot be used to determine the "best" Z-score to maximize wealth.

Table Three presents a summary of the six Z-scores used in the case.

TABLE THREE

Z-score	# of buys	# of sells	$wealth
2.0	2	1	$166,391.88
1.75	2	1	$156,015.40
1.50	2	1	$141995.14
1.25	3	3	$179,499.91
1.00	3	3	$167289.91
0.75	3	3	$151707.13

STUDENT RESPONSE

This case is a huge hit, especially for the Finance majors. They stated that they had never traded like this--from a purely technical nature. They have had several courses where they evaluated the purchase or sale of a stock from a fundamental perspective . Although teams had four weeks to complete the project, two teams had the project completed in 24 hours. Students were so excited about the amount of money they "made" slow trading. Even for a stock such as Sun Trust which dropped about 50% in value during the 65 weeks, the team made a small amount of money by slow trading. Most teams would have evaluated another stock with no offer of extra credit.

FUTURE RESEARCH

The possibilities for future research are extensive. Below is a partial list of some of the future topics and questions to be researched.

1) Compare the wealth gained using a database of 40 different stocks. Students were allowed to choose from a group of 41 stocks. Which stock gained the trader the most wealth?

2) What level of Z-score is the best? Six are used. Again, as stated before this research can be performed in Fortran with less effort than Excel. A nested Do loop can be used to try Z-scores between 0.50 and 2.5 by 0.01.

3) This is a static simulation. A better method is to go back 130 weeks, and use the oldest 65 weeks of data to forecast the first week of the static model. Update the dataset and repeat 65 times. Is there a difference?

CONCLUSION

Innovative Education Topics are a key to keeping the United States the world leader in business and industry. "Hands-on" and "real-world" cases such as the Slow Trading case are an excellent and self-contained method of meaningful learning for students.

This is a wonderful exercise in the practical application of topics that students can bring to the table when they enter the business world. Why is this such a good case for the quantitative classroom?

1) The data is real and timely.
2) The situation is realistic and not just a "classroom exercise."
3) The computer is used extensively.
4) Sophisticated models are developed--by computer.
5) Several plots are analyzed.
6) This faculty member enjoys this real and very challenging case.

This faculty member could see the "light come on" in the students' minds. Seeing the light validated the usage of the class time and encouraged hope for these students to use the "slow trading" strategy.

REFERENCES

1.   Achelis, Steven B., Technical Analysis from A to Z, 2nd edition, McGraw-Hill, 1995

2.   Andrews, Robert L., "A Data Collection and Analysis Project for a Statistics or Quality Management Class," Proceedings of the Southeast Decision Science Institute, 1995, pg. 127.

3.   Bollinger, John, Bollinger on Bollinger Bands, McGraw-Hill

4.   Coleman, B. Jay, The Analysis of Statistical Relationships, 1993.

5.   Murphy, John J., Technical Analysis of the Futures Markets, Prentice-Hall, 1986

6.   Neter, John & Wasserman, William, Applied Linear Statistical Models, Richard D. Irwin, 1974.

7.   Racheu, Svetlozar T., Menn, Christian, & Fabozzi, Frank J., Fat Tailed and Skewed Asset Return Distributions, Implication for Risk Management, Portfolio Selection, and Option Pricing.

THE SUSTAINABLE CORPORATION: AN INTEGRATIVE COURSE FOR BUSINESS AND LIBERAL ARTS STUDENTS

Kirk R. Karwan, Department of Business & Accounting, Furman University
Greenville, SC 29613. (864) 294-2285, kirk.karwan@furman.edu

ABSTRACT

Sustainability is a relatively new topic that is only now being formally added to the curricula of business schools. Unfortunately, there is no 'natural' home for the topic within the departmental structure of most schools, and this 'structural' issue is likely to impede the development of important and relevant coursework for the next several years. Liberal arts schools, on the other hand, often encourage the development of new and integrative courses and perhaps even offer an advantage to business professors interested in pursuing business sustainability issues in the classroom. At Furman University, we are in the third year of offering a class that is entitled "The Sustainable Corporation". The course has been well received, over-subscribed, and increasingly taken by majors across the liberal arts spectrum. This paper briefly details how the course is being taught and provides an assessment of how the course has fared to date.

INTRODUCTION

To a certain extent, courses about business and sustainability are 'naturals' for educational institutions that talk about 'breadth' in their curricula. Furman University, a national liberal arts institution founded in 1826, has incorporated the concept of sustainability as one of five explicit goals in the University's most recent strategic plan. This objective is being achieved via initiatives involving university *business* practices, curricula development, scientific research, public policy analysis, and community awareness. In conjunction with a second university goal, that of 'serving the greater community', the university offers a perfect platform for discussing and implementing academic efforts associated with the broadest definitions of sustainability and sustainable development.

Within the University's Department of Business and Accounting, sustainability concepts are increasingly being infused throughout the core curriculum and specialty classes have evolved. Three unique class offerings in the management arena incorporate global sustainability at their core. "The Sustainable Corporation" presents the 'business case' for an organization to simultaneously consider environmental and social goals with their financial or economic objectives. A planned capstone "New Product Development" course will require students to incorporate sustainability from concept development to product recapture. An additional class in "Ethics and Corporate Social Responsibility" addresses the ethical and social dimensions of the sustainability paradigm. Freshman seminars are also being designed to introduce management aspects of global sustainability. The intent of these courses is to have students determine whether or not a 'refined' version of capitalism is possible, and whether or not (and how) business organizations can actually sustain themselves using a triple bottom line.

This paper describes the first of the three 'specialty' courses referenced above. The Sustainable Corporation has served as a prototype for the department's thinking in this arena and is a good

example of how business concepts can be taught to liberal arts students (or non-majors) interested in issues beyond those of the traditional bottom line.

THE LIBERAL ARTS CONTEXT

Furman's desire to become a leader among liberal arts colleges in sustainability education and operation is manifest in a number of ways. Specific recent initiatives have included the University's designation of a "Year of the Environment," the hiring of a full-time Director of Sustainability and Environmental Education, the formation of an on-campus sustainable living community, environmentally-friendly landscaping and maintenance practices, the adoption of green building practices in all academic and residential facilities, and substantial efforts to increase faculty and student research addressing sustainability across the university's varied disciplines. The high visibility of these activities on campus makes it easier to introduce environmental and natural resource issues into business-oriented classroom discussions.

In the broadest sense, liberal arts institutions seek to establish an ethos and tradition that focuses more on the development of intellectual arts than vocational or professional skills. Various authors have summarized the common goals of a liberal arts curriculum as the development and enhancement of the following: critical thinking; formation of abstract concepts; analytical skills; independent thinking; appreciation of cultural experiences; leadership ability; the demonstration of mature and social judgment; and oral and written communication skills. Business schools, of course, argue that they too instill these abilities in students.

Arguably, the liberal arts environment often affords a broader curricular path to achieve these outcomes, including efforts designed to integrate learning across disciplines and enhance interaction between students and professors in and out of the classroom. This is most certainly the case for Furman University; where opportunities for integration and interaction are further facilitated via a small student population (approximately 2,600 students) and General Education requirements that transcend academic discipline, philosophy and pedagogy. The General Education courses provide all students a great breadth in curriculum, including a pair of first year seminars; core requirements in body and mind, empirical studies, foreign language, human cultures, mathematical and formal reasoning, and ultimate questions; and global awareness offerings focusing on humans and their natural environment and world cultures.

Since the initial incorporation of sustainability into the University's Strategic Mission in 2001, Furman has continued to grow in its commitment and its desire to integrate the sustainability paradigm within all dimensions of University life. Interestingly, and as a result, the university has served as a good example of an organization that sometimes struggles to deal with conflicts that arise whenever environmental and/or social goals conflict with the economic needs of the institution. Students are regularly able to witness the tough choices that managers (i.e., administrators) have had to make in new building practices, transportation fleet choices, energy decisions, etc.

THE SUSTAINABLE CORPORATION COURSE AT FURMAN

Although the department's initiatives are fairly broad in this area, they all began with the introduction in 2006 of a new course entitled 'The Sustainable Corporation'. In more than one way, this particular course is unlike most typical classes in business and management. First, the

course is reading-intensive, with three books and an array of current articles covered during a standard semester term. Secondly, the subject involves asking questions about the 'basic business model' that is taught in business programs across the country and throughout the world. Students are introduced to the 'new' business approach that has taken hold in many companies, i.e., that entails the measurement of performance using a 'triple bottom line' wherein corporate decisions take into account environmental and social performance in addition to financial performance. The entire course revolves around one key question: what is the role of a business organization in terms of environmental stewardship and corporate social responsibility?

Since much of the discussion in this arena has been undertaken by environmental activists and, as such, can take on an 'idealistic' air, students learn that the issues have simultaneously been confronted by a wide array of practical thinkers and business executives. The intent of the class is to present the 'business case' for an organization to simultaneously consider environmental and social goals with their financial objectives. As mentioned above, in the end the class attempts to answer the question of whether or not a refined version of capitalism is possible and whether or not (and how) business organizations can actually sustain themselves using a triple bottom line.

The course is only partially theoretical. An array of guests participates in classroom discussions, including professors from various science disciplines, directors of environmental non-profit organizations, and corporate representatives. During the first three years of the course, this has included visitors from General Electric, BMW and Milliken, among others. We have also been visited by attorneys, government officials, and even the Lord Mayor of Dublin (Ireland) who spoke to students about the challenges of creating a 'sustainable city'.

Three textbooks form the basis of the class. The first, written by Paul Hawken, Amory Lovins and Hunter Lovins [3] offers the reflections of environmentalists who are also astute business practitioners/observers, and sets the stage for students to understand the magnitude of the challenges associated with natural resources in the future. The second book, written by Ray Anderson [1], one of the world's leading 'eco-industrial evangelists', brings the private corporation squarely into the debate and offers an outline for a manufacturing organization seeking to reduce its ecological footprint (eventually to zero!). With this text, students come to realize that sustainability is not simply a conceptual exercise. Anderson's company, Interface, is a Georgia-based carpet maker that has pioneered an enormous number of product and process innovations that have enhanced profitability and changed the nature of competition in an entire industry. Representatives of this organization have come to class each year to discuss the company's approach and latest challenges.

The final text used in the class was written by Cornell business professor Stuart Hart [2] and serves as a very able vehicle to introduce the notion of corporate social responsibility. Hart has written a number of highly visible academic papers in this realm, and has an intuitive and compelling means of tying together a number of management theories about competition, innovation, and globalization. With this book, students come to realize that many of their futures (in terms of both living standard/quality and professional experiences) are likely to be affected by how governments, society and corporations move forward with the sustainability paradigm.

The key project in the course is a paper where students choose a company that is working on a sustainability initiative or that is already well-recognized in this arena. In the paper, students are

asked to describe the company, its approach to sustainability, and to assess how serious the company is about its foray into sustainability issues. Specifically, students are asked to:

Briefly describe the company's products, processes and reach (i.e., domestic or global), to convincingly argue that they understand what the company actually does,

Assess the company's mission, vision and objectives and determine what sustainability means to the company and to what extent sustainability plays a strategic role,

Determine what the company is actually <u>doing</u> in terms of sustainability, describing specific programs, etc., and

Offer a critical assessment of the company's efforts. In other words, students are asked to take a stance and indicate whether they believe that the company is serious about its initiative(s), if it is simply playing along with a trend, or if it is simply protecting itself in some way (whether from government regulation or public opinion).

A second integrative exercise, a type of take-home exam, asks students to tie together the material that they have digested throughout the term. In two of the past three years, this exercise required students to provide a "Framework" (including a diagram) for thinking about "The Sustainable Corporation". In describing their frameworks, students are also asked to be sure that they:

(1) Define the term sustainability and explain what it means to a business organization,

(2) Clearly explain why a company should be involved in sustainability (i.e., determine the strategic drivers),

(3) Give a prescription for what a company must do to be successful in this area,

(4) Ask if it makes sense for a company to take a leadership position in sustainability or to be a follower,

(5) Determine the level of hype about sustainability in today's press and among companies,

(6) Explain if there really is a new 'business model' based on sustainability that will redefine capitalism in some way, and

(7) Integrate corporate examples discussed in class and described in the readings that illustrate all of their views on the ideas and concepts.

RESULTS

The Sustainable Corporation class has been interesting to teach and an eye-opening experience for most students. The only pre-requisite for the class is basic Economics (taught as a micro/macro combination at Furman), yet aspects of management, marketing, operations, finance, and accounting are up for discussion. At the undergraduate level this poses very little problem, since the course does not require a detailed understanding of any of these functional areas and many business students have not yet taken all of the 'core' business classes before enrolling.

Although all Furman students have heard the term 'sustainability' very few really seem to have much of an understanding of the term, and even fewer (business students included) have any appreciation for the role of the corporation in a society's ability to become sustainable. (The current author acknowledges his own bias, but strongly believes – along with the authors of the three primary texts described above - that the corporation is the most likely structure in today's societies to create and provide solutions to both the social and environmental issues associated with the triple bottom line.) Interestingly, this particular course also serves as a very positive introduction to business for students from other majors and/or disciplines. Students who are cynical about the motives of business leaders tend to come away from the course with a more enlightened view of the role of the corporation in society.

Student ability to critically assess the corporate intent associated with sustainability efforts seems to have increased dramatically in the past three years. Part of this has been the result of the professor's increased ability to articulate the issues and structure discussions, but most of it (arguably) is the result of what has transpired in the corporate world in a very short period of time. It seems that virtually all organizations claim to have a 'green' aspect to their thinking, products, and operations. In other words, students are now hearing as much or more about sustainability issues from the business press and everyday transactions as they are from universities whose administrators are, for example, signatories to the Presidents' Climate Commitment (http://www.presidentsclimatecommitment.org/).

The Sustainable Corporation course has grown in popularity. The number of sections offered will increase next year and student papers have become stronger as awareness of sustainability concepts has grown on campus and within the business major. It is my contention that business schools should all be teaching this type of course. The material is rich and compelling, the class offers a very effective means of attracting non-business students, and the forum offers a way to convince all participants of the need for the corporation to take a lead in framing and solving 'the world's complex sustainability problem'.

REFERENCES

[1]   Anderson, R.C. (1998). <u>Mid-Course Correction: Toward a Sustainable Enterprise</u>, Atlanta: Peregrinzilla Press (publisher), Chelsea Green Publishing Company (distributor).

[2]   Hart, S.L. (2007). <u>Capitalism at the Crossroads: Aligning Business, Earth, and Humanity</u>, Upper Saddle River, NJ: Wharton School Publishing, second printing.

[3]   Hawken, P., Lovins, A., and Lovins, L.H. (1999). <u>Natural Capitalism: Creating the Next Industrial Revolution</u>, Snowmass, CO: Rocky Mountain Institute.

EXPERT SYSTEM FOR STUDENT ADVISEMENT

Ramesh M. Choudhari, Department of Mathematics and Computer Science,
South Carolina State University, Orangeburg, SC 29117

ABSTRACT

The purpose of this paper is to explain the construction of a rule -based, forward chaining, and procedure oriented expert system for student advisement. The advisement process is an important function of any academic institution. The quality of advisement can play a crucial role in student's academic life. The goal of the expert system is to help advisors as well as students to plan their degree programs. In addition to that, the system also gives information on various topics such as different programs available in departments, their requirements, facilities available, courses available, and as simple as how to use the system itself. The system also assists in making changes to the existing plan, to help in registration process and to check graduation status. Several tests are performed to evaluate the system response to user requests. It is observed that the system response is consistent with the human response in the same situation. The student advisement system certainly simplifies the task of advisement and improves the quality of student advisement. The system is going to offer students an important viable option in advisement which was not available before.

INTRODUCTION

The advisement process is an important function of any academic institution. The quality of advisement for students can greatly enhance their chances of succeeding in a school. The academic advisement is a decision making process through which a student advised by an advisor, maximizes the educational experience through interaction specifically pertinent to both curricular and career planning. The advisement is a rather complex process and involves activities from bookkeeping to discussing different issues with students. The adviser needs to have all possible information to give good constructive advice to a student. The goal of the expert system is to help advisor as well as student to plan his or her degree program and to help make necessary changes to the plan as required. In addition to that, the system also helps in registration and to check graduation status [2][3][9][13][15][16][27]]28][29][36].

EXPERT SYSTEMS

An expert system is computer-based system that uses knowledge, facts, and reasoning techniques to solve problems that normally require the abilities of human experts. Expert system can be designed for the specific hardware and software systems, or can be designed for general purpose machines. The primary goals to design any expert system is to substitute an unavailable human expert, acquire and retain knowledge of several experts, train new experts, and provide knowledge on a specific task when an human expert is not affordable. An expert system I developed is defined as a computer program that has expertise, self-knowledge, depth of knowledge, and ability to perform symbolic reasoning.

Expertise

An expert system must perform well, that is, exhibits same levels of performance in the domain of interest as human expert can exhibit. An expert system must be skillful in applying its knowledge to produce solutions which are both efficient and effective, using the shortcuts or tricks that human expert uses to eliminate wasteful or unnecessary computations. An expert system must also be robust. This means expert system should not fail to process incorrect data or incomplete rules.

Self-knowledge

An expert system has knowledge that allows it to construct its own operations in a given problem solution. This knowledge the system has about how it thinks is called metaknowledge. Most current expert systems have an explanation facility. The ability to explain their own operations is one of the most innovative and important qualities of expert system.

Depth

An expert system has depth; that is, it operates effectively in a narrow domain containing difficult, challenging problems. Thus rules in expert system are complex and numerous. Expert systems work in real-world domain in which it applies its knowledge to a practical problem and produces solutions that useful in some cost effective way. The understanding of real-world problem is important in an appropriate problem domain for an expert system, as it is absolutely crucial to its success.

Symbolic Reasoning

When human experts solve problems, particularly the type we consider appropriate for expert system work, they choose symbols to represent the problem concepts and apply various strategies and heuristic to manipulate these concepts to get solutions. An expert system also represents knowledge symbolically, as sets of symbols stand for problem concepts. An expert system then manipulates these symbols rather than mathematical computations. The consequence of this approach is that knowledge representation [1][10][15][16][20][21][23][25][26][31][37][39].

FEATURES OF AN EXPERT SYSTEM

The heart of an expert system is the body of knowledge gathered during system building. The knowledge is explicit and well organized to facilitate decision making. The collection and the encoding of the knowledge is one of the most important aspects of an expert system. It has significant impact on the construction of a program because in the expert system it is explicit and accessible unlike any other conventional programs.

The most important feature of an expert system is the high levels of knowledge it provides to help in problem solving. This knowledge can represent the best thinking of the top experts in the field, leading to problem solving solutions that are innovative, correct and efficient. The flexibility also make a difference in a sense that it can grow in steps to meet the needs of the institution.

Another useful feature of an expert system is its power to predict. The system can act as a model of problem-solving in the given domain, giving the possible answers for a given problem situation and indicating how they would change for new situations. The expert system can explain in detail how the new situation causes the change. This allows the user to evaluate the potential effect of new facts or data and understand their relationships to the solution. The user can also evaluate the effect of new procedures on the solutions by adding new rules or modifying existing ones.

The body of knowledge that defines the proficiency of an expert system can also act as an institutional memory. If the knowledge base was developed through interaction with important personnel in an institution, it represents the current policy or operating procedures of that institution. When key personnel leave, their expertise is retained.

A final feature of an expert system is its ability to provide training for users. Expert system can be designed to provide such training, since they already have the necessary knowledge and the ability to explain their reasoning processes. Software may be added to have friendly user interfaces. As a training facility expert system provides new staff members with vast reservoir of experience and knowledge [1][8][10][11][15][23][24][25][30][31][37][38][39].

EXPERT SYSTEM ORGANIZATION

Expert systems have been organized in many different ways. The various organizations include different components. However, certain components are common to most expert systems: user interface, knowledge base, and inference engine.

The user interface is a software component that is responsible for communication between an end user and an expert system. Through user interface, the user can enter facts about a given problem solution, can ask questions about a given problem domain. Many expert systems accept new knowledge through user interface.

The knowledge base is a collection of high-quality of knowledge pertaining to the specific problem domain. This knowledge is acquire form one or more human experts in the problem domain and is stored in a knowledge-representational form appropriate to the expert system. The knowledge base contains facts (data) and rules (or other representations) that use these facts as the basis for decision making.

The inference engine is a software component responsible for inference reasoning for the expert system. The inference engine uses knowledge from the knowledge base and information from the user to infer new knowledge. The inference engine contains an interpreter that decides how to apply the rules to infer new knowledge and a scheduler that decides the order in which the rules should be applied. The structure of inference engine depends on both the nature of the problem domain and the way in which knowledge is represented in the expert system.

The knowledge in an expert system is well partitioned into different domain knowledge. Having the domain knowledge separate makes it easier for the knowledge engineer to design procedures for manipulating this knowledge. How the system uses knowledge is of utmost importance because expert system must know both the appropriate knowledge and the means to use the knowledge base to be considered skilled at some task [1][10][11][23][24][25][30][31][35][38][39].

IMPORTANCE OF THE ACADEMIC ADVISEMENT

The advisement process is a major function of any academic institution. The proper advisement for students enhances chances of succeeding in a college. Academic advising is a decision making process through which a student advised by an advisor, maximizes the educational experience through interaction specifically pertinent to both curricular and career planning. The advisement is a rather complex process and involves activities from bookkeeping to discussing different issues with students. To a large extend academic advisement is an outcome of several years of academic experience and knowledge of the department and the institution where an advisor works. An advisor needs to have all the possible information to give a good advice to a student. Incomplete information about student's performance and practically no information about courses across the campus are the major limitations to give constructive advice to a student [3][13][17][28][36].

NEED FOR AN EXPERT ADVISOR

The expert system can provide an easy and quick access to the necessary information about a student and the relevant information across the campus, and thus can have a significant impact on the quality of student advisement. Once a student records are updated and is available in the system, it can be accessed anytime and advisors do not have to chase a paper trail. If student record is not complete or not updated, that poses a difficult problem to address. One of the ways to address it is to collect missing information as much as possible from the student and the advisor and extrapolate or interpolate the missing information. A degree of subjective judgments are involved in this situation. The non academic problems like student's financial situation, his work-place constraints, and his priorities in the life are more difficult to address in an expert system. However, the expert system can be an invaluable tool for advisers to make necessary decisions in the advisement process, and a viable option for students to make necessary preparations and decisions in their academic lives [3][13][15][36].

METHODOLOGY

The development of the expert system is divided into two parts. In the first part, the system is designed and in the second part, it is implemented on a computer. The first part consists of construction of an abstract model for advisement, development of necessary data structures to hold information and development of algorithms to process information. The second part consists of programming to realize the system on a computer system. The system is implemented on the main frame using programming language Pascal. The knowledge is represented in form of sets of rules. The set of rules is implemented as Pascal procedure using If-Then-Else statements. This procedure oriented approach is used due to ease and flexibility of implementation in procedure oriented language like Pascal [15][16].

ABSTRACT MODEL

The core concept in the system is the curriculum model. There are four major components in any degree program: general education, major, minor, and electives. Each course in the curriculum has specified require grade for graduation. The successful completion of a degree program essentially depends on completing the necessary number of hours and courses with appropriate grades described in the curriculum for the degree program. The courses required for a given degree program are arranged in proper order from first semester to the last semester as illustrated in figure 1. This becomes the basis for our curriculum model for the system [13][15][16][19][29][36].

Curriculum Leading to the Degree of Bachelor of Science in Computer Science

Freshman

First Semester				Second Semester			
Course	Hours	Grade	Course	Hours	Grade		
Educ	101	2	P	Educ	101	3	C
Engl	101	3	C	Engl	102	3	C
BSc	101	3	D	M	106	3	C
Econ	101	3	D	BSc	102	3	D
MS	101	2	D	Econ	102	3	D
M	105	3	C	MS	102	2	C

Sophomore

M	203	3	C	M	204	3	C
M	209	3	C	M	208	3	C
CS	201	3	C	CS	202	3	C
Huma	201	4	D	Huma	202	4	D
M	212	1	C	MS	202	2	D
MS	201	2	D	SP	103	3	C

Junior

P	201	4	C	Psy	201	3	D
Huma	301	3	D	P	202	4	C
CS	301	3	C	CS	304	3	C
CS	307	3	C	CS	308	3	C
M	307	3	C	M	213	3	C

Senior

CS	401	3	C	CS	409	3	C
CS	402	3	C	CS	403	3	C
Approv		3	C	Approv		3	C
Approv		3	C	Free		3	C
Free		3	C	Free		3	C

Figure 1. Curriculum Model

The curriculum model is abstracted in the form of data structure called curriculum-page for a department as well as for a student in the department. The departmental curriculum-page contains all the courses required for the degree program and the required grades as illustrated in figure 1. The student's curriculum-page contains all the courses required for the degree program and slots open for grades and elective courses. The curriculum-page is a kind of loose adoption of frames. The loose in a sense that procedures and functions acting on it are loose i.e. not attached to the structure. As most of the information about curriculum for a given class is known and is well defined, the static structure is used to implement the curriculum-page.

Another important concept in the system is the degree plan. The degree plan is essentially a list of courses a student needs to take from the first semester to the last semester in a given period of time. The degree plan is the basic concept. As any changes student wish to make to his degree program for any reason, the expert system will generate an appropriate new degree program for him. When a student enters the school, the system makes a degree plan for him according to his specifications. Subsequently, he can make changes to his original plan and system will generate new degree plan for him. In addition to making degree plan, the system can review his existing plan and can help him for registration and to evaluate his graduation status.

The ultimate goal of a student is to graduate from the school with a diploma. From student point of view, the graduation is the final goal to be achieved. The system can assist a student to evaluate his current degree plan and inform him status of graduation. If he is unable to graduate with the existing conditions, the system will offer him suggestions to remedy the situation and a possible way to graduation [13][15][16][19][29][32][36].

THE SYSTEM DESCRIPTION

The "Student_Advisor" is a rule-based, forward chaining, and procedure oriented expert system for student advisement. The system is developed on the main frame using the programming language Pascal.

The aim of this project was to construct an expert system for student advisement. The goal of the expert system is to help advisors as well as students to plan his or her degree program. In addition to that, the system also gives information on various topics such as different programs available in departments, their requirements, facilities available, courses available, and as simple as how to use the system itself. The system also assists in making changes to the existing plan, to help in registration and to check graduation status [11][15][16][23][35][39].

User Interface

Most of the expert systems constructed and will be constructed in future are going to interact extensively with end-users. So, user interfaces are utmost important for productive use of expert systems. To make working environment comfortable, convenient, and pleasant is the primary task of any designer. The user acceptance is greatly depends on user-interface of the system.

User interfaces are constructed using menu and Q&A system. Each module invokes its own user interface to communicate with users. The information collected from user is interpreted by the module and the necessary actions are taken. Thus each module interprets and controls part of the system and so act as shell or subshell for the system [15][22][23 [24][35][39].

Knowledge Representation

The knowledge-base is essentially information (knowledge) from the college-handbook, faculty-handbook, and advisor's personal experiences over several years in academics. The knowledge-base is implemented as rules. Rules are organized as sets of rules. The related rules are put into a set. The sets of rules are implemented as Pascal procedures. This procedure oriented approach is selected because the system is implemented in Pascal [4][5][7][12][18][33].

Data Bases

A lot of information is required to make decisions involved in student advisement. The system derives information from its databases. The major data-bases used in the system are as follows:
Course_Base : All the courses available in the college.
Student_Base : All the students enrolled in the college.
Help_Base   : All the information about college and the system itself to be used by help module.

Module Organization

The modules which act as shell or subshell are organized as subtasks as follows:
. Display_Options
. Get_Option
. Process_Option

Display_Options displays possible options for the module, and prompts the user for his response. Get_Option reads user response from the user. Process_Option activate necessary module to process the option selected by the user. The procedures which are responsible for applying knowledge to make decisions in the system are implemented as Pascal procedures using If-Then-Else statements or Case statements. This procedure oriented approach is used to represent knowledge and processing information is due to ease and flexibility of programming in Pascal [15][16].

TEST RESULTS

The test results are in the form of outputs from the system which is implemented. Several tests are performed to evaluate the system response to the users' requests. One of the test results are illustrated in the figure 2.

This test consists of processing the request for reviewing the existing plan. The user session is shown in the figure 2. The user logs in and selects the option for reviewing a plan. The current status of his present curriculum is shown in the figure 3. He is Computer Science major and he is returning to the school to complete his curriculum. He has finished 118 credit hours so far.

The system requests and collects the specifications from the user for his future plan. The user wishes to work in fall with 6 credit hours and in the spring with 6 credit hours. Based on the acquired knowledge, the system evaluates his current curriculum and suggests him with two courses in the fall and two in the spring as shown in the figure 2. It can be seen from the figure 3 that the student has Ds in CS201 and CS301 and has not taken one free elective and one approved elective. The acceptable grades in CS201

and CS301 are Cs, hence he has to make them up. The student wishes to take 6 hours in fall and 6 hours in spring, with these constraints he has to take CS201 and CS301 in fall and electives in spring. Thus the response of the expert system is consistent with the human response [15][16].

Sample Test Output

```
*******************************************
*      Welcome to the Student Advisement System      *
*                                               *
*      The following options are available:     *
*      1 : Administration                        *
*      2 : Advisement                            *
*      3 : Help                                  *
*      4 : Exit                                  *
*******************************************
```

Make your choice
2

Give your student id:
506813460

The following options are available:
1 : Help
2 : Advisor
3 : Exit

Make your choice
2

The following plans are available:
1 : Requirements
2 : Degree plans
3 : Review plan
4 : Change of plan
5 : Registration
6 : Graduation
7 : Exit

Make your choice
3

This institution consists of the following divisions:
1 : Arts
2 : Sciences
3 : Engineering
4 : Business
5 : Exit

Figure 2. -(Continue)-

Make your choice
2

Division of sciences consists of the following departments:
1 : Department of Biology
2 : Department of Chemistry
3 : Department of Computer Science
4 : Department of Mathematics
5 : Department of Physics
6 : Department of Statistics
7 : Exit

Make your choice
3

Degrees offered by this department are:
 1 : Bachelor of Science
 2 : Master of Science
 3 : None of above

Make your choice
1

The Following degree options are available:
 1 : Professional
 2 : Teaching
 3 : None of above

Make your choice
1

The following minors are available:
1 : Math
2 : BA
3 : Engi
6 : Exit

Make your choice
1
From which semester you wish to start plan ?
1 : Fall
2 : Spring
3 : Summer

Make your choice
1

How many credit hours did you finish including the current one
118

Figure 2. -(Continue)-

How many more fall semesters you wish to work to complete the degree
1

How many maximum hours you wish to register in fall
6

How many more spring semesters you wish to work to complete the degree
1

How many maximum hours you wish to register in spring
6

How many more summer semesters you want to work to complete the degree
0

How many maximum hours you wish to register in summer
0

The following approved elective courses are available:
1 CS411
2 CS417
3 CS499

Make your choice
1

The following free elective courses are available:
1 M317
2 M401
3 M409

Do wish to make choice form these courses, type y for yes
y
Make your choice
3

    Degree plan need to be completed
Fall year
CS201 Programming I   3
CS301 Assembly Lang.   3

Spring year
CS411 Database System 3
M409   Math. Stat.   3

The following plans are available:
1 : Requirements
2 : Degree plans
3 : Review plan
4: Change of plan

Figure 2. -(Continue)-

5 : Registration
6 : Graduation
7 : Exit

Make your choice
7

The following options are available:
1 : Help
2 : Advisor
3 : Exit

Make your choice
3

Figure 2. Test Output

Curriculum Leading to the Degree of Bachelor of Science in Computer Science

Freshman

First Semester				Second Semester			
Course	Hours	Grade	Course	Hours	Grade		
Educ	101	2	P	Educ	101	3	B
Engl	101	3	B	Engl	102	3	B
BSc	101	3	B	M	106	3	B
Econ	101	3	B	BSc	102	3	B
MS	101	2	B	Econ	102	3	B
M	105	3	B	MS	102	2	B

Sophomore

M	203	3	B	M	204	3	C
M	209	3	C	M	208	3	C
CS	201	3	D*	CS	202	3	C
Huma	201	4	C	Huma	202	4	C
M	212	1	C	MS	202	2	B
MS	201	2	B	SP	103	3	B

Junior

P	201	4	C	Psy	201	3	C
Huma	301	3	C	P	202	4	C
CS	301	3	D*	CS	304	3	C
CS	307	3	C	CS	308	3	C
M	307	3	B	M	213	3	B

Senior

CS	401	3	C	CS	409	3	C
CS	402	3	C	CS	403	3	C
CS	411	3	C	Approv		3	
BA	205	3	C	MUS	201	3	B
Free		3		BA	215	3	B

Figure 3. Student's Current Curriculum

CONCLUSIONS

The expert system for student advisement is a valuable tool for advisors as well as students. It can provide quick and easy access to the needed information and feedback on different issues involved in the process of advisement. It certainly simplifies the process of advisement and undoubtedly useful to the advisor to make important decisions in a student's life. It gives a viable option to students, which was not available before.

REFERENCES

[1]   Alty, J. & Coombs, M. *Expert Systems, Concepts and Examples.* Manchester, England: NCC Publication, 1984.

[2]   Association of American Colleges. Liberal Learning and the Arts and Sciences Majors Washington, DC, 1992.

[3]   American Psychological Association. Is Psychology for them?: A Guide to Undergraduate Advising. Washington, DC, 1988.

[4]   Barr, A. and Feigenbaum, E. A. (eds.). *The Handbook of Artificial Intelligence, Vol. I.* Reading, Mass: Addison-Wesley Publishing Co.,1989.

[5]   Barr, A. and Feigenbaum, E. A. (eds.). *The Handbook of Artificial Intelligence, Vol. II.* Reading, Mass: Addison-Wesley Publishing Co.,1989.

[6]   Barr, A., Cohen, P. R., and Feigenbaum, E. A. *The Handbook of Artificial Intelligence, Vol. IV.* Reading, Mass: Addison-Wesley Publishing Co.,1989.

[7]   Barstow, D. R., Aiello, N., Duda, R. O., Ermam, L. D., Forgey, C., Gorlin, D.,Greiner, R. D.,Lenat, D. B.,London, P. E., Mcdermott, J.,Nii, H. P.,Politakis, P.,Reboh, R.,Rosenschein, S., Scott, A. C., Van, Melle, W., & Weiss, S. M. Languages and tools for knowledge engineering." in Hays-Roth, F., Waterman, D. A., and Lenat, D. B. (eds.) *Building Expert Systems. Reading*, Mass: Addison-Wesley Publishing Co., 1983.

[8]   Bennett, J. S. ROGET: A knowledge-based consultant for acquiring the conceptual structure of an expert system. *Memo HPP-83-24*, Computer Science Department Stanford: Stanford University, October, 1983.

[9]   Bergquist, W. H. *Designing undergraduate education.* 1st Edition. San Francisco, Jossey-Bass Publishers, 1981.

[10]   Brachman, R., Amarel, S., Engelman, C., Engelmore, R., Feigenbaum, E., and Wilkins, D.

"What are expert systems?" in Hayes-Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems*. Reading, Mass: Addison-Wesley, 1983.

[11] Buchanan, B., Bechtal, R., Bennett, J., Clansey, W., Kulikowski, C., Mitchell, T., and Waterman, D. A. "Constructing an expert system" in Hayes-Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems. Reading*, Mass: Addison-Wesley, 1983.

[12] Buchanan, B. and Shortliffe, E. Rule-Based Expert Systems. in Buchanan, B. and Shortliffe, E. (eds.) . *Reading*, Mass: Addison-Wesley, 1975.

[13] Carnegie Foundation for Advancement of Teaching. *Mission of college curriculum: a contemporary review with suggestions: a commentary of the carnegie Foundation for Advancement of Teaching.* 1st Edition. San Francisco, Jossey-Bass Publishers, 1977.

[14] Chandrasekaran, B. Expert system: matching techniques to tasks. in Reitman, W. (ed.) *Artificial Intelligence Applications for Business.* Norwood, NJ: Ablex, 1984.

[15] Choudhari, Ramesh. Expert system for student advisement. *Ph.D dissertation*, School of Engineering, Kennedy Western University. Boise, Idaho:1994.

[16] Choudhari, Ramesh. Conceptual Model for online student advisement. Southeast *The Institute for Management Sciences*, Annual Meeting. Myrtle Beach, SC, October 1994.

[17] Choudhari, Ramesh. Automatic Student Advisement System. *South Carolina Academy of Science, Annual Meeting.* Aiken, SC, April 1994.

[18] Cohen, P. R., and Feigenbaum, E. A. *The Handbook of Artificial Intelligence Vol. III.* Reading, Mass: Addison-Wesley Publishing Co.,1989.

[19] Conrad, C. *The undergraduate curriculum: a guide to innovation and reform.* Westview Press, 1978.

[20] Feingenbaum, E. A. and Feldman, J. (eds.) *Computers and Thought.* New York: McGraw-Hill, 1963.

[21] Feingenbaum, E. A. Expert systems in the 1980's. in Bond, A. (ed.) *Machine Intelligence, Infotech State of the Art*, series 9, no. 3. Pergamon Infotech Limited, 1981.

[22] Foley, J. D., Van Dam, A., Feiner,S.K., Hughes, J. F. Computer *Graphics, principles and Practice.* 2nd Edition. Reading, Mass: Addison-Wesley, 1990.

[23] Hayes_Roth, F., Waterman, D. A., and Lenat, D. (eds.) Building Expert Systems. *Reading*, Mass: Addison-Wesley, 1983.

[24] Hayes_Roth, F., Waterman, D. A., and Lenat, D. An overview of expert systems. in Hayes_Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems*. *Reading*, Mass: Addison-Wesley, 1983.

[25] Jackson, P. Introduction to Expert Systems. *Reading*, Mass: Addison-Wesley, 1988.

[26] Johnson, P. E. What kind of expert should a system be? *The Journal of Medicine and Philosophy*, vol. 8. 1983: 77-97.

[27] Kramer, H. C., Advising by faculty. National Education Association. Washington, DC .1977.

[28] Lawrence Erlbaum Associates. *Handbook on student development: advising, career development, and field placement*. Hillsdale, N. J., 1987.

[29] Levine, A. *Handbook on undergraduate curriculum.* 1st Edition. San Francisco: Jossey-Bass Publishers , 1978.

[30] Luger, G., F., Stubblefield, W., A. Artificial Intelligence and design of Expert Systems. *Reading*, Mass: Addison-Wesley, 1989).

[31] Martin, J., and Oxman S. *Building Expert Systems*. Englewood Cliffs, New Jersey: Prentice-Hall, 1988.

[32] Mcneil, J. D. *Curriculum: a comprehensive introduction.* 4th Edition. Glenview, III: Scott Foresman/Little, Brown Higher Education, 1990.

[33]   Minsky, M. A framework for representing knowledge. in Winston, P. (ed.) *The Psychology of Computer Vision*. New York: McGraw-Hill, 1975.

[34]   Stefik, M., Aikins, J., Balzer, R., Benoit, J., Birnbaum, L., Hay-Roth, F., and Sacerdoti, E. Basic concepts for building expert systems. in Hayes_Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems*. *Reading*, Mass: Addison-Wesley, 1983.

[35]   Stefik, M., Aikins, J., Balzer, R., Benoit, J., Birnbaum, L., Hay-Roth, F., and Sacerdoti, E. The architecture of expert systems. in Hayes_Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems*. *Reading*, Mass: Addison-Wesley, 1983.

[36]   Title III, Institutional Aid Programs, *The Faculty advising Handbook*. The Counseling and self-Development Center, S.C. State College.1983.

[37]   Waterman, D.A. A Guide to Expert Systems. *Reading*, Mass: Addison-Wesley, 1986.

[38]   Waterman, D. A., and Hayes-Roth, F. An investigation of tools for building expert systems. in Hayes_Roth, F., Waterman, D. A., and Lenat, D. (eds.) *Building Expert Systems*. *Reading*, Mass: Addison-Wesley, 1983.

[39]   Weiss, S. M. and Kulikowski, C. A. *A Practical Guide to Designing Expert Systems*.   New Jersey: Rowman & Allanheld, 1984.

DECISION SUPPORT SYSTEM FOR DATA VALIDATION

Ramesh M. Choudhari, South Carolina State University, Orangeburg, SC 29117
Shobha R. Choudhari, South Carolina State University, Orangeburg, SC 29117

ABSTRACT

The purpose of this paper is to explain the construction of a Decision Support System for data validation. The quality of data is important in research projects. Inaccurate data can give rise to incorrect results causing incorrect conclusions. So validating a dataset becomes an important step in any data oriented research project. The researchers constructed the Decision Support System to validate data based on the conceptual model developed. The primary objective in the construction of DSS is to have a quick and easy access to the status of a dataset to make a decision regarding dataset and its analysis. The aim is to construct uniform and consistent data validation model. The aim is also to achieve a high degree of automation and a great degree of ease to use. The system can provide useful information about validation problems related to data objects in a data file that can be used to make decisions about the dataset. The ease of use and the degree of automation would make the system a useful tool for researchers, data managers, and analysts.

INTRODUCTION

For any data oriented research project, high quality of data is important to produce statistically correct results. So the data validity becomes an important issue in such projects. In the context of this paper, data validation is the process of explicitly checking inherent and acquired properties of data. Software using incorrect format or type would result in execution errors causing premature termination of processing. This would cause a significant loss of processing time. Incorrect and incomplete data values would cause incorrect results and subsequently incorrect conclusions. Hence, complete, consistent, and correct data is essential for research projects. As a result, checking validity of data becomes the essential first step in these projects. In this paper, the researchers would like to focus on validity of the data, and developed the Decision Support System to check the data validity [5][9][15][17][23].

CONCEPTUAL MODEL

Data object can be considered as an abstract object defined by a four tuple (A, N, V, T) where A represents the address of an object in the address space of the computer system, N represents the name of an object in the name space of the software system, V represents the value of an object, and T represents the type of an object. The realization of an object means the determination of all these four entities in the context of the computer system. So, validation can be considered as the process to validate (to check the correctness of) all these four entities. However, data analysis performs analysis on data values. So in the context of data analysis, we will consider only two entities, value and type. Thus, data validation becomes the process of checking the correctness of the value and type of a data object. Type becomes an inherent property of a data object, and user specified properties become acquired properties of a data object.
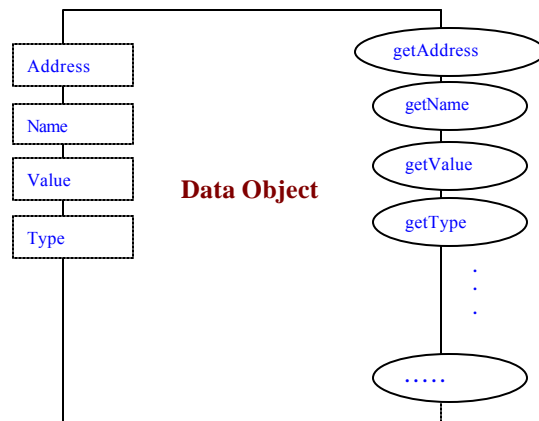
Figure 1. Data Object Model

To illustrate the concept, consider the example: If data object is integer type, then a set of integer values (min .. max) and five operations (+, -, *, /, and mod) are its inherent properties. However, if that data object represents age of teenagers in terms of year, then two of its acquired or specified properties could be that its minimum and maximum values are 13 and 17. In the process of validations of such a data object, its inherent property of type integer and acquired property having values in the range of 13 to 17 need to be validated.

Another acquired property of a data object could be the specified length of the values assigned to that data object. The length of the data values can not exceed the specified length, or in some cases data values must have the exact same length, even though higher length is allowed according to the data object's inherent property. A common example of such type is string. We need to check such acquired properties of the data objects.

Format of the data object could also be an acquired property. Many times, format for a data object is specified to enter data. For example, if the data object named "date" has a specific format, say "dd-mm-yyyy", then the data entered for that data object is valid only if it is in the given format even though the other formats of date may represent the same date. Additionally, if the responses for the data object are specified, then the value of the data object is valid only if it is one of the responses specified for that data object. Thus, several required properties can be specified for a data object to validate the data file [9][11][13][14][15][22][23][24].

DECISION SUPPORT SYTSEMS

There is no agreement on the definition of Decision Support Systems. We are going to use the practical definition of DSS. A DSS is an interactive, flexible and adaptable computer based system that uses data, knowledge, and reasoning to aid management of a specific problem.

Components of DSS:

The DSS is composed of following components:

1. Data Base Module – Software system to manage internal and external databases used for computations to make decisions.

2. Model Module – Software system that uses conceptual model to make analytical computations.

3. User Interface Module – Software system responsible for user communications.

4. Knowledge Base Module – Software system that manages problem specific knowledge [1][2][3][12][17][18].

ABSTRACT MODEL

Using the concepts and ideas explained above, the researchers developed the computerized data validation system. The system validates data set by checking inherent and acquired properties of data objects specified by the user. Data set is a collection of data objects. It is realized using text file, referred to as data-file. A data-file is a collection of data-lines. Data-line is a collection of data-fields. Each data-field holds a data object. So the data validation process becomes validation of a data-file. The validation of a data-file is reduced to the validation of data-fields. The model and implementation of the data validation system is explained below.

SYSTEM MODEL

The system model is essentially composed of three modules: User Interface Module, Processing Module, and Output Module.

User Interface Module

The user interface module consists of user input module and output module. The user input module contains the mouse and keyboard event handlers to collect information from the users regarding the total number of fields in the data-file and specifications about each fields such as field type, length, minimum and maximum values allowed for the data.

The output module is responsible for tasks such as displaying messages along with the data-field and data-line whenever the property of a data-field is not satisfied by its data object, as well as saving the results created by the processing module in an output file.

Model Processing Module

The processing module consists of several subprocessors, each one responsible for processing specific tasks, such as accessing the values of each data-field, processing the user specified properties of the data-fields, and the inference processor to make necessary symbolic computations to draw conclusions regarding data objects.

Data Base Module

The function of this module is to manage the inherent properties of data objects. The relational data base model is used to do so.

Knowledge Base Module

This module is responsible to manage the knowledge base of data objects. The knowledge base is dynamically created and used in inference module at the time of execution [21][25][26][30] [31].
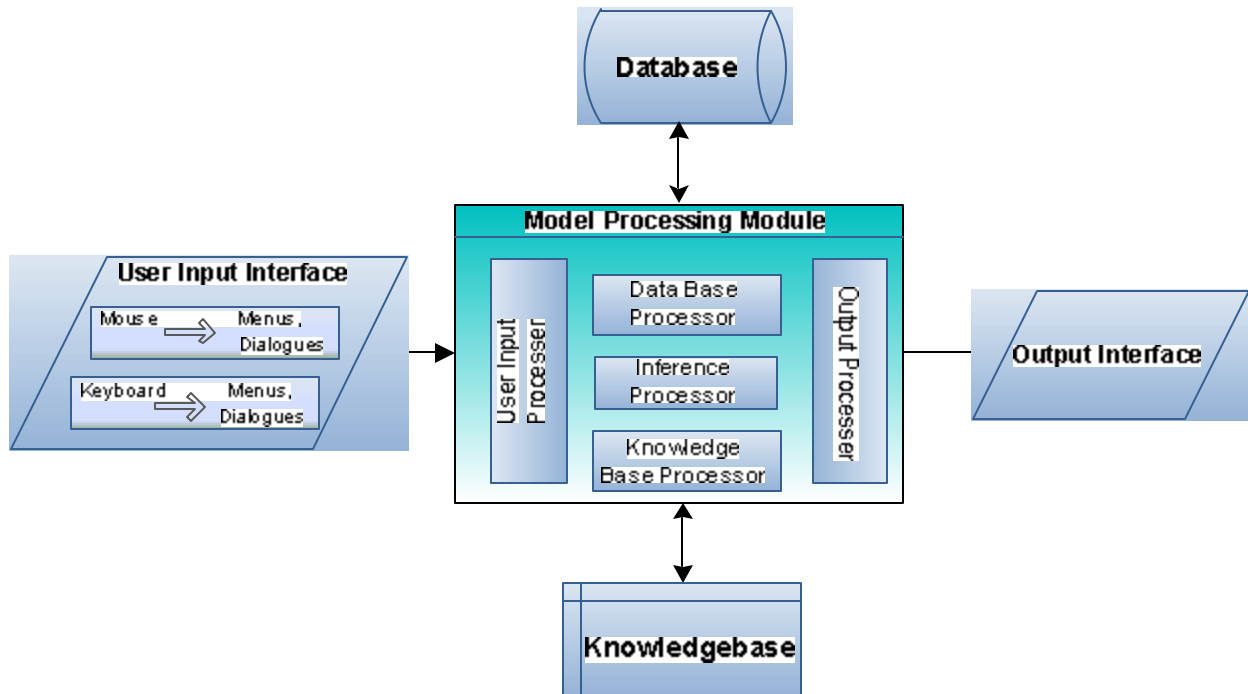

Figure 2. Architecture of the System Model

IMPLEMENTATION

A prototype of the system is implemented in the Windows environment. The graphic user interface is menu driven, and implemented as menus, using the current GUI techniques. User dialogues are implemented to collect user input as needed.

The heart of the system is the processing module that is implemented by the main processor. The processor consists of several subprocessors that are responsible for specific tasks such as processing user inputs, processing data. The inference subprocessor performs the necessary computations by applying data validation rules. The inference subprocessor is implemented using forward if-else chaining.

Output module is implemented by the display procedures using data aware controls. It displays the appropriate error messages about validation problem along with field and the data-line number in the user friendly format [4][5][6] [7] [8] [10] [16][19][20][27][28][29][30].

TESTING

The testing of this system was done on more than one data set. The following screen shots show a typical user session with a data file, Main Menu, user dialogues, data-field specifications, and results of data validation. A small data-file with few data-lines was selected for easy understanding of the whole process that covers many categories of data validation.

```
"SSN" "YR"
"1234567899" 2001
"123456789" "X"
"950128843" 2002
"95013063" 2003
"950130889" 2004
"950134851" 2000
"950134851" 2008
"950134851" 2010
```

Figure 3. Screen Shot of "Data-File"
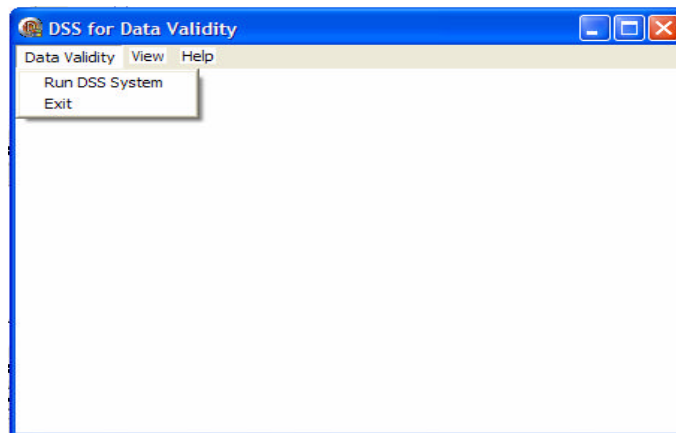
Figure 4. Screen Shot of "Main Menu of DSS"
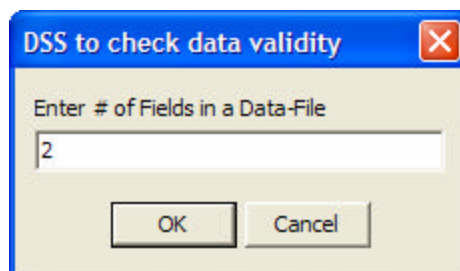
Figure 5. Screen Shot of "User Dialogue"

Figure 6. Screen Shot of "Specifications for Data Object"

Figure 7. Screen Shot of "Specifications for Data Object"

The error file reports errors in the data-file after running the data validation system. The user can take the decision based on the report. The contents of the error file are shown below:

```
"SSN"
    ^ Length Incorrect
"SSN" "YR"
        ^ Type Incorrect
Fields Do Not Match: Error In Line#:        1

"1234567899"
          ^ Length Incorrect
Fields Do Not Match: Error In Line#:        2

"123456789" "X"
              ^ Type Incorrect
Fields Do Not Match: Error In Line#:        3

Correct Line#        4

"95013063"
          ^ Length Incorrect
Fields Do Not Match: Error In Line#:        5
Correct Line#        6

"950134851" 2000
                ^ Value Out Of Range
Fields Do Not Match: Error In Line#:        7

Correct Line#        8

"950134851" 2010
                ^ Value Out Of Range
Fields Do Not Match: Error In Line#:        9
```

Figure 8. Screen Shot of "Results of Data Validation"

CONCLUSION

The Decision Support System for data validation is necessary for researchers, database administrators and analysts as valid data is important to get the correct and reliable results from the data. The task of data validation could be enormous and time consuming to do manually, especially for a large data file. Manual validation may not be as accurate as the automated process. The Decision Support system for data validation can provide quick and easy access to the information regarding validation problems in a data set. The system does data validation by checking the inherent and acquired properties of the data objects. The system is standalone, user friendly, menu driven and easy to use without any specific technical knowledge. The ease of use and the degree of automation would make the system an invaluable tool for researchers, data managers, and analysts.

REFERENCES

[1]   Allison, G. T., *The essence of Decision*. Boston: Little, Brown, 1971.

[2]   Alter, S. L., *Decision Support Systems: current Practice and Continuing Challenges.* Addison Wesley Publishing Company, 1980.

[3]   Ariav,G., Ginzberg, M. J., DSS Design: A Systematic View of Decision Support. *Communications of the ACM*, Vol. 28, No. 10 (October 1985).

[4]   Bell Doug. *Software Engineering: A Programming Approach.* Addison Wesley, 2000.

[5]   Booch Grady. *Object Oriented Analysis and Design with Applications*. The Benjamin/Cummings Publishing Company, Inc., 1993.

[6]   Borland Software Corporation. *Borland Delphi for Windows.* Scotts Valley, CA.

[7]   Budd Timothy. *An Introduction to Object-Oriented Programming.* 3rd Edition. Addison Wesley Publishing, 2001.

[8]   Cantu Marco. *Mastering Delphi 7*. SYBEX Inc., 2004.

[9]   Choudhari Ramesh and Choudhari Shobha. Data validation. *Annual Meeting of SEInforms*, Myrtle Beach South Carolina, 2008.

[10]   Coad Peter and Yourdon Edward. *Object Oriented Analysis.* Prentice Hall, 1990.

[11]   Date, C. J., "An Introduction to Database Systems." Reading, Mass.: Addison-Wesley, 1990.

[12]   Davis, M. W. Anatomy of Decision Support. *Datamation*, July 15th, 1984.

[13]   Davis Rob. *What is Data Validity?*. http://www.robdavispe.com/free2/software-qa-testing-test-tester-2214.html.

[14]   Dersham Herbert and Jipping Michael. *Programming Languages: Structures of Models*. 2nd Edition. PWS Publishing Company, Inc., 1995.

[15]   Henrichsen Lynn, Smith Michael T., and Baker David S. "Validity." Research Methods in TESL and Language Acquisition. Department of Linguistics and English Language. Brigham Young University, UT, http://linguistics.byu.edu/faculty/ henrichsenl/ResearchMethods/RM_2_18.html

[16]   Jalote Pankaj. *An Integrated Approach to Software Engineering*. 3rd Edition. Springer, 2005.

[17]   Keen, P. G. W., Gambino, T. J. Building Decision Support Systems. *The Mythical man-month* Revisited in Bennet, J. L. Building Decision Support Systems. *Reading*, Mass.: Addison-Wesley Publishing Company, 1983.

[18]   Kenn, P. G. W. Scott Morton, M. Decision Support Systems:- An Organizational Perspective. *Reading*, Mass.: Addison-Wesley Publishing Company, 1978.

[19]   Koffman Elliot. *Turbo Pascal. 5th Edition*. Addison Wesley Publishing, 1995.

[20]   Kovach Warren. *Delphi 3: User Interface Design.* Prentice Hall, Europe, 1998.

[21]   McGregor John D. and Sykes David A. *Object-Oriented Software Development, Engineering Software for Reuse.* International Thomson Computer Press, A Division of International Thomson Publishing Inc., 1992.

[22]   Merriam Sharan B. What Can You Tell From an N of 1? Issues of Validity and Reliability in Qualitative Research. *QUIG Interdisciplinary Qualitative Studies Conference Announcement*. The University of Georgia. http://www.coe.uga.edu/quig/merriam93.html.

[23]   Microsoft Corporation. *Data Validation*. http://msdn2.microsoft.com/en-us/library/aa291820(VS.71).aspx, 2008.

[24]   Moore Anthony. *ASP.Net Validation in Depth.* Microsoft Corporation. October 2000, Updated March 2002. http://msdn2.microsoft.com/en-us/library/aa479045.aspx#aspplusvalid_rules.

[25]   Moore, J. H. and Chang, M. G. "Design of Decision Support Systems", *DATA BASE*, Vol. 12:1, No. 2 (1980), pp. 15-28.

[26]   Nilson, N. J., *Principles of Artificial Intelligence*. Tioga 1980.

[27]   Rachele Warren. *Learn Object Pascal with Delphi*. Wordware Publishing, Inc., 2001.

[28]   Thurrott Paul, Brent Gary, Bagdazian Richard, and Tendon Steve. *Delphi 3 SuperBible*. Watt Group Press, 1996.

[29]   Turban Efraim. *Decision Support and expert Systems. Management Support Systems*. Macmillan Publishing Company, New York, 1993.

[30]   Williams Shirley and Walmsley Sue. *Discover Delphi Programming Principles Explained*. Addison Wesley Publishing, 1998.

[31]   Winston, P. H. Artificial Intelligence. *Reading*, Mass: Addison-Wesley, 1979.