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Analysis of Employee Learning on Operations and Supply Chain Management in Healthcare Industry

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Abstract

Long Term Care facilities are a highly regulated industry due to funding sources being subject to Medicare and Medicaid reimbursement. The demand for nursing homes is increasing significantly with anticipation of the Baby Boomers reaching age 65. Most of the long-term care studies are focused on quality improvement and reduced deficiencies. This study provides a different view on how external pressure affects strategic planning in employees learning to benefit operations and supply chain management for long-term care providers. The findings indicate that normative behavior has an important effect on workforce development. Furthermore, staff knowledge building also enhances the firm's operational performance and improves supply chain communication.

1. Introduction

Long Term Care (LTC) facilities produce an estimated \$529 billion or 3.7% of the nation's economic activity. According to a 2009 report by the American Health Care Association, 15,691 nursing facilities with a workforce of 1,784,016 care for 1,401,295 patients every day (AHCA, 2009). Meanwhile, Medicaid is the major funding source for those nursing home facilities—having contributed more than \$60 billion in 2008 (Nursing Home Buyouts Face Scrutiny, 2007). Medicaid supports and funds 64 percent of skilled nursing facilities (SNF) in the nation. Therefore, the revenues from most nursing homes are subject to Medicare and Medicaid reimbursement rates. The average reimbursement shortfall for Medicaid nursing home was estimated to be \$19.55 per Medicaid patient day in 2011 (AHCA, 2011).

Allowing private equity or investment groups' nursing facilities to generate net income, the effective strategy for them would be cutting costs, including caretakers. As for both non-profit and for-profit nursing homes, the strategic planning to generate income with managerial decision

through external and internal environment is a challenge to achieve governmental performance requirements. Budget deficits of the U.S. government have a strong impact on Medicare and Medicaid reimbursement payments in the healthcare industry. Since the financial stability and quality performance of long-term care facilities is subject to Medicaid reimbursement rates, long-term healthcare facilities must effectively utilize limited financial support and follow a well-planned strategy to meet governmental quality requirements. Institutional theory and strategic planning fulfill a major role in the decision-making processes of long-term care providers. Due to the uncertainty that SNFs face regarding government policies, firms can efficiently and effectively implement business processes and knowledge in order to achieve organizational objectives. Therefore, the objective of this study is to measure the impact of the external pressure on how the firm's strategic planning under employees and operations processes. The literature review will be presented in next section, followed by research hypotheses. Also, the research methodology used to test the hypotheses will be provided, along with the research results.

2. Literature Review

2.1 Institutional Theory

Powell and DiMaggio (1991) defined the new institutional frameworks as having links between organizational environment and organizational actions which include comprehensive consideration of human involvement. The perspective of institutional theory is that successful organizations are embodied within social advantage regarding norms of rational behavior (Scott, 2001). Therefore, individuals or firms have the potential to advance and respond to wider social, environmental and political pressures in order to change institutional behaviors. Coercive isomorphism can be explained by the formal or informal pressures from the external

organizations that the firms are dependent upon regarding the expectations of society. Additionally, these forces can be directly connected to political or governmental mandates and regulations (DiMaggio and Powell, 1983). In order to connect with external sponsors, the firms might require modifying their structures to acquire and maintain support of the external agents. At a minimum, the organizations must provide access or information to a wide variety of government sectors. Specifically, regulatory agencies assert forces which lead the organization to exercise its influence by controlling resource flows and sharing and creating internal cultural expectations (D'Aunno, Succi, and Alexander, 2000). The authoritative forces appear primarily from government mandates; for example, a firm may be pressured to adopt major new regulatory programs that demand changing from cost-based payments to prospective payments in order to be reimbursed for expenses of treating Medicaid patients (Yang, Fang, and Huang, 2007). Mimetic isomorphism occurs when environmental uncertainty is high or an organization's goals are ambiguous; furthermore, such a condition encourages the firms or individuals to imitate each other. The successful firms are usually modeled by similar organizations to enhance the efficiency (DiMaggio and Powell, 1983). These procedures and policies also support information processing internally which encourages the members in an organization to generate information conforming to the external images (Duimering and Safayeni, 1998). Yang et al. (2007) stated that imitations most frequently occur among competitors among similarly-sized firms. They applied size-localization to study the mimetic process in organizational behaviors within hospital settings. When firms are facing uncertainty, the firms would replica or imitate the successful organizations; specifically, the adoption of Total Quality Management and Continuous Quality Improvement technique are a form of mimetic isomorphism. Members under normative institutions desire to be accepted in social obligation and connect with the qualified professional

associations which are defined as professionalization. Growing professionalization can be found from two aspects: university specialists and professional networks (DiMaggio and Powell, 1983). Scott (1987) noted that the hospitals in the U.S. are not required to receive accreditation from the Joint Commission on Accreditation of Hospitals as a condition of their operations; however, most of them voluntarily obtain such legitimization. Castle and Fogel (2002) studied the relationship between nursing home administrators who belonged to a long-term-care professional association and the quality of its facility. Their findings showed that the support and resources obtained from the professional associations will often result in higher quality of care, such as receiving a higher private-pay proportion.

2.2 Workforce Development

Skilled nursing facilities are highly service-oriented. Staff levels employees have been often studied, especially in regard to job satisfaction, whereas registered nurses' (RNs) turnover rate is a common research area. Job satisfaction can be derived from operating conditions, as based on a firm's organizational planning including employee scheduling, training and rewards. The evidence has shown that higher job satisfaction is associated with lower turn-over rates of caregivers (Rantz et al., 2004; Castle, 2005; Castle et al., 2007; Castle and Engberg, 2008; Donoghue and Castle, 2009; Seblega et al., 2010). Additionally, Zinn et al. (2010) stated that the facilities with improving quality report card performance are more motivated to make certain investments of resources in updating the equipment or increasing staff wages. Since higher quality improvement is a less expensive marketing technique to attract more residents, this quality tool also assists with staff retention and quality outcomes. Furthermore, the majority of nursing home staff are the front-line workers including registered nurses, licensed practical or vocational nurses and certified nursing assistants. When facing any job procedures from

operating the equipment to encounters with the patients, the staff should be provided sufficient training to deal with or avoid any operational breakdowns. Tucker (2004) reported that about 9% of nurses spent their daily work routines on operational inefficiency, such as shortages of medications which deviate from expected processes. Thus, organization should recognize such unproductive outcome as a way to generate learning opportunities to benefit employee's experience in order to improve operational efficiency. Repetition and experimentation can facilitate learning the tasks and develop better performance to increase production opportunities. Even though the individual skills are relevant to the productivity, an organizational setting to encourage the learning processes is essential for their employment (Teece and Pisano, 1994). Sarkis et al. (2010) discussed workforce management and training as a key for effective operations in responding to competitive pressures. Additionally, it is evident that employee empowerment through training, motivation, and knowledge enhancement can increase continuous total quality management (Westphal, Gulati, & Shortell, 1997). The US healthcare industry is a highly regulated business, especially for skilled nursing facilities as compared to other senior or assisted living homes. SNFs are required to follow the quality and environmental regulations in order to avoid the threat of regulators giving lower quality measurements. Lower quality rating will damage an organization's community image and customer relations. Organizational culture might be adopted to develop the learning and increasing knowledge of the firm's employees. Therefore, a deep managerial involvement in implementing employee training is essential to motivate participation among employees (Coates and McDermott, 2002).

2.3 Operations Management

According to Grover and Flagle (1990), efficiency is the best utilization of resource production. Moreover, the level of productivity efficiency measures the association with work

levels and health care production; furthermore, operational efficiency examines the patient flow in terms of outpatient, inpatient, and facilities to achieve the ideal match of resources to patient needs. The regulation of government reimbursement and increasing health expenditures, along with efficiency improvements are the methods to assist providers in alleviating health care delivery costs. The most general approach to measuring efficiency involves comparing inputs and outputs, such as beds, full-time equivalents in terms of staff size, and operating expenses (Harrison and Ogniewski, 2005).

Inman et al. (2011) tested the relationship between operational performance and market performance in production and manufacturing sectors. Operational performance was measured under cost management and quality asset management performance metrics. The results indicated that a positive relationship exists between operational performance and market performance. Regarding healthcare performance, delivery can be treated as the waiting time before and after seeing the doctors. Production costs can refer to total costs to deliver the care, whereas product quality can imply the quality of healthcare. Many researchers have identified that operational processes or operational measurement can determine an aggregate performance outcome. However, achieving higher quality care may result in increased operational costs (Davis, 1991). Some studies have implemented nursing home expenditures as a measure of operational costs to assess the facility in delivery of high performance services (Harkey and Vraciu; 1992) but other findings have shown that facilities which provide a high quality of care usually generate less waste and fewer errors in measures positively related to efficiency care (Harkey and Vraciu; 1992; Fleming, 1991). When firms practice an effective total quality management environment, they achieve a higher output performance through operating efficiency (Kaynak, 2003).

2.4 Supply Chain Management

Management should widen the focus from a traditional functional view to a more transversal perspective, such as the integration of internal business processes and functions to the integration of inter-company processes. Many studies have focused on how firms should integrate their activities with suppliers and customers to improve their performance and align with the firms' strategies. However, few studies have emphasized supply chain integration and manufacturing improvement programs; thus, identifying the common patterns of manufacturing and supply chain strategies would assist in understanding the implications to the supply chain network (Cagliano, Caniato, & Spina, 2006). Supplier collaboration should take into account certain issues, such as risk sharing, trust, mutual benefit, rewards, and information exchange. External and internal collaboration should accompany strategic and tactical levels in firms across the supply chain network. External collaboration presents a vertical collaboration that includes downstream and upstream parts, such as customer relationship management (CRM) along with suppliers (Ragowsky & Somen, 2002; Barratt, 2004). Sharing information between partners of a supply chain when implementing electronic data interchange (EDI) technology can decrease uncertainty and raise supplier performance, significantly developing the overall supply chain system (Srinivasan et al., 1994).

The firms can also learn from different partners through acquisition or venture to develop first-hand or complementary technology and create internal knowledge (Wang and Ahmed, 2007). The firms' capability is a learning-based ability which utilizes and incorporates knowledge through acquiring from external sources (Lenox and King, 2004; Tsai, 2001). Therefore, the result from an extended process of investment and knowledge accumulation within the organization is path-dependent (Chen, 2004). Additionally, Powell (1995) provides

adapting new total quality management approach between performance and relationship with customers and supplier using Baldrige National Quality standards. Choi, Dooly, and Rungtusanatham (2001) research that under dynamic environment the supply network can be relieved through requirement constant adjustments. Furthermore, the relationship with its medicine supply network is also a method to cope the uncertain of the costs. In the United States, more than 80 percent of the nursing home medications are supplied by “institutional” pharmacies. However, independent community pharmacies or retail pharmacy chains are still attempting to compete for market share (Mendelson, Abramson, and Tumlinson, 2002).

3. Hypotheses

Fig. 1 presents the model derived from our prior discussion. The research hypotheses tested here provide an evaluation of the theory, along with the causal relationship among the external pressures: workforce development, operations management, and supply chain management.

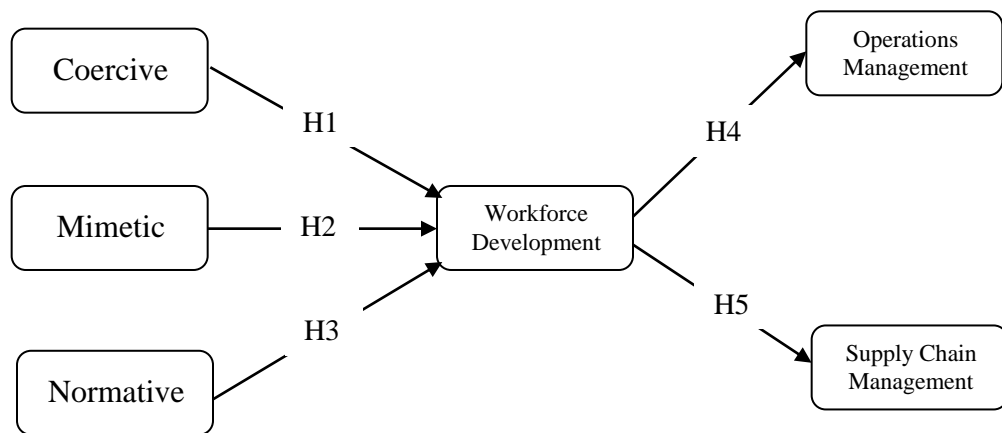


Fig. 1 Model to test causal relationship in long-term care industry

Liang et al. (2007) stated that institutional theory should be considered in external social, technical and political environments in order to influence knowledge assimilation behaviors. Institutional theory determines that structural and behavioral aspects are driven more by the requirements for organizational legitimacy and less by the desire for efficiency. Learning behavior views top management as responsible for changing the norms and culture enabling the members to adapt to the new innovative technology and guiding individual behavior (Khalifa and Davison, 2006). Swanson and Ramiller (2004) imply that firms may observe and replicate successful competitors. Thus, firms tend to develop certainty about a novel behavior as a way of responding to uncertainty within the environment and subsequently transform policy into actions. Liu et al. (2010) explore the relationship between organizational behavior and the institutional factors which influence management to practice the new adoption process. The findings revealed that mimetic pressures are not related to organizational learning behavior. When the new knowledge is highly complex to understand and implement, it might be difficult to duplicate the competitors. However, coercive and normative pressures are significantly associated with knowledge expanding intention. Normative isomorphism is defined as the professional/social networks ties among the related field. As DiMaggio and Powell (1983) have noted, this type of normative pressure is especially likely to be found in professional sectors and organizations. Thus, voluntary hospitals in the U.S. are not required as a condition of their operation to receive accreditation from the Joint Commission on Accreditation of Hospitals, but most choose to establish such legitimacy. These professions are expected to depend on primarily normative influences, while attempting to create cultural forms having their own goals and values (Scott, 1987). The employee innovative movement is a process involving some degree of social institutionalization concerning the value of the innovation among organizational stakeholders.

Thus, the decision of investing in a new technology may be a normative acceptance to react to an economic event (Dansky and Gamm, 2004). Modern health care relies on a scientific base which evolves over time to respond to procedural correctness and then to accumulate experience and knowledge. In many research and teaching hospitals, previous knowledge learning leads to research in testing new therapies and improving in established procedures (Scott, 1993).

Hypothesis 1: Coercive pressures are positively related to workforce development.

Hypothesis 2: Mimetic pressures are positively related to workforce development.

Hypothesis 3: Normative pressures are positively related to workforce development.

Wang and Ahmed (2004) identified capability through behavioral innovativeness from individual, teams, and management levels. Measuring behavioral innovativeness is a continuing process from examining characteristics and commitments of certain groups in the organization. Zollo and Winter (2002) state that learning mechanism involves with organizational routines, experience and knowledge accumulation. Under organizational processes, both staff and line activities are toward the operational function of the firm and dedicated to the modification of operating routines. Therefore, healthcare management teams often devote significant efforts and time to enable the dynamic capabilities to improve the patient process and performance (Pablo et al., 2007). A standard performance indicator is required for improving operational efficiency, assessing management, providing accountability, and encouraging collaboration (Leggat et al., 1998; McKone-Sweet et al., 2005)

Hypothesis 4: Workforce development has a positive influence on operations management.

Bennion and Redmond (1994) studied the attributes of actual performance against “ideal” performance under buyers selecting supplier criterion. The results suggest that supplier movements should be better matched with the necessities of buyers. Thus, the essential element to satisfying the purchasers is to understand how the buyers evaluate the supplier’s performance to fulfill the customers’ desires (Qualls and Rosa, 1995; Lambert et al., 1997). Havvik (2000) provides that an efficient healthcare supply chain has the potential benefit to reduce the operating costs by an estimated 2 to 8 percent. Furthermore, an efficient and user-friendly supply chain is associated with healthcare revenues by enhancing staff retention and providing better patient service. Part of the barriers to implement supply chain management is a lack of understanding of the importance of following and scrutinizing critical performance information. Therefore, the training and education of the employees involves gaining more knowledge of supply chain management and requiring business processes to accomplish greater competitive advantage (Gowen III and Tallon, 2003; McKone-Sweet et al., 2005).

Hypothesis 5: Workforce development has a positive influence on supply chain management.

4. Methodology

The individual skilled nursing facilities are the unit of analysis which means the unit of analysis is at the firm-level. A set of questionnaires was distributed to each of the skilled nursing facilities in five states (Texas, New Mexico, Connecticut, South Carolina, and Kansas) in the US which are subject to Medicare and Medicaid reimbursement. The survey items focus on Institutional theory (Coercive, Mimetic, Normative Isomorphism), and workforce development, operations management and supply chain management to be applied for this research. All the measurement items are from previous test questionnaires; therefore, there are no newly

developed scales for this study. The research model was reviewed by operations management and management faculty experts. The questionnaires were first examined by seven administrators of skilled nursing facilities in Arlington, TX to ensure the face validity. A few minor changes in wording were suggested to better fit with the healthcare - nursing home sector.

4.1 Data Collection

1,500 surveys were distributed via US Mail in early February 2012 to the administrators of skilled nursing facility in five states. Since then, a total of 218 surveys have been received. Some surveys have been excluded due to the initial mailing's incorrect mailing address and administrator's unwillingness to participate, as well as the received surveys missing more than 20% of the survey items. Also, some research studies suggest that facilities with less than 30 beds contain staffing characteristics with low signal-to-noise ratios should not be included in the analysis (Castle and Engberg, 2008; Liu and Castle, 2009; Rantz et al., 2004). A small quantity of missing data items were replaced with scale average scores. Therefore, the final sample size of 193 valid surveys is applied for the data analysis which represents a response rate of approximately 13%. Please see Table 1 Nursing Home Characteristics – Frequency Data. The differences in size of nursing facilities, as well as differences in organizational status (for profit and not-for profit status), were examined between responding and non-responding facilities to test how the sample might differ from the population. Non-respondent bias is tested by facility size and ownership. The Chi-square test statistic is assessed for the number of beds and indicates a value that is not significant ($\chi^2 = 0.71$, *d.f.* = 2, *P* = 0.701) showing that the response rate in the number of bed sizes is not significantly different than expected. Non-respondent bias by nursing home ownership (For Profit, Government, Not-For Profit) was evaluated and also indicated no significant difference between respondents and non-respondents ($\chi^2 = 2.28$, *d.f.* = 2, *P* = 0.32).

Table 1 Nursing Home Characteristics – Frequency Data

Variable (n = 193)	Frequency	Percent
Number of beds		
30 – 99	75	38.9
100 – 199	112	58.0
> 200	6	3.1
Total	193	
Ownership		
For Profit	159	82.4
Not-For Profit	34	17.6
Total	193	

4.2 Factor Analysis

The reliability is tested by conducting Cronbach’s coefficient alpha for six scale constructs. The Cronbach’s alpha for Coercive, Mimetic, Normative, Workforce Development, Operations Management, and Supply Chain Management is 0.75, 0.78, 0.52, 0.78, 0.74, and 0.53, respectively. Cronbach’s reliability test is often used to examine the fit of multiple items to measure for one underlying construct. However, the general guideline for Cronbach’s alpha is often defined as at least 0.6 in the lower limit for reliability (Nunnally, 1978; Flynn et al., 1990). Although two of the latent constructs (Normative and Supply Chain Management) are below 0.6 but above 0.5, this is still acceptable since some studies point out that the relationship would emphasize different elements may not have high alphas and 0.5 Cronbach’s alpha is still an acceptable limit (Papadopoulos and Heslop, 1990; Ogden and Flanagan; 2008).

Table 2 Measurement model fit and Structural model fit

Model fit measure	CFA	SEM
Degree of freedom (d.f.)	155	161
χ^2 – Test statistic	262.50	300.44
Normed χ^2 (χ^2 /d.f.)	1.69	1.86
RMSEA Point Est	0.061	0.067
Comparative fit index (CFI)	0.96	0.95
Normed fit index (NFI)	0.92	0.90
Non-normed fit index (NNFI)	0.95	0.94
Goodness of fit index (GFI)	0.88	0.86
Incremental fit index (IFI)	0.96	0.95

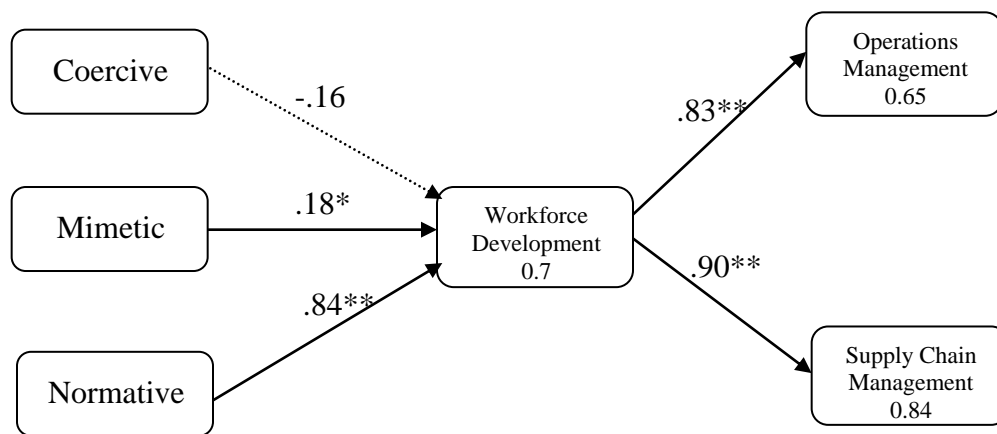
Factor analysis is conducted to reduce item responses to a particular score for each of six construct dimensions. Principle component analysis is applied to summarize the original information into a range of scores. Carmines and Zeller (1979) provided some guidelines for scale measurement in principal component analysis which should be at least 40% to explain variance proportion of each item. The factor loadings for each item under each construct range from 0.87 to 0.675 which provide additional evidence of scale reliability. The loading for each observed items are presented in Appendix 1 Item Factor Loadings and Description. The convergent validity is tested by running the measurement model for six latent constructs with 20 related individual items. The point estimates from individual item loading on latent variable range from 0.32 to 0.96, with significant t-values greater than 2.58 (Anderson and Gerbing, 1988; Boyer, 2012). Next, estimated model fit values are assessed. The root mean square error of approximation (RMSEA) is a measure of model fit that is not relied on sample size (Hair et al., 1998) which has a value of 0.061 (between 0.05 to 0.1) representing a reasonable model fit in this study (Browne and Mels, 1994). Other measurement model statistics are reported in Table 2: Measurement model fit and Structural model fit with all the reasonable fits. For example, a

normed Chi-square value of 1.69 indicates the model adequately represents the data. The comparative fit index (CFI), normed fit index (NFI), non-normed fit index (NNFI), goodness of fit index (GFI), and incremental fit index (IFI) are 0.96, 0.92, 0.95, 0.88, and 0.96, respectively.

5. Statistical Results

The structural equation modeling analysis is implemented to test the specified causal model in Fig. 1 Model to test causal relationship in long-term care industry. The input for the structural equation model estimation is based on scores of the six dimensions. Please see Fig. 2 Results of testing causal relationship in long-term care industry and Table 2 Measurement model fit and Structural model fit for output results. The chi-square test for overall model fit has a value of 300.44 ($p < 0.01$) and the normed chi-square statistic of 1.86 indicates the model is not overestimated and is a reasonable model. Also, RMSEA (0.067) specified this is a reasonable model fit. Additionally, the normed fit index (NFI) of 0.90, the comparative fit index (CFI) of 0.95, the non-normed fit index (NNFI) of 0.94, the goodness of fit index (GFI) of 0.86, and the incremental fit index (IFI) of 0.95 are reasonable outputs. The research hypotheses offer empirical support for five out of six causal relationships. Table 3 Path estimates for overall structural model shows the results of model estimation including path estimates, standard error, and t-tests for the path significance. Hypotheses 1 through 3 provide the causal influence of coercive, mimetic, and normative on workforce development. The path estimates for the relationship are: coercive to workforce development ($\gamma_{11} = -0.16$, $p > .10$), mimetic to workforce development ($\gamma_{21} = 0.18$, $p < .05$), and normative to workforce development ($\gamma_{31} = 0.84$, $p < .01$). However, only hypotheses 2 and 3 are support with significance p-value. Hypotheses 4 and 5 offer the causal relationship of workforce development on operations management and supply chain management. The path estimates for Workforce development's significant causal

relationships are: Operations management ($\beta_{21} = 0.83, p < .01$) and Supply chain management ($\beta_{31} = 0.90, p < .01$). Further insight into the segment of institutional theory relationships can be observed by examining the path estimates which are standardized to compare the relative weights. For example, the path estimates from Normative to Workforce Development is 0.84 ($p < 0.01$), approximately five times the weight of the path from Mimetic to Workforce Development which is 0.18 ($p < 0.05$). This information means that the causal impact of Normative on Workforce is about five times as strong as the influence of Mimetic on Workforce.



Notes: * path significant at $P < 0.05$
 ** path significant at $P < 0.01$
 All path coefficients are standardized

Fig. 2 Results of testing causal relationships in the long-term care industry

Table 3 Path estimates for overall structural model

Hypotheses	Path	Point estimate	Standard error	t-Value
H1	Coercive → Workforce	-0.16	.132	-1.65
H2	Mimetic → Workforce	0.18	.066	2.26*
H3	Normative → Workforce	0.84	.191	7.49**
H4	Workforce → Operations	0.83	.099	8.05**
H5	Workforce → Supply Chain	0.90	.071	6.54**

* path significant at $P < 0.05$

** path significant at $P < 0.01$

6. Discussion

Many nursing studies are primarily focused on patients' quality and deficiencies. Our research observes a different view of firms' strategic employee development to government regulations. The statistical results provided above present that external pressures are linked to employee learning development in long-term care facilities. Even though the coercive aspect has a negative non-significant relationship with employee development, this can be explained by the long-term care providers having been regulated by the government for decades; therefore, the nursing home administrators perceive the regulations from the government as essential requirement without opposition. Thus, the three institutional constructs: coercive, mimetic to normative gradually increase their level of significant influence to impact the workforce development. Nursing homes are in a highly competitive and regulated industry which encourages firms to imitate each other to maintain patient quality and meet government mandates. Moreover, nursing home management treat normative behavior as highly correlated with employee learning behavior. This connection can be seen through more and more long-term care facilities seeking to join and recognize in different healthcare associations, such as Joint Commission, American Health Care Association, Malcolm Baldrige National Quality Award and American Association for Long Term Care and Nursing. In order to qualify to join these professional associations, the facilities also require improved work systems, increased staff training, and evaluation and support of staff well-being. The effect of staff development can result in increased employee satisfaction, higher employee loyalty and retention (Heskett et al., 1994). This study further investigates the association that workforce developments can enhance operations and supply chain relationships. Higher staff learning improves operational efficiency and supplier relationships which can be seen in employees' willingness to put more efforts on

increasing operations performance and building better communicating channels with the suppliers. Finally, government regulations constrain the long-term care facilities to fulfill the quality requirement in order to receive reimbursements. However, increased strategic planning can assist the firms to reach improved operational performance and supply chain relationship.

Appendix 1 Item Factor Loadings and Description

Construct	Factor Loadings
Coercive (Liu et al., 2010)	
Our main suppliers that matter to us believe that we should follow government regulations	.789
The industry association requires our facility to follow government regulations	.782
Our insurance company requires our facility to follow government regulations	.836
Mimetic (Liang et al., 2007)	
Our main competitors who have adopted government policies are favorably perceived by others in the same industry	.897
Our main competitors who have adopted government policies are favorable perceived by their suppliers	.893
Our main competitors who have adopted government policies are favorable perceived by their customers	.697
Normative (Zsidisin et al., 2005)	
Our facility provides continuing trainings for our employees	.868
Join professional associations are important to our facility	.676
Our facility believe in quality of the health care	.834
Workforce Development (Meyer and Collier, 2001)	
Our work environment supports the well-being and development of all employees	.806
We use a variety of methods to measure employee satisfaction	.821
We work to improved employee health and safety (such as ergonomic training for jobs requiring lifting)	.683
Employees receive career development services	.818
Operations Management (Meyer and Collier, 2001)	
We measure the performance of our administrative services	.776
Analytical techniques such as process mapping and error proofing are used for addressing problems	.676
Feedback on administrative services is obtained from internal customers (other departments)	.783
Feedback on administrative services is obtained from external customers (patients and other stakeholders)	.774
Supply Chain Management (Meyer and Collier, 2001)	
We establish long-term relationships with suppliers	.783
Quality is our most important criterion for selecting suppliers	.725
Suppliers are involved in designing new and revised services	.675

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AN EXPERIENTIAL MODEL FOR TEACHING SUSTAINABLE OPERATIONS

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ABSTRACT

It is difficult to dispute that the earth's natural resources are being consumed at an ever increasing rate and that these resources have a limit. This is debated and discussed daily in every corner of society. It is in the news. We see solar panels appearing on roof tops. We see wind turbines appearing on mountain ranges. The authors, as management science educators in a small liberal arts college's business program became intrigued. Businesses are charged by their stock holders with returning a profit. Those that do, succeed. Those that do not, fade away. Can businesses make their required profit and still do the right thing? Can they invest in alternative energy programs such as wind and solar with high fixed cost bases but that in the long run reduce costs? Will the business short term profit goals support this? Can they initiate programs such as community gardens that are directed to helping society? That helps society but how does it help the bottom line? To help answer the questions the authors developed a course entitled: *Sustainable operations: the right road to profitability*. The goal was to take students on a journey that would look at a variety of businesses, both manufacturing and non-manufacturing, and examine their sustainable operations beliefs and their practices. We wanted to find out what businesses were actually doing. Was it in the company's DNA or was it sound bites and photo-ops? What we did, what we learned, what we hope to do to expand the course are the basis of this paper.

COURSE STRATEGY

This course focused on the business processes taken to increase profit as an economic strategy while working within a business model that also affects positive changes on society and /or the environment. Students started by learning the basic concepts of business profit and loss and currently defined best practices for sustainable operations. In groups, students visited local businesses and investigated for indications of sustainability. This was followed by a travel tour of regional model businesses and sustainability focused facilities in the southeast showcasing their operations and practices. Included were visits to operating examples of sustainability components such as wind power, solar power, manufacturing, health care, and land fill use. The course concluded with a re-visit of local businesses and student collaboration to present recommended changes to achieve sustainable business operations. In planning this course, the author's goals were to include a significant (50%) travel component to facilitate experiential learning. Distances requiring air travel were eliminated due to travel cost. For 25 students bus travel was considered appropriate. Investigation of potential business visits in the Southeast portion of the US led to finalization of a route between Salem, Va. (homebase) and Charleston, SC (final destination)

COURSE EXECUTION

PART 1 – on campus

The primary goal was to lead students to an understanding of the relationship between economic, social, and environmental sustainability. Since the course was open to all liberal arts students some of which were non-business degree seeking, the first objective was to gain an understanding of specific ways a business can raise profit while benefiting society and/or the environment. Once this was established, a second objective was to expose the students to a variety of alternative energy sources and sustainable practice opportunities while considering their positive and negative business impacts in both the short and long term. With this base knowledge the authors engaged several local businesses to support the program. These represented – small scale manufacturing (locks), large scale manufacturing fabrication (steel), restaurant, automotive dealership (electric vehicle), a microbrewery, and the College itself. Students were divided into groups and given the initial assignment of visiting their respective local businesses and learning as much as possible through interview and observation about the business's current sustainability practices.

PART 2 - Experiential Learning

After the introductory discussions and local business visits the class embarked on a 10 day travel adventure to search out sustainable operations.

- Stop 1 - Volvo trucks, Dublin Virginia
- Stop 2 - Interstate rest area, North Carolina
- Stop 3 - BMW manufacturing, Greenville NC
- Stop 4 - Bon Secors Health System, Spartanburg, NC
- Stop 5 - Holiday Inn Express, Charleston, SC
- Stop 6 - Barrier Island Ecology tour, Charleston, SC
- Stop 7 - Port of Charleston, Charleston, SC
- Stop 8 - Clemson University Wind Turbine Test Facility
- Stop 9 - Historical city tour, Charleston, SC
- Stop 10 - Middleton plantation tour, Charleston, SC

Each of the above businesses was searched out by the authors and offered a different perspective on sustainability. The class saw the gamut of sustainable operational practices and had the opportunity to see them, touch them, and ask the business personnel questions to further explore areas such as what was done, why it was done, cost, return on investment, revenue enhancement, and how the practice impacted the corporate image. We observed large solar panel fields generating significant portions of operational energy. We saw community gardens established to give back to society. We learned that the historical city of Charleston had been employing energy saving sustainable practices since its establishment in the 18th century. We saw how a hotel uses coated swine hair in filtration systems. We saw how certain crabs practice sustainability by regenerating lost claws. At each turn there were new and exciting examples of doing positive things to enhance the corporate bottom line.

PART 3 – Assessment & Grading

The primary focus on return to campus after the travel component was to re-engage with the local businesses that were initially researched. Each student group now took what they learned experientially on the travel portion and applied this to the local businesses they had initially visited. Each prepared and made a presentation to the local business' representatives detailing what "could be done" to improve the local business profitability through sustainable operations practices. As grading was a requirement, assignments needed to be developed to challenge thinking and provide assessable materials. A significant portion of the course grade (27%) was allotted to "professionalism & participation. Since we were travelling with 25 students for 10 days representing the college and interacting with business professionals we wanted to make sure that student behavior did not become an issue. While there were some minor incidents along the way overall behavior was not an issue. The students worked in groups and made initial presentations after their local business interviews and then there was a final presentation to the businesses at the course end. This was 20% of the grade. The students were required to maintain a daily journal of activity following a template the authors had provided. This quickly became a significant issue due to the volume of material the authors were receiving and the ability to grade and return with feedback before morning. Internet connectivity became troublesome in different

locations adding a further challenge to the students and it became necessary to alter the assignment to fit the logistical capabilities. This was weighted 10%. While we travelled, there were 2 different assignments included with a goal of being both fun and educational. This required students to participate in a “Search out Sustainability” scavenger hunt. They would take photos of things they saw as they traveled that were sustainability indicators and then submit 10 items with their interpretation as to how that represented helping society and the environment. This was weighted 10%. There was a textbook used (Willard, Bob. (2012) *The Sustainability Advantage* with one chapter read each travel day. Students made up questions from each chapter’s reading and these were integrated into a 20% weighted, comprehensive exam delivered at the end of the course. Finally, since this course was part of the school’s overall Intellectual Inquiry program there was a 10% reflection paper submitted as well.

COURSE CONSTRAINTS

The course was faced with a number of constraints that needed to be addressed as it was developed and executed. This started with the cost to the students. Students and parents face a significant cost challenge when they start their college experience and the costs for an experiential May Term experience adds to that burden – it is not an included cost. There are often up to 20 travel experiences offered each May to offer students a choice and only a limited pool of students available each May to take the available courses. If the cost is too high, students with financial limitations will not enroll and the course may be canceled due to the minimum student enrollment requirement being met. This meant that care needed to be taken to make the trip affordable. Another factor is the actual course time available. This is a three week course taught in May with the authors bound by that time period. The authors had collaborated with a goal of teaching this course in May 2013. Initial work began two years in advance and included two exploratory visits to the selected businesses that would be visited on the travel portion of the course. The development portion of the course was extensive and some may underestimate the need for or the extent of this effort as a requirement to a successful overall experience. Another constraint was the requirement for grading. This was a credited course and as such needed a grading system. The dilemma was that students are accustomed to a course with a textbook, chapter by chapter explanation, and intermediary homework, quizzes, and tests all leading to a final grade. In an experiential model there must be time for “teachable moments”, spontaneous observation and exploration, and “outside the box” discussion. The students wanted traditional teaching – the authors wanted to offer an experience. This was a challenge. As mentioned earlier, students came from a variety of academic majors. As a result some had never encountered the basic business model of Profit = Total revenue – Total cost. This needed to be explained at the start. Different majors have inherent different teaching philosophies and as a result the course authors, who are business educated and trained, needed to work with different learning modes and preferences within the student body. Another challenge. Finally it was noted that some students brought some ingrained philosophies of their own regarding the pro’s and con’s of

sustainability that were difficult to alter in the three week course period. At this age it had been expected that we would find open minds when in one or two situations we found personal opinion (or perhaps parental opinion) had taken strong conservative root.

EVALUATION OF LEARNING OUTCOMES

Our main goal was to make students think about the link between profit, people and the planet and to recognize that when done right, there can be a positive correlation between profit and people, and/or between profit and the planet. To assess their understanding, students were required to write daily journals, take tests, and do a final reflection paper; a follow-up survey was also done three months after the conclusion of the course.

Through the guided reflection journals students appeared to get the message, and as a group, they did quite well on the cumulative final exam. From the survey conducted after the fact it is apparent that the authors did an excellent job of getting them to see the positive connection between profit and the planet but not as much so for understanding the connection between profit and benefiting society. Although a little disappointing, it is understandable as the class did focus more on the environmental aspects of sustainability. A highlight from the feedback was that a majority of students now notice sustainable operations as they go about their daily business and even think about what organizations could do better in terms of sustainability. The authors are very pleased with this result as we want our students to go out into the world consciously thinking about how to make money the *right* way. That said we cannot say that when our students are in a decision making position, that they won't fall back on the easier "profit above all" mentality because we are not certain that they really got the big picture. It is felt that our message needs to be better communicated throughout the curriculum.

Anecdotally, the authors believe that the students' reaction to the material was mixed. Whereas many did get it, and now consciously look for opportunities to be sustainable, the authors feel like some still don't. Clearly our students live in a world where more is better and resources seem unlimited, so thinking about truly being limited is beyond the scope of many of their imaginations.

Throughout the course, the authors received a lot of great comments and most journals indicated that students were really learning. Unfortunately, there were a few students that were determined not to learn. We expected them all to go into the course with an open mind, which most did, but some not so much so. This was a new experience for the authors. Generally when we enter an operations management class, students come with experiences and ideas, but political prejudices are rarely apparent or a problem. Since some ultra conservatives see saving the planet as a liberal effort to institute socialism throughout the world and thus bad, we had some forces to contend with that we didn't expect. One young man wrote in his journal, "The professors ought to explain to the class why this country still has unions since it's a proven fact that unions only

hinder productivity!” Going into the course we hadn’t anticipated such closed mindedness and did not have mechanisms in place to deal with it.

STUDENT EVALUATIONS

The student evaluations were mixed too. Many loved the course, but a handful did not. We think that this handful were those closed minded students who wanted to prove us wrong. One wrote several times in his journal that “this doesn’t apply to my major” which is interesting because that’s not what we asked nor was it even true. The authors feel too that using the same classroom evaluations for an experiential travel course is not assessing what it should. The first two questions on our student evaluations are about the faculty being organized and strictly adhering to the syllabus. Although these are clearly good goals, we feel that the ability to adapt on the fly is more relevant to a travel course. Clearly we wouldn’t want to miss a “teaching opportunity” because it wasn’t planned and placed on the syllabus. And when teaching a full course in 19 days, things that normally are minor hindrances, become major. For example, we had issues with the internet speed in some of the hotels. Had we been on campus, it wouldn’t have been a problem and if it was, we would use flashdrives but having not prepared for this, we only had between us all around four flashdrives.

We do though believe that the reason for less than ideal student evaluations really has to do with students’ preconceived notions that conserving the environment or benefitting people can only be accomplished at the expense of profitability and not the operational mishaps (like the slow internet). We did not plan for this. As Management Scientists, we find that students don’t come into our courses with prejudices or preconceived notions (other than their convictions that they “can’t do math”) so this was new to us and provided us with a real learning experience.

Lessons learned – What provided the greatest source of learning?

Without a doubt, taking students to visit companies and requiring them to journal about those experiences provides a great source of learning. Even if they don’t agree with the message, they must think about it and explain their source of disagreement which is learning. And unfortunately, many students think that a “real” person provides better information than a professor, so this method of teaching is effective.

In order to keep the students engaged throughout, a large portion of their grades was based on their consultancy work. As noted earlier, prior to leaving on our trip, students were divided into teams and assigned to a local company. Students were then required to meet with company representatives and then present to the rest of the class some basics about their assigned company. Students knew then that when they returned from the trip that they would be presenting directly to the company representatives on how their respective companies could be more profitable by adding in more sustainability or being more socially focused. The results of

their solutions were mixed but it is felt that they did have some good ideas that might be implemented.

At the end of the course, students were required to write a reflective essay. We had guided them through their journals in preparation for this essay which seemed to work well. Given the responses we received on the journals, it is evident that the methods that we used to teach worked well.

Lessons learned – What would we do differently?

Dealing with IT issues while on the road was a major nightmare that could easily have been avoided. The authors could use a lot more paper handouts and homework, but that goes counter to our message. Probably a better approach would be to require students to have two flashdrives, so we could hand them back and forth, i.e., we would be grading one assignment while they were working on the next. This is a simple fix.

Dealing with students' preconceived notions and attitudes is tougher. One possibility is to interview students beforehand and only allow students with "the right mindset" to enroll. The problem there is that although the school allows us to choose our students for travel courses, if we don't make our numbers then we don't get teaching credit. So if the course were to be taught again, we would probably still take all interested students but we would develop a survey about attitudes that we would have them fill out both before the class and afterwards.

Student engagement and excitement was present in some students, but clearly not in all. Next time the authors would determine in advance which students were more likely to be engaged and spread them out among the groups. The students should also have more chances to grade each other's attitudes and contributions to the group.

Much of the work that students did was in teams which the authors found to work well. From previous experience it had been decided early on that *we* would choose the members for each team. This worked but where this approach fell short was not having them grade one another and as mentioned above, the authors did not try to determine in advance which students were less likely to be engaged. In hindsight, the authors should have found more information out about each student and spent more time/effort in assigning them to groups. Then the students should have had the opportunity to grade one another so that social loafers would be exposed. As it was, we learned about social loafing through the grapevine which is not a reliable source for adjusting grades.

Requiring daily journals was just too much. It was tough on the students and even tougher on the faculty. Next time we would require either much shorter journal assignments or have journals due every other or every third day.

What was learned as a class, i.e., do businesses practice sustainability for image or profit?

It became quite evident after several site visits that businesses that practice a high level of sustainability do it both to be profitable and to look like they are green. Several of the sites we visited used solar panels and they were all quick to note that solar panels are not profitable; most have pay-back periods in excess of 20 years. They were quick to note too though that solar panels are big and obvious, and give the impression that a company is sustainable.

All the companies that we visited also had used sustainable measures to save costs. Sometimes it was saving paper, other times saving energy, and other times saving/recycling parts which all had the effect of reducing costs and thus increasing profitability. Something that was common to all the sites we visited was a genuine interest in saving the earth – it wasn't their primary purpose, but it was clear that individuals were invested in their work.

SUGGESTIONS FOR FUTURE CLASSES

Generally speaking the class went well. A small difference in the way the authors collected projects (i.e., using flashdrives rather than uploading files into Blackboard) would have made a huge difference.

A major question that came out of this course which the authors would like to pursue is: are students whose natural inclinations are toward environmental sustainability more likely to enjoy the course and thus rate it highly and are students who believe profits can only be made at the expense of the environment likely to rate the course low? Next time through the course the authors will develop a survey which students will take both before the course and at the end. The survey will be used to determine students' level of understanding the interconnections between profit/people/plant as well as their natural inclinations to believe that profitability should be at the expense of all else.

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Youtube – Ray Anderson on sustainability, As the world faces ever-increasing environmental challenges so the demand for smart solutions is growing - and more and more pressure is being placed on business to help provide an answer.

ASSURING ACADEMIC INTEGRITY OF STUDENT PROJECTS IN AN INTRODUCTORY MIS COURSE – A CASE STUDY

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ABSTRACT

This paper presents some results from a case study of student performance in an introductory MIS course in an AACSB-accredited business school in the US. The objective of this study was to investigate the efficacy of quiz-type examination methods in incentivizing originality and mitigating the possibility of copying and plagiarism among students with respect to computer assignments.

Keywords: Instructional Methods; Academic Integrity; Assurance of Learning; Assessment Methods

INTRODUCTION

Computer literacy is often defined as the “*level of familiarity with the basic hardware and software (and now Internet) concepts that allows one to use personal computers for data entry, word processing, spreadsheets, and electronic communications* [1].”

An ongoing polling project conducted by National Public Radio (NPR), the Kaiser Family Foundation, and Harvard's Kennedy School of Government indicates that 81% of Americans under age 60 are currently using a computer at home or work [9]. Furthermore, according to the same pooling results, “*kids give their teachers and schools good marks on their ability to teach kids about computers - 87% say their teachers know how to use computers, and 75% say their school has done a pretty good job teaching them about computers.*” It is, therefore, conceivable to expect a higher level of computers literacy from students entering college today than those of the past generations. For instance,, most freshmen at very least know how to use email and browse the web, and possess basic knowledge of some word processing and spreadsheet software. Such literacy, however, does not necessarily implies computer self-efficacy (i.e., a person's perception of his/her individual ability and capacity to accomplish specific tasks involved in various aspects of operating a computer – including the use of a new software package) on the part of students. To that end, a study by Karsten and Schmidt [3] based on comparing computer self-efficacy of two independent samples of students enrolled in an introductory information system course in 1996 and 2006 documents an interesting observation: even though the 2006 group “*reported significantly more computer experience, used computers much more frequently, and took significantly more core courses that require computer use*” than the 1996 students, “*their computer self-efficacy was significantly lower*” than their 1996 counter parts. Clearly, the results of such analyses may vary widely across and within various academic institutions as different student populations are likely to display a different spectrum of prior experiences and self-competencies with computer applications; however, the need to ensure that all students, irrespective of their background, have mastered the fundamental skills in Microsoft application development in core MIS courses prior to advancing higher level specialized course remains unchanged.

Considering the above, most introductory MIS courses require students to demonstrate their competency and proficiency in computer skills which include spreadsheet modeling, relational database design and web page developments. This requirement is usually met by students completing a series of hands-on computer project assignments throughout the semester. These projects are typically designed to achieve the desired learning outcomes by providing the students with opportunities to utilize Microsoft Excel and Access functionalities to propose solutions to small business problems. Since the projects are handled as “homework” and carried out outside the

classroom, it is therefore very important for the instructors to be able to trust that that work submitted by a student in compliance with an assignment represents his/her own original work. This element of trust in as noted by McLafferty and Foust [4] is the “holy grail” of academia, and is necessary for not just surviving but thriving of our profession. Unfortunate, although most students view cheating as unethical, studies have shown that a “*substantial proportion will cheat in college* [5],” especially as they “*continue to face various sources of pressure from family, potential employers, and others to achieve higher grades* [6]” in order to keep their hopes for securing gainful employment in tough economic times alive. The negative consequences of students cheating are not limited to academia as today’s college students will be the decision makers of tomorrow’s business world. And, research suggests that “*those who cheat in college are more likely to cheat on the job* [2]” and that “*past cheating is a strong predictor of future cheating* [8].” Hence, as concern over professional ethics in the business community is growing rapidly – owing to revelations unethical corporate activities in recent years – the need to address the issue of academic dishonesty in business schools, accordingly, is becoming more critical. The issue at hand is very clear: “*what students learn as acceptable behavior in classroom in the classroom impacts their expectations of what is acceptable professionally* [2],” thus, it is imperative for course instructors to adopt proper safeguarding measures against cheating to mitigate the risk of rewarding, and thereby implicitly rewarding, an unethical behavior.

CASE STUDY

This note reports on an experimental study conducted over a year-long period within the framework of an introductory MIS course which is part of the core curriculum of an AACSB accredited business school. In addition to covering the fundamentals of MIS and e-Business, this course calls for hands-on development of several Excel Spreadsheet and Access database applications by the students throughout the semester. The task of developing such applications are assigned as course projects and students are expected to complete each project assignment on an individual basis with no collaboration/consultation with others and submit the requested outcomes within a specific timeline to receive due credit for their work. The projects constitute about 25% of the total points on the course assessment scale and contain an extensive set of tasks related to design, construction and testing of the applications, as well as series of “*what-if*” questions which are focused on analyses of business decision making scenarios.

The authors teach multiple sections of this course to junior-level business students of all business majors each semester. As the number of students enrolled in this course has increased over the years and alternative methods for course delivery (face-to-face, hybrid, or online) have been adopted, the instructors have become concerned about the possibility of some students copying the work of others in one form or another and submitting it as their own original work for credit. Historically, the project work has been carried out outside the classroom, and students have not been quizzed on the content of their project after submitting their work; i.e., the project file and report have been the only bases for grading and assessment purposes. About two years ago the authors decided to experiment with safeguarding measures against cheating and plagiarism that may occur in students project work. One of the ideas explored was to require students to take a proctored multiple-choice exam after completing each project. (See [7] for more discussion about computer-proficiency-type exams as they apply to IT related course in business schools.) The rationale for adopting such measure stemmed from the idea that those who submit copied projects will have a harder time answering a series of questions which are specifically designed to assess student knowledge of the project design and content as well as their competencies for performing specific tasks in Excel and Access environments. Furthermore, it was also envisioned that requiring the students to take a test on their submitted work could serve as a motivation for those students who may be inclined to cheat otherwise to do the project work on their own.

This report contains partial results of this particular experiment, and provides a comparison of student performance under two scenarios: i) project work accompanied by a follow-up multiple-choice exam (PRE, here-in-after), and ii) project work only (PR). Both scenarios were implemented concurrently in two different sections of the course in both fall and spring semesters. The number and content of project assignments were identical for both scenarios in

each semester; however, the apportionment of points to projects/exams was adjusted in such a way that cumulative points assigned to Excel and Access projects and tests under the PRE scenario equaled those assigned to projects only under PR.

Table 1 presents a comparison between the PRE and PR scenarios based on the total scores achieved by the students in each categories of Excel and Access. It should be noted that the scores depicted in Table 1 are cumulative scores which are comprised of two project scores (in the case of PR), and two projects and one test scores (in the case of PRE).

Table 1. Experimental Results
(PR: Projects only PRE: Projects & Exams)

Categories	PRE			PR			(Student <i>t</i> -Test)	Sig.
	Count	Average Score (Out of 100)	Standard Deviation	Count	Average Score (Out of 100)	Standard Deviation		
Excel	67	92.20	17.87	70	90.66	17.36	0.5104	0.3053
Access	67	84.86	26.07	70	92.84	16.59	-2.1282	0.0178

CONCLUSIONS

The preliminary results of our experimental study suggest that the introduction of multiple-choice exams has had a significant impact on the students' performance in the area of Access data modeling. In contrast, the difference in overall scores for Excel projects between the two scenarios does not appear to be significant. Several factors can be affecting such outcomes:

- Although all students must pass a course in Microsoft Office applications as the prerequisite to enroll in this course; nevertheless, our experience show that most students possess a much weaker background knowledge and skill sets, if any, in Access than in Excel.
- Most of our students state that they find Excel more user friendly than Access.
- Student surveys conducted in classroom indicate that the majority of our students believe that they will be more likely to use Excel in their future professional careers than using Access.

Overall, the results seem to suggest that incorporating the multiple-choice exams into the course assessment scheme can be regarded as a step in the right direction in that it can potentially neutralize project score inflations caused by cheating/copying. It should however be kept in mind that that some students perform better when working on project assignments than they do when taking exams. To that end, a proctored hands-on computer test seems to provide a more effective means of assessing students' software skills. More experiments are currently underway to explore such assessment avenue.

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MINORITY STUDENTS' USE OF FACEBOOK

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ABSTRACT

Social media in general and Facebook, the leading social networking site in the world, in particular have provided a venue for a broad variety of studies. Topics of investigation have included ethnicity (Gabre and Kumar, 2012; Grasmuck, Martin and Zhao, 2009), gender (Junco, Merson and Salter, 2010), identity construction (Boyd and Heer, 2006), privacy (Lewis, Kaufman and Christakis, 2008; Pinchot and Poullet, 2012; Whitcomb and Fiedler, 2010), and the effect of social media on student engagement and academic performance (Junco, 2012). There appears to be little prior research, however, that has evaluated the use of Facebook by minority students. This study attempts to address this gap in the literature by presenting the results of an examination on attitudes and use of Facebook by minority students. We also discuss potential future research topics.

Keywords: Attitudes, Facebook, Minority Students, Social Networking, Technology

GDP GROWTH, UNEMPLOYMENT, FINANCIAL STRESS: THE US AND THE UK

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ABSTRACT

This project employs baseline trivariate vector auto-regression (VAR) models to estimate the relationships between financial stress, GDP growth, and the unemployment rate for the United States and the United Kingdom. We then compare the estimations between these two nations. We find that indexes of financial stress can be of value in improving forecasts in these simple exercises.

INTRODUCTION

The recoveries across countries from the “great recession” have been historically slow in terms of economic growth rates and have failed to return unemployment rates to what economists consider normal levels. Additionally, the recoveries across economies have been uneven across nations.

It is commonly acknowledged that the *great recession* had its roots in the financial sector, and that continued financial stress has been one of the causes of the slow recovery from the recession. Most models of macroeconomies based on data since the 1950s predicted faster rates of economic growth and a more rapid rate of recovery of employment.

Because of the focus on the financial sector as a proximate cause of both the recession and slow recovery, many researchers have constructed new indexes of financial stress. (See [6].) Most of these indexes do not extend back very far in time—often only to the early 1990s. Such a short time frame does not provide sufficient data for convincing tests of whether these indexes will be helpful in predicting important macroeconomic variables such as GDP growth and unemployment rates. There are, however, two indexes for the US that extend to the early 1970s. One of the indexes is produced by the Federal Reserve Bank of Chicago, and is termed the National Financial Conditions Index (NFCI). The other is produced by Hatzius, et al. The former is available on-line from the FRB Chicago. The latter was not available for us to use in the project. For the UK, we were able to obtain an index of financial stress from the International Monetary Fund. That index extends back to 1981.

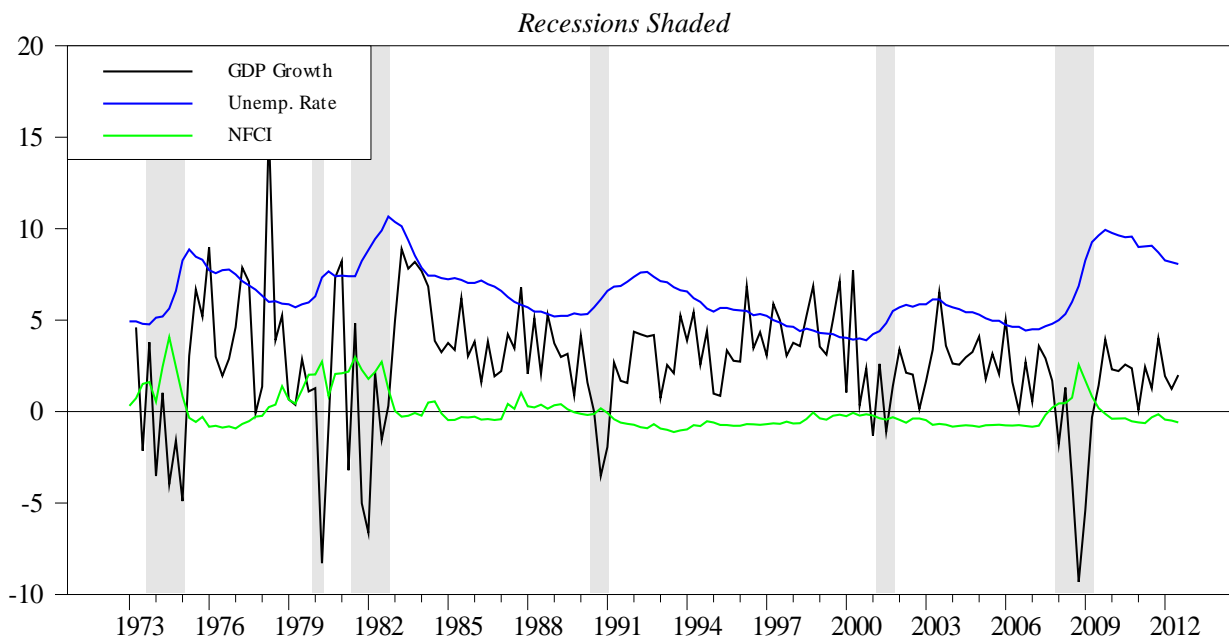
These indexes cover a period of time that includes six recessions for the US and three for the UK. The time frames are sufficiently long to judge whether the indexes can be helpful in predicting growth and unemployment.

DATA AND METHOD

The data for this project begin in the early 1970s for the US and the early 1980s for the UK. In each case, the data set extends through the last quarter of 2012. The variables are the growth rate

(annualized) of real GDP, the unemployment rate, and the index of financial stress. The index of financial stress from the FRB Chicago is a weekly measure. We averaged the weekly values over the course of each quarter, producing the desired quarterly index. The unemployment rates are quarterly averages of monthly data. These series are available from the FRED economic database of the FRB St. Louis, and the FRB Chicago. Figure 1 depicts the US series on unemployment, real GDP growth, and the NFCI for the sample period.

Figure 1: GDP Growth, Unemployment Rate, and NFCI



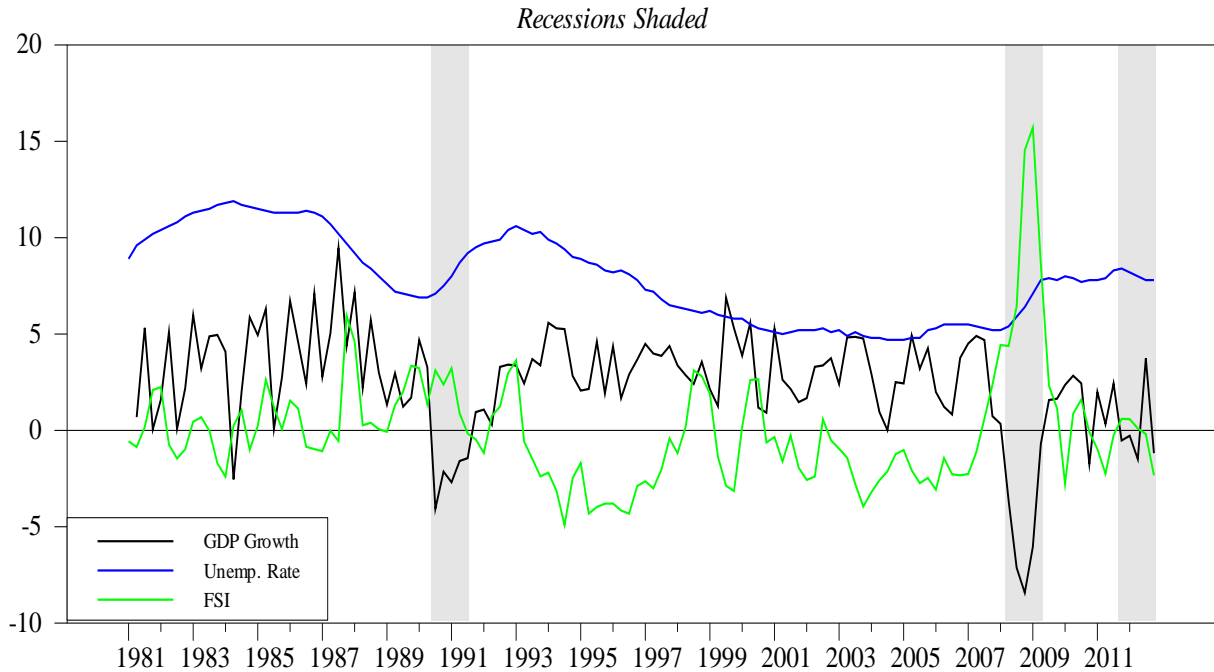
For the UK, the start for the data is constrained to 1981 by the time origin of stress index described above from the IMF. Figure 2 contains the same three measures for the UK.

From inspection of Figure 1 for the US, in which recessions are shaded, it is reasonably clear that the periods following negative real GDP growth are periods of rising unemployment, and that recoveries produce declines in the rate of unemployment with a significant lag. Note also that with the exceptions of the 1990-91 and the 2001 recessions, each of the other four recessions were also accompanied by significant financial stress as measured by the NFCI. It is further clear that the 1990-91 and the 2001 recessions were relatively mild in comparison to other recessions over the time frame depicted in the figure, lending support to the view that financial stress is associated with deeper and more prolonged recessions.

In Figure 2 for the UK, with three recessions shaded for a shorter time interval, some similarities are evident. The first two recessions were accompanied by rising unemployment rates, however during the 2011-12 recession, which was mild in comparison, saw the unemployment rate falling modestly. The 1990-91 and 2008-09 UK recessions were also preceded and accompanied by financial stress as measured by the IMF index, but the stress index was approximately neutral during the 2011-12 recession.

For both the US and the UK, the recoveries from the *great recession*, are, as is widely acknowledged, anemic in comparison to earlier economic recoveries.

Figure 2: UK GDP Growth, Unemployment Rate, and the FSI



To estimate the relationships among the three variables, simple VAR models are estimated for each nation in the form of equation 1.

$$UR_t = \alpha_0 + \sum_{i=1}^p \beta_i UR_{t-i} + \sum_{i=1}^p \delta_i GDP_{t-i} + \sum_{i=1}^p \varphi_i FS_{t-i} + \varepsilon_t \quad (1)$$

Where UR is the unemployment rate, GDP is the annualized quarterly growth rate of real GDP, FS is an index of financial stress, t indexes time, e_t is a white noise disturbance term and the b_i and c_i ($i = 1, \dots, p$) are the lag coefficients, and p indicates the order of the lags. Each variable serves as the left-hand side of (1) in a VAR. We are, of course, interested primarily in forecasts of real GDP growth and the unemployment rate. For comparison purposes we also estimated a bivariate VAR model excluding the financial stress index. We do not report the results of that exercise.

The number of lags to be included in the model can be selected by complexity penalized likelihood criteria such as the Akaike information criterion (*AIC*). The *AIC* can be represented as

$$AIC = (2k / T) + \log(\sigma) \quad (2)$$

where k is the total number of estimated coefficients in the equation, T is the number of usable observations, and σ is the scalar estimate of the variance of the equation's disturbance term. In this case the AIC chooses only two lags. Most VAR practitioners suggest that the AIC is likely to choose lag structures that are too parsimonious to capture the dynamics of the relationships between the variables included in the model. It is generally recommended that at least a year's worth of lags (four with quarterly data) should be included in the estimated model (see [3], p 206). We choose to include a year's worth of lags for the US and the UK in the results that follow.

RESULTS

Estimation and Analysis

Tables I, II, and III are the traditional F-tests of "Granger [4] causality" for the individual equations in the VAR model, where $p = 4$ (lags = 4). Table I suggests that real GDP growth is unrelated to its own lags, perhaps weakly related to the unemployment rate, but significantly related to financial conditions. These results are not particularly surprising given: (1) that real GDP growth does not exhibit smooth persistence, (2) unemployment lags rather than leads real GDP growth, (3) the depth and duration of the recessions are clearly associated with heightened levels of financial stress (see Figure I). Table II indicates that the unemployment rate is related to its own lags as well as those of real GDP growth and the NFCI. Finally, from Table III, the NFCI is related to the unemployment rate, its own lags and perhaps weakly to real GDP growth.

Table I: US VAR F-Tests, Dependent Variable: GDP growth

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	0.6057	0.65914
UR	1.4337	0.22591
NFCI	6.7536	0.00005

Table II: US VAR F-Tests, Dependent Variable: Unemployment rate

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	2.5013	0.045120
UR	1308.99	0.000000
NFCI	15.2162	0.000000

Table III: US VAR F-Tests, Dependent Variable: NFCI

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	1.9627	0.103416
UR	6.3550	0.000099
NFCI	114.46	0.000000

Granger causality tests for the UK estimations reveal some contrasting results. Choosing $\alpha = .10$, here we find that GDP growth is related to its own lags as well as the unemployment rate and the measure of financial stress. The unemployment rate is related in the sense of Granger to

its own lags, GDP growth, but not to the measure of financial stress. Finally, the IMF FSI for the UK is related only to its own lags. While we can expect consistency in measurement of the unemployment rates and GDP growth across these two nations, there are at least two reasons why these comparisons should be viewed with reserve. First, the differing lengths of the data series for the nations is a compromising factor; and second, the measures of financial stress are from different sources and contain different variables.

Table IV: UK VAR F-Tests, Dependent Variable: GDP growth

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	4.1591	0.00355
UR	2.1617	0.07802
IMF FSI	2.2000	0.07363

Table V: UK VAR F-Tests, Dependent Variable: Unemployment rate

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	2.0761	0.088764
UR	4805.35	0.000000
IMF FSI	0.7583	0.554610

Table VI: UK VAR F-Tests, Dependent Variable: NFCI

<i>Variable</i>	<i>F-Statistic</i>	<i>Significance</i>
GDP Growth	1.4178	0.232823
UR	1.0670	0.376388
IMF FSI	37.9501	0.000000

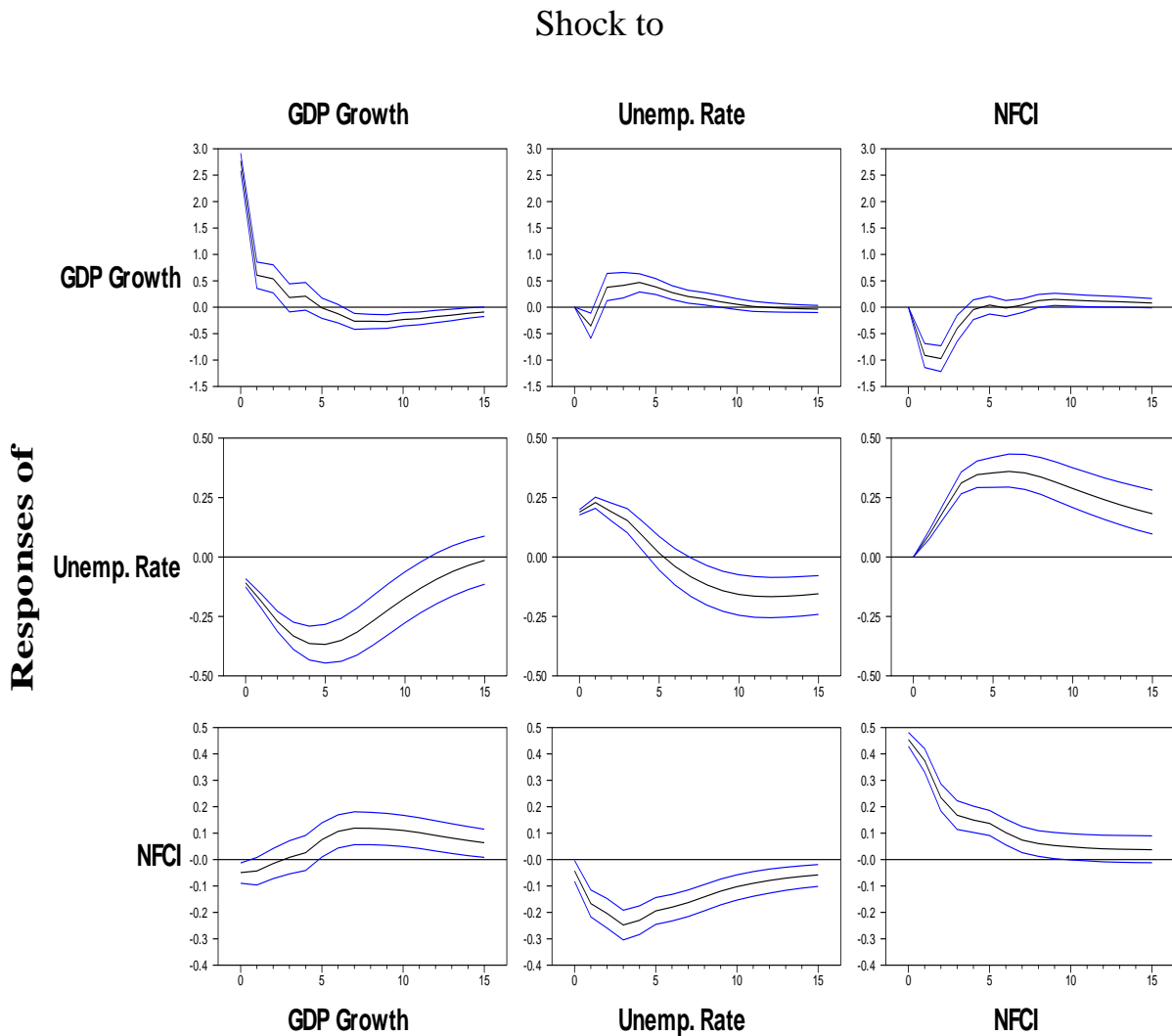
Table VII summarizes the results of the test of Granger causality in a more convenient form. “Yes” indicates causality at the = .10 level of significance. The reader is again reminded that these results are for differing time series lengths for the two nations.

Table VII: Summary of Granger Causality Tests

Dependent Variable	Lags	Causality Tests: US	Causality Tests: UK
<i>GDP Growth</i>	own unemployment rate financial stress	No No Yes	Yes Yes Yes
<i>Unemployment Rate</i>	own GDP growth financial stress	Yes Yes Yes	Yes Yes No
<i>Financial Stress</i>	own GDP growth unemployment rate	Yes No Yes	Yes No No

Figure 3 contains the impulse response functions computed from the VAR model. The blue lines are 95% confidence bands for the variable responses. The impulse response functions simulate the dynamic response of the variables to a one-standard deviation change (shock) to one of the variables. Here the horizon over which the responses are evaluated is four years (16 quarters). For example, the first column represents the responses of the three variables to a (positive) shock to real GDP growth. A shock to GDP growth has a relatively short term effect on itself, a persistent effect on the unemployment rate (GDP growth lowers the unemployment rate as expected), and little short-term effect on NFCI.

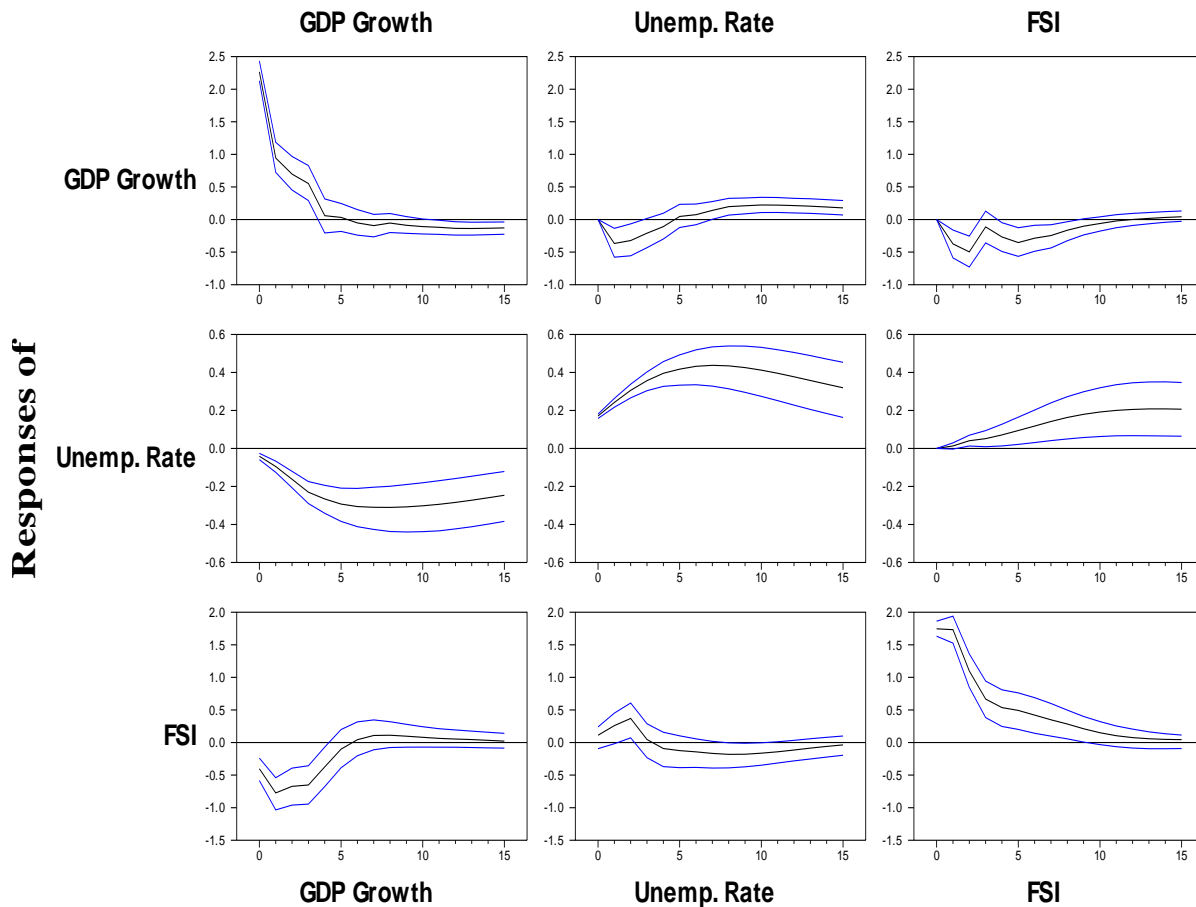
Figure 3: US Impulse Response Functions



A shock to the unemployment rate has relatively little effect on GDP, a short term effect on itself that raises unemployment (as expected) and a longer term effect to *lower* the rate of unemployment. Interestingly, a shock to the unemployment rate has a negative effect on the NFCI (middle panel at the bottom). We suspect the latter result represents an easing of monetary policy due to a rise in the unemployment rate, which by extension could explain why

unemployment ultimately declines following an initial shock to the unemployment rate. Finally, the third column represents the effect of a shock to the NFCI. A one standard deviation change in the NFCI (a worsening of financial conditions) results in a sharp short-term decline in real GDP growth and a persistent rise in the rate of unemployment. These effects are, of course, in line with economic theory and the motivation for constructing such indexes. The bottom right panel might suggest that worsening financial conditions are not short-lived.

Figure 4: UK Impulse Response Functions



The impulse responses for the UK are depicted in Figure 4. The first column of the graphic suggests that a shock to GDP growth has a relative short term effect on itself, a persistent effect on the unemployment rate (similar to the US), and unlike the US suggests a negative (less stress) effect on the IMF FSI. A shock to the unemployment rate has a short term negative effect on GDP growth, a persistent effect on itself, and little if any effect on the FSI. Recall that for the US, a shock to the unemployment rate resulted in less financial stress, perhaps due to a monetary policy response. Finally, a shock to the FSI (more stress) lowers GDP growth, increases the unemployment rate, and such stress is not short-lived.

This last result is consistent with that of the US and lends credence that measures of financial stress are likely to be helpful for both nations in predicting GDP growth and, in turn, the unemployment rate. Such a result is not a surprise, but it is a welcome confirmation that the efforts made in constructing and maintaining these measures of financial stress are useful in the prediction of basic macroeconomic variables like growth and unemployment.

Some Forecasts

Table VIII contains out-of-sample forecasts for all three variables for six years, based on the US data available at the time of this writing. Though the model predicts the absence of stress, most forecasters would agree that only the GDP growth and the unemployment rate are of primary interest as forecasts.

Table VIII: US Forecasts from the VAR

<i>Quarter</i>	<i>GDP Growth</i>	<i>Unemployment Rate</i>	<i>NFCI</i>
2013:01	4.37	7.32	-0.27
2013:02	2.50	7.28	-0.13
2013:03	2.37	7.20	-0.03
2013:04	2.25	7.21	-0.06
2014:01	2.55	7.22	-0.16
2014:02	2.90	7.19	-0.17
2014:03	3.07	7.13	-0.18
2014:04	3.04	7.06	-0.20
2015:01	3.06	7.00	-0.21
2015:02	3.07	6.92	-0.21
2015:03	3.07	6.85	-0.21
2015:04	3.03	6.78	-0.20
2016:01	2.98	6.72	-0.19
2016:02	2.93	6.67	-0.18
2016:03	2.89	6.63	-0.17
2016:04	2.86	6.59	-0.16
2017:01	2.83	6.57	-0.15
2017:02	2.80	6.54	-0.15
2017:03	2.78	6.53	-0.14
2017:04	2.76	6.51	-0.14
2018:01	2.75	6.50	-0.14
2018:02	2.74	6.49	-0.14
2018:03	2.74	6.48	-0.13
2018:04	2.73	6.48	-0.13

The GDP growth predictions are for relatively robust growth in the near term, followed by a smooth return to near mean historical rates (the growth rate of real GDP averaged 2.6% over the

sample period). Similarly, the model predicts that the unemployment rate will decline slowly toward historical averages based on the sample period (the unemployment rate averaged 6.4% over the sample period). Figure 5 contains the same forecasts, with the actual data in the graphic going back to 2006. In comparison to forecasts from a model without the financial stress index, the unemployment rate is a bit slower to converge to the historical mean when accounting for financial stress, while the forecasts of the growth rate of real GDP differ very little between the two models.

Figure 5: US Forecasts of Unemployment Rate, Real GDP Growth

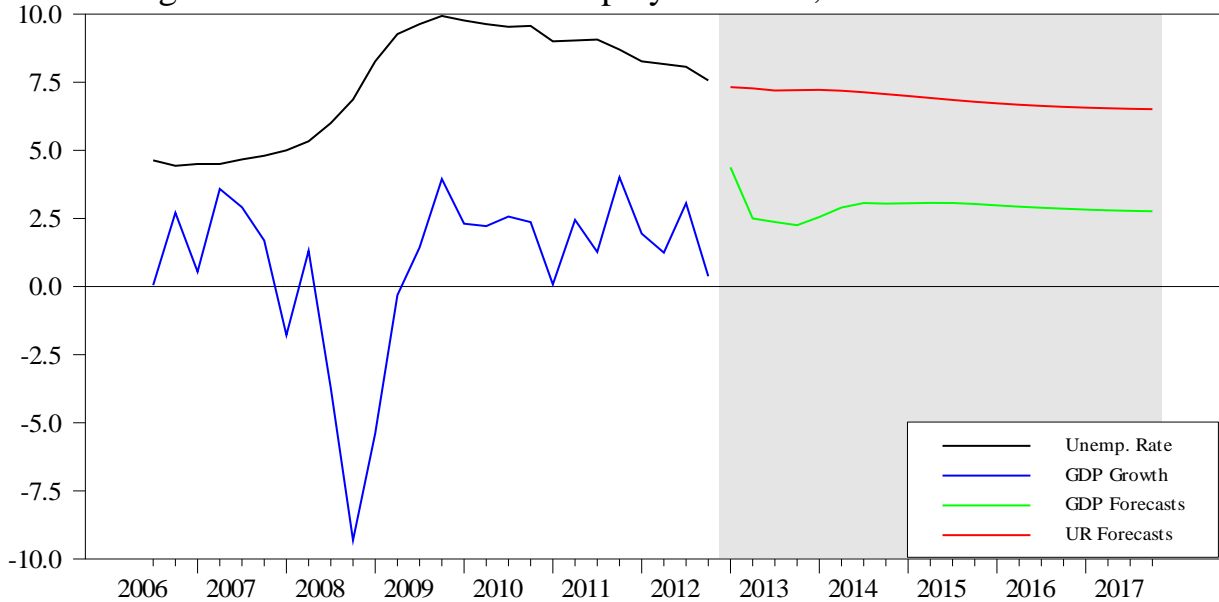


Figure 6: UK Forecasts of Unemployment Rate, Real GDP Growth

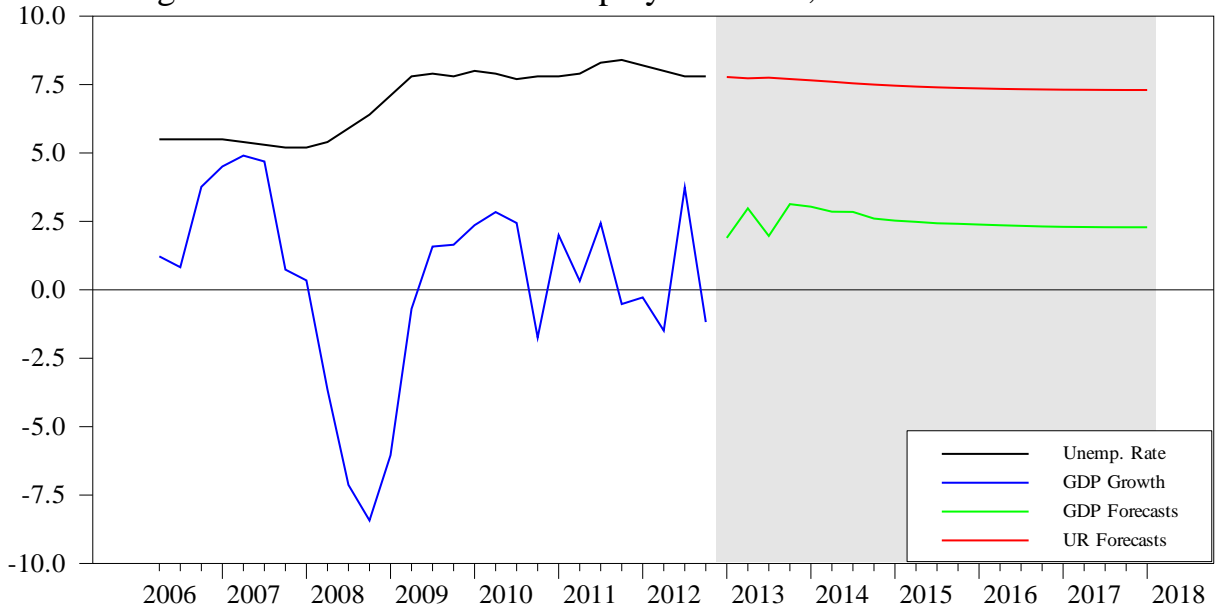


Figure 6 is the graphic representation of the forecasts for the UK and Table IX contains forecasts of the same variable set over the identical forecast horizon as those for the US. Over the period for which we have data for the UK, the growth rate of real GDP averaged 2.48% at an annual rate and the unemployment rate mean was 7.9%. The forecasts suggest a reasonable recovery for the GDP of the UK over the 2013-14 interval and a mild long-term decline in the unemployment rate.

Table IX: UK Forecasts from the VAR

<i>Quarter</i>	<i>GDP Growth</i>	<i>Unemployment Rate</i>	<i>IMF FSI</i>
2013:01	1.90	7.78	-1.15
2013:02	2.98	7.73	-0.52
2013:03	1.97	7.75	-0.05
2013:04	3.13	7.70	-0.26
2014:01	3.04	7.65	-0.56
2014:02	2.85	7.60	-0.57
2014:03	2.85	7.55	-0.50
2014:04	2.60	7.50	-0.37
2015:01	2.53	7.46	-0.23
2015:02	2.49	7.43	-0.13
2015:03	2.43	7.40	-0.07
2015:04	2.41	7.38	-0.04
2016:01	2.39	7.36	-0.03
2016:02	2.36	7.34	-0.02
2016:03	2.34	7.33	-0.02
2016:04	2.32	7.32	-0.02
2017:01	2.30	7.31	-0.02
2017:02	2.29	7.31	-0.03
2017:03	2.29	7.31	-0.03
2017:04	2.29	7.30	-0.04
2018:01	2.29	7.30	-0.05
2018:02	2.29	7.30	-0.06
2018:03	2.29	7.30	-0.07
2018:04	2.29	7.30	-0.07

It is interesting to note that the forecasts of growth rate of GDP for the UK converge near the sample mean (2.48%) and the unemployment rate forecasts converge on 7.3%, lower than the mean over the sample period. Recall that the estimated constant term is a partial determinant of the forecast values in an autoregressive equation.

CONCLUSIONS

We find that vector autoregressions for the US and UK including real GDP growth, the unemployment rate, and indexes of financial conditions perform as expected in forecast settings—that is, the models produce reasonable forecasts for the macroeconomic variables of interest. Traditional F-tests indicate that including measures of financial conditions can improve forecasts for GDP growth and the rate of unemployment. Since that is one of the primary motivations for such indexes, the results here are encouraging, but not particularly surprising. The financial indexes we employ are available over a sufficient length of time for exercises such as those in the project.

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FURTHER ANALYSIS OF THE SIZE PREMIUM IN SMALL BUSINESS VALUATION

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ABSTRACT

Appraisers of value for closely-held enterprises often need to address the impact of small size. A common method to account for size is to use the size premium from either Ibbotson or Duff & Phelps reports. However, since these size premiums are determined from publicly traded firms, the size of “micro-firms” in these reports are still magnitudes larger than the average closely-held firm. This study examines the Ibbotson and Duff & Phelps data to develop various models that better assess the impact of size on the cost of equity calculations for small, closely-held firms.

INTRODUCTION

Valuation of a small closely-held business always presents a difficult estimation process. While various valuation metrics are readily possible from publicly traded enterprises, similar transaction data for closely-held firms is limited to private transaction data bases such as *Pratt's Stat* and *BizComp*. And while these databases certainly provide useful data points, the usefulness of this type of transaction data depends upon finding transactions of firms within the databases that are somewhat comparable to the firm under investigation. In some industry sectors, the databases provide hundreds of transactions to compare, while in other industry sectors these databases may only have a few, if any, transactions reported. Given these constraints, inevitably valuation professionals will examine a variety of different techniques when valuing a closely-held enterprise. The valuator will not only investigate transaction data but also examine the possibility of using a discounted earnings methodology, or a derivative of a discounted earnings methodology such as a capitalized earnings technique. While discounted earnings methods have their own set of

constraints, such as developing an accurate earnings forecast for the firm, a particular requirement for a discounted earnings method is the development of an appropriate discount rate.

It is widely recognized that one method of developing an appropriate discount rate in practice is through a weighted average cost of capital (WACC) approach to the valuation. In a weighted average cost of capital, the cost of capital is computed from three components, the cost of debt, the cost of equity, and the cost of preferred stock. In general, most small closely-held firms do not have preferred stock, in which case the basic formula for the weighted average cost of capital is

$$\text{WACC} = \frac{E}{(E+D)} \times r_e + \frac{D}{(E+D)} \times r_d \times (1-t) \quad (1)$$

where E represents total shareholder equity, D is the total debt, and t is the tax effects associated with the interest on the debt. The cost of debt, r_d , is usually considered the fair market interest rate on the firm's debt. For a closely-held firm, however, a more difficult issue is the calculation of the cost of equity. Unlike the cost of debt, which can essentially be determined from published interest rates, the cost of equity, r_e requires analysis. The WACC is used to calculate an "enterprise" value or market capitalization using an earnings figure prior to the debt service. To calculate an "equity" value, the business related debt is subtracted from the "enterprise value". An alternative way to calculate the "equity" value is to employ an earnings figure after debt service, and use only the cost of equity for the discounting (or capitalization). While there are many different theories and variations associated with this calculation, in practice the most typical method of calculating the cost of equity for a closely-held business is the basic "build-up" method, that is, $r_e = \text{Risk Free Rate} + \text{Equity Risk Premium} + \text{Industry Premium} + \text{Firm Specific Premium} + \text{Size Premium}$.

In practice the risk free rate is determined by the yield rate of a government backed instrument, such as T-bills or T-bonds, although there is some debate as to which is most appropriate. The equity risk premium is generally obtained from one of two data sources which are published annually, Ibbotson (such as the *Ibbotson SBBI Valuation Yearbooks*) or the *Duff & Phelps Risk Premium Reports*. For example, the *Ibbotson SBBI 2009 Valuation Yearbook* [2] reports a value of 7.90% as the overall equity premium (over the 20-year T-bond income returns), while the *Ibbotson SBBI 2012 Valuation Yearbook* reports a value of 6.62% overall equity premium [3, p. 202]. For the Ibbotson 2012 data, the overall equity premium is calculated over the period 1926 to 2011. Ibbotson also calculates an industry equity premium, which examines whether a specific industry sector has risk below or above the overall market. For example, according to the *Ibbotson SBBI 2012 Valuation Yearbook* [2] the Motor and Generator (SIC 3621) industry has an industry premium of 3.38% while the Nitrogenous Fertilizer (SIC 2873) industry has a premium of -1.80% [3, pp. 34-35]. This industry premium would then be added (or subtracted) within the build-up method of calculating the appropriate discount rate for a particular closely-held firm. The fourth component is a firm-specific analysis, which involves examining a particular firm's specific situation, such as quality of management, intellectual property protection, etc. The final component is the size premium, which is the topic of our analysis.

ANALYZING THE SIZE PREMIUM

The relationship between the size of the firm and the value of the firm has received significant attention in the last three decades. From a theoretical point of view, the argument is two-fold. First, larger firms are believed to have more bargaining and negotiating power in the market with

their upstream suppliers and downstream customers. Second, large-firms are believed to have scale advantages both in input components, such as hiring better workers, and in output components, such as size advantages in distribution. The impacts of both of these forces, market power and economies of scale, should be reflected in the firm's past earnings however. It is important to note, therefore, that the impact of size is the component of excess returns achieved that is not accounted for, or implied, by their betas. This suggests that business size reflects an expectation of future market capability not captured in past earnings performance but still reflected in equity prices.

Using transaction data for small closely-held firms taken from *Pratt's Stat*, 2000 to 2010, we estimated a linear regression model of revenue multiple (RevMult) using both earnings before taxes (EBT) and revenues (SIZE) as predictor variables. The estimated model was $\text{RevMult} = 6.25(\text{EBT}) + 1.53(\text{SIZE})$. In estimating the model we assumed that a firm with no revenues and no earnings would have a 0 value, thus no constant term was estimated. As expected, the positive coefficients on EBT and SIZE indicate a positive relationship between transaction revenue multiples and both EBT and SIZE. The model explains 83.4% of the variance (r^2) in observed transaction revenue multiples, with the model being statistically significant at $\text{prob} < 0.01$. Thus for closely-held transactions there does seem to be close relationships between valuation multiples and both firm profitability and firm size. The fact that both EBT and SIZE were significant, and in the expected direction, suggests that a size premium (above the statistical explanatory contribution of EBT) may indeed be appropriate when calculating the appropriate discount rate. Within the build-up method, a smaller sized enterprise receives a higher premium since a higher discount rate translates into a lower valuation given the same earnings

The impact of firm size on the cost of equity is also seen in publicly-traded firms, as revealed by the size premium published by both Ibbotson and Duff & Phelps. Historically Ibbotson calculated the size premium by examining the size deciles of publicly-traded firms, with the 10th decile being the smallest 10% of the publicly-traded firms examined. The *Ibbotson SBBI 2009 Valuation Yearbook* [1] reports a 5.81% premium for the 10th decile of small firms. This premium represents excess earnings not implied by the higher betas typically seen in smaller firms.

When valuing a small closely-held firm, however, there is a problem with using this "decile" premium - the average size of firms in the Ibbotson 10th decile is approximately \$100million in market capitalization. In comparison, the vast majority of closely-held firms have a market capitalization less than \$1.0million. In fact, the median market value in the approximately 12,000 transaction in *Pratt's Stat* between 2000 and 2012 was approximately \$300,000; with the market values ranging higher or lower depending on the industry sector. For example, the median market value of "Eating and Drinking Places" (SIC 5822) in *Pratt's Stat* (2000 to 2012) was \$122,000 and the market value for "Women's Apparel Stores" (SIC 5621) was \$193,000. Manufacturing enterprises tend to have higher capitalization values, such as the \$792,000 median market value for "Wood Furniture Manufacturers" (SIC 2511), while some heavy manufacturing sectors have higher median market values. Comparing a small privately held firm with a category of publicly-traded firms (10th decile of Ibbotson) with a median of \$100million capitalization is like comparing apples and oranges.

This is a particularly serious issue since it is starting to be recognized that the premium for size increases "exponentially" as the firm gets smaller. In 2009 Ibbotson [2] created two sub-

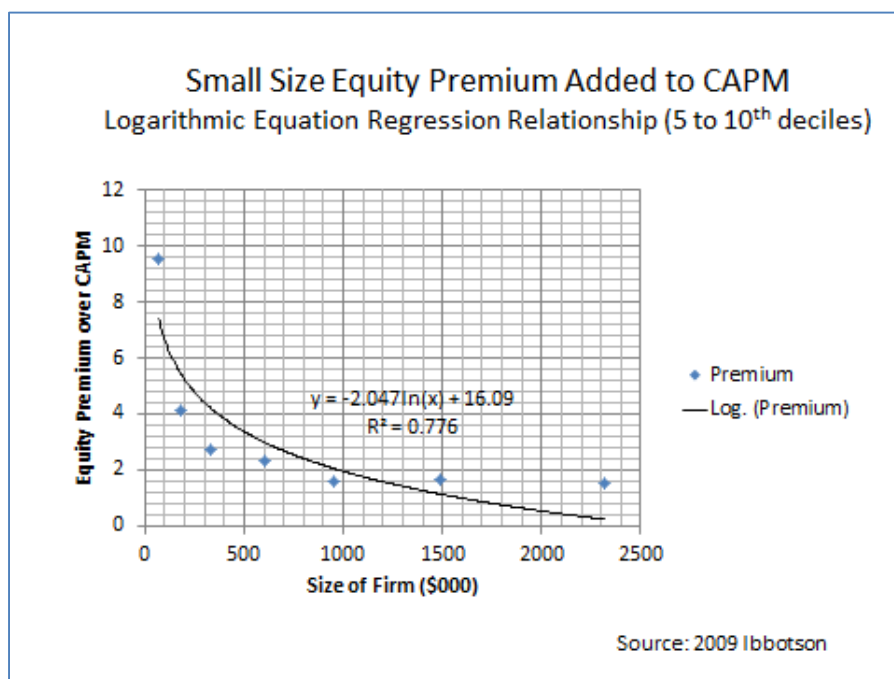
categories in the 10th decile, labeled “10a” and “10b.” For the “10b” group (the smallest firm category reported in the 2009 Ibbotson Report [2] the equity premium is 9.51%; but even then the median capitalization of the firms in the Ibbotson “10b” category is still about \$68.75 million,

What is the true impact of size then? Let us consider a closely-held firm with an approximate \$2.0million total market capitalization (called FIRM A) – certainly the 9.51% “10b” premium suggested in the 2009 Ibbotson [2] report underestimates the appropriate size premium for our example FIRM A. One can see the exponential (non-linear) growth in the size premium by the following equity premiums from 2009 (the year Ibbotson started to examine the sub-categories in the 10th decile).

Source: Ibbotson: SBBI Market Results, 2009

<u>Ibbotson Decile Category</u>	<u>Average Beta</u>	<u>Firm Size (midpoint of firms in Category)</u>	<u>Size Premium</u>
5	1.16	\$2,317million	1.54%
6	1.18	\$1,493million	1.63%
7	1.24	\$950million	1.62%
8	1.30	\$608million	2.35%
9	1.35	\$335million	2.71%
10a	1.42	\$177million	4.11%
10b	1.38	\$68.75million	9.53%
(FIRM A)		~\$2million	???

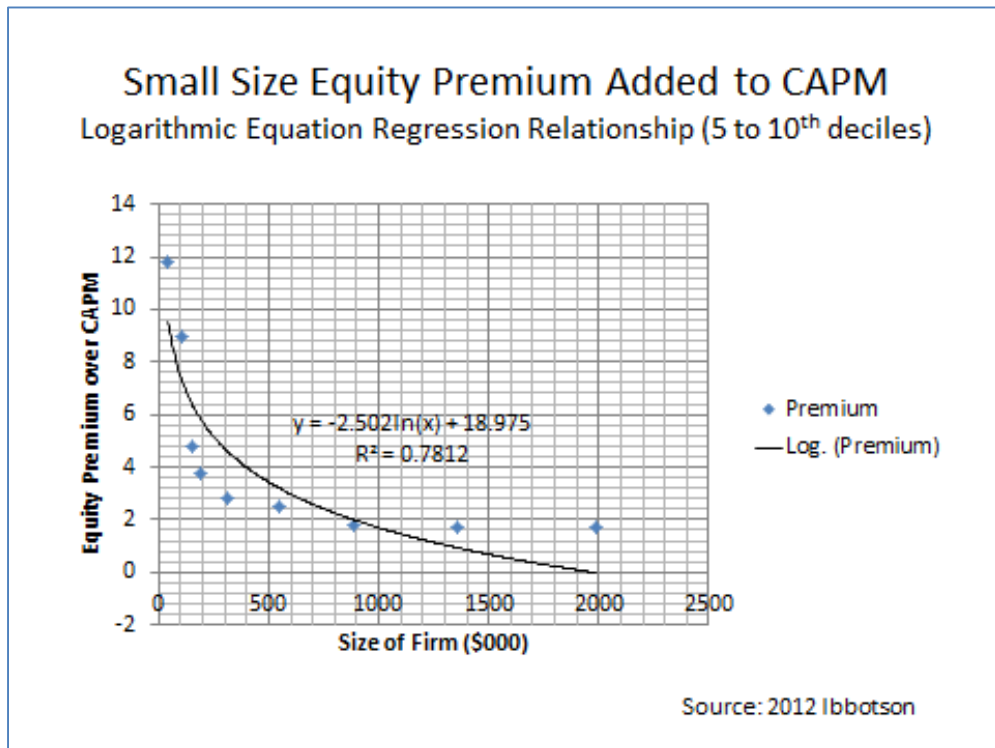
Using this data we calculated several different regression models, using logarithm and power relationships. The logarithmic regression is presented below.



Duff & Phelps, in fact, argue that the relationship between size and premium is indeed logarithmic [1, Exhibit A-1]. It should be noted, however, that when examining the Ibbotson data, the power curve actually fits the data better, with an r^2 of 0.92. Using the estimated logarithmic equation estimated from the Ibbotson categories 5 to 10, the appropriate size premium for our FIRM A with a \$2million capitalization would be 14.67%. Using a power curve we get a 45.94% premium. Using a logarithmic regression on the Ibbotson “micro-categories” of 8 to 10b, results in a size premium for FIRM A of 20.44% - all much higher than the “10b” category premium of 9.53%.

For comparison, we performed the same analysis using the 2009 Duff & Phelps [1] data, which reports 25 size categories (the 25th category, with the smallest firms still has an average market capitalization value of \$111 million). Using the logarithmic formula provided in Duff & Phelps [1, Exhibit 1-A) results in a 13.06% premium for our FIRM A. We also estimated a power curve relationship using the Duff & Phelps data and calculated a 24.15% size premium for our example FIRM A using this power curve relationship. Both the logarithm and power curves using the Duff & Phelps data have r^2 s greater than 0.98 indicating a very good fit with the data.

In 2012, Ibbotson further divided their 10th decile category. Their “10a” category was subdivided into two new categories, “10w” and “10x” while their “10b” category was also subdivided into two new categories, “10y” and “10z”. We therefore analyzed the size premium using this new data. While the data presents slightly more refined small business categories, the same “size” problem is evident given the data comes from publicly traded firms. In particular, while the size premium for the smallest size category (10z) reported in Ibbotson [3] is now reported at a higher, 11.77%, the median size of firms in the “10z” category is still much larger than the typically small closely-held firm (the mid-point of category “10z” is approximately a \$43.5million capitalization).



Using the 2012 model estimate, FIRM A's appropriate size premium would be 17.24% with the logarithm model from above, or 27.18% using a logarithmic model estimated from the 9th and 10th decile subcategories (which actually results in a better fit). The power curve estimates gives an even higher estimated size premium. Regardless of the regression model employed, all of these estimated size premiums are much higher than the 11.77% Ibbotson reports for category "10z".

CONCLUSIONS AND IMPLICATIONS

Many valuation professionals use the basic build-up method for calculating their cost of equity. However, when it comes to analyzing the impact of size for even the smallest enterprises, most valuation professionals still use the Ibbotson 10th decile premium, or if familiar with the newer subcategories in Ibbotson, they might use the size premium of the "10b", or even the more refined "10z" categories. This still understates the impact of size given that the average size of firms in Ibbotson smallest size category (10z) far exceeds the vast majority of small closely-held firms. In fact, only about 8.00% of the sales transactions of closely held firms recorded in *Pratt's Stats* have a market value equal to, or above, the midpoint value of the Ibbotson "10z" category. Likewise the average capitalization of firms in the last category (25th) of Duff & Phelps exceeds the median capitalization of closely-held firm transactions in *Pratt's Stats* by a magnitude of 200.

When valuing a small closely-held firm, simply using the Ibbotson or Duff & Phelps small firm premiums in a build-up method will certainly result in a lower than appropriate cost of equity calculation, and thus a valuation estimate substantially higher than appropriate.

For example, assume that our sample FIRM A has a normalized earnings (after adjustment for fair market expenses and debt service) of \$300,000 with an expected capitalization of approximately \$2million. Using *Ibbotson SBBI 2012 Valuation Yearbook* [3], the risk free rate is reported as 2.48%, the equity premium is 6.62%, and the "10z" small firm premium is 11.77% for a total of cost of equity of 20.87%. Ignoring industry and firm specific premiums, assuming no growth and using a simple capitalization of earnings method (adjusted earnings/capitalization rate), this results in a calculated equity value for FIRM A of \$1,437,470.

However, using the same risk free rate and equity premium, but with a calculated 27.18% small firm premium using the logarithmic model estimated from the Ibbotson 9th and 10th decile subcategories (2012 data, see above), we calculate an estimated cost of equity of 36.28%. Using this higher cost of equity then results in a calculated equity value of FIRM A of only \$826,902.

Value Calculation: FIRM A Example		
	<u>Ibbotson "10z"</u>	<u>Calculated (Logarithm Model)</u>
Risk-Free Rate (2012 Ibbotson)	2.48%	2.48%
Equity Premium (2012 Ibbotson)	6.62%	6.62%
Small Firm Premium	<u>11.77%</u>	<u>27.18%</u>
Total Cost of Equity	20.87%	36.28%
Normalized Earnings	\$300,000	\$300,000
Calculated Equity Value	\$1,437,470	\$826,902

Thus using the simple decile method, the calculated value of our sample firm is possibly 73.8% higher than the appropriate value calculated using our regression methods, or an overestimate of \$610,000. This is a significant difference, and the type of important issue that can significantly impact buy-sell agreements, court testimony, and estate valuation when examining smaller, closely-held firms.

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Improving Hospital Laboratory Performance through Optimal Stage Selection: The Analytic Hierarchy Process Approach

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ABSTRACT

Laboratory services in healthcare delivery systems play a vital role in inpatient care. Laboratory testing alone accounts for approximately 10% of hospital billing. A goal for the U.S managed healthcare delivery system is to considerably reduce laboratory costs. To aid in achieving this goal, this research study focuses on the optimization of a clinical laboratory in a hospital system. This paper shows how the analytic hierarchy process (AHP) is utilized in assessing and ranking the three stages of the laboratory process to determine the stage that is most critical for optimization purposes. Once this stage is identified and optimized significant cost savings can be achieved. The final results of the AHP model indicate the preanalytical stage is the most critical stage amongst the three stages in the laboratory process.

INTRODUCTION

Laboratory medicine, which can also be described as clinical pathology, is a field where pathologists provide testing of patient samples (generally blood and/or urine). Hospital laboratories are healthcare facilities where laboratory medicine is conducted. Laboratory testing accounts for approximately 10% of hospital billing, which is a significant component of healthcare delivery cost [1]. Studies have shown that laboratory data affects approximately 65% of the most critical decisions on admission, discharge, and medication [1]. For example, the presence of bacteria can be detected from a patient sample, which provides information for the necessary treatment. A clinical test conducted on a sample can determine the level of enzymes in the blood that reveals a risk of a heart attack or the level of glucose in the blood that is an indicator of diabetes. Moreover, service quality is critical in laboratory medicine. Every time high quality service is not provided to a patient requiring a laboratory test, another blood draw will have to be performed. This will cause excessive and unnecessary needle sticks for patients, which will over time decrease customer satisfaction and increase laboratory costs. Overall, laboratory medicine is a key component in healthcare delivery systems due to the amount of spending, the importance of service quality, and the impact on medical decisions.

Hospital laboratories need to be improved in order to reduce healthcare costs and increase service quality, which are the overall goals for this study. In the laboratory process there are three core stages: preanalytical stage, analytical stage, and postanalytical stage. Each of these stages will be discussed in further detail in the section of Background on the Hospital Laboratory Process. In each of the stages it is important to consider the amount of cost saving that can be obtained, the amount of time that can be reduced, and the increase in the quality of the procedures. The specific objective for this study is to identify which of the three core stages is the most critical and should be selected for improvement. Selecting the most critical stage to improve could achieve the most cost savings and the highest increase in service quality.

In this study, the Analytic Hierarchy Process (AHP) Model is used to rank the three stages in the laboratory process. The stage with the highest priority number when ranked from highest to lowest will be selected as the most critical stage to improve. Literature has indicated that the AHP methodology has been a viable option for many healthcare managers and providers when determining the best selection amongst multiple alternatives regarding medical treatment and healthcare facility performance [4] [5] [6] [7] [8] [9] [10] [12].

The remainder of the paper is outlined as follows. In the next section, the background on the laboratory process in a healthcare delivery system is provided. Subsequently the steps required to develop an AHP model are presented followed by the AHP model developed for the hospital laboratory in this study. Finally, the results are presented and a discussion of future research is provided.

BACKGROUND ON THE HOSPITAL LABORATORY PROCESS

The hospital laboratory process includes three core stages: preanalytical stage, analytical stage, and postanalytical stage. The preanalytical stage includes the steps such as a physician placing an order, patient identification, dietary considerations of the patient, medication considerations, coordination of care and treatment for the patient, assessment of other physical status (IV's, access ports, etc.), selecting proper tube type and the actual blood collection process. Figure 1 illustrates each step of the preanalytical stage. For the preanalytical stage, the aim is to decrease the amount of errors that occur within this stage of the process. It has been concluded that over 60% of the errors that occur in the hospital laboratory take place in the preanalytical stage [2]. The way to reduce the errors is to identify and prevent the associated root cause. Thus, laboratory professionals, physicians, and nurses should more or less focus on the source of the error and not just the error itself [3]. Figure 1 illustrates each component of the preanalytical stage.

The analytical stage involves the testing aspect. There are several different testing methods used depending on the test request. The medical technologist or technician is responsible for tasks pertaining to the instrumentation or testing requirements, instrumentation calibrations, and on-the-spot maintenance. The analytical stage consists of analyzing the specimen, running tests on the specimen, and retrieving the results. Figure 2 illustrates each part of the analytical stage.

The postanalytical stage involves the review of the results prior to sending them out. Medical technicians are involved in this process by reviewing the lab results for normal or abnormal ranges. A pathologist's review might also be required. Results are sent to the ordering or referring physician once they have been analyzed for abnormalities. There are strict guidelines on how the results can be sent or transmitted. The auto verification process has been implemented in the last few years for many hospital laboratories. In an auto verification process, rules are written in the Laboratory Information System (LIS) to evaluate the results and if all criteria are met, the results are sent to the patient records without a technologist review. In practice, this frees up the technicians to focus on the problem specimens. Figure 3 illustrates each component of the postanalytical stage.

Figure 1: Preanalytical Stage in Hospital Laboratory

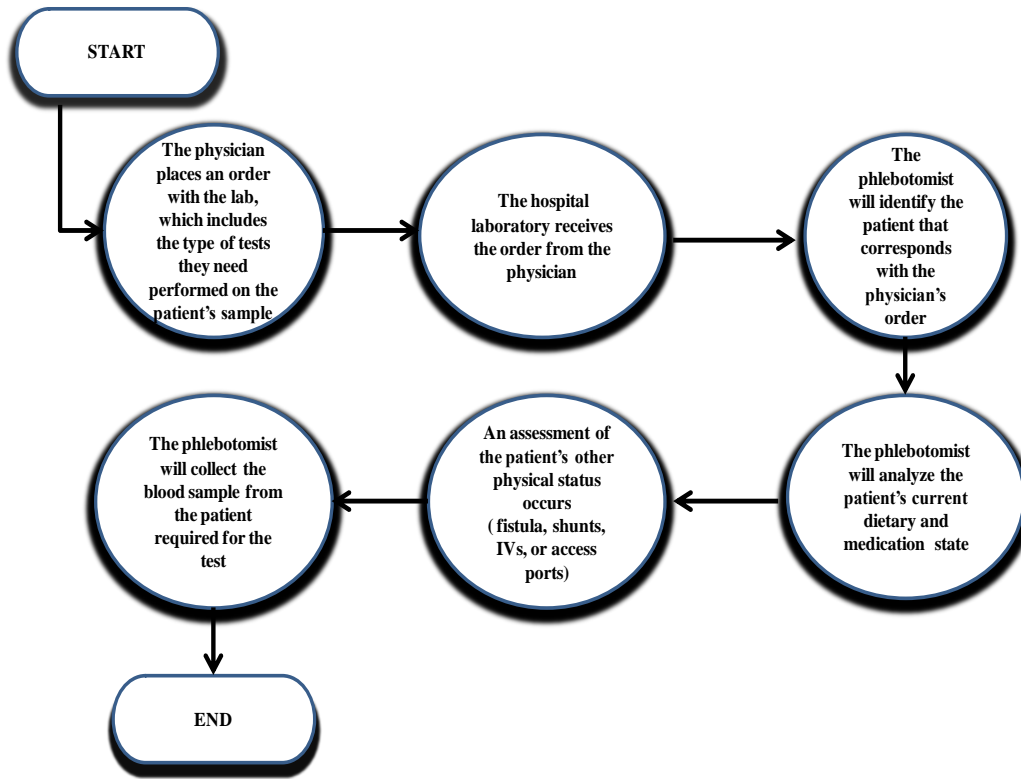


Figure 2: Analytical Stage in Hospital Laboratory

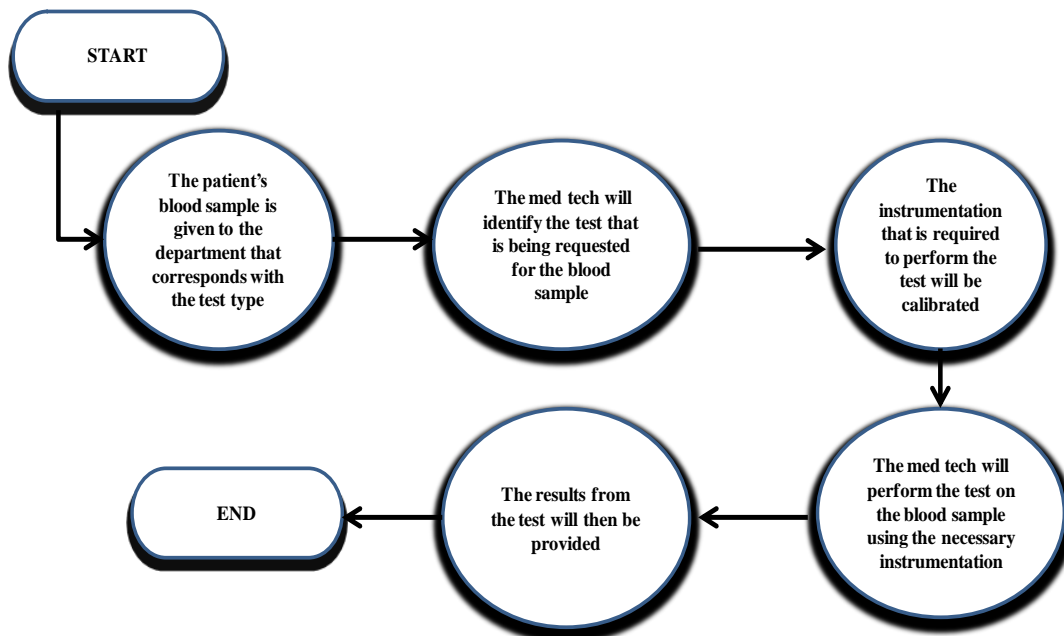
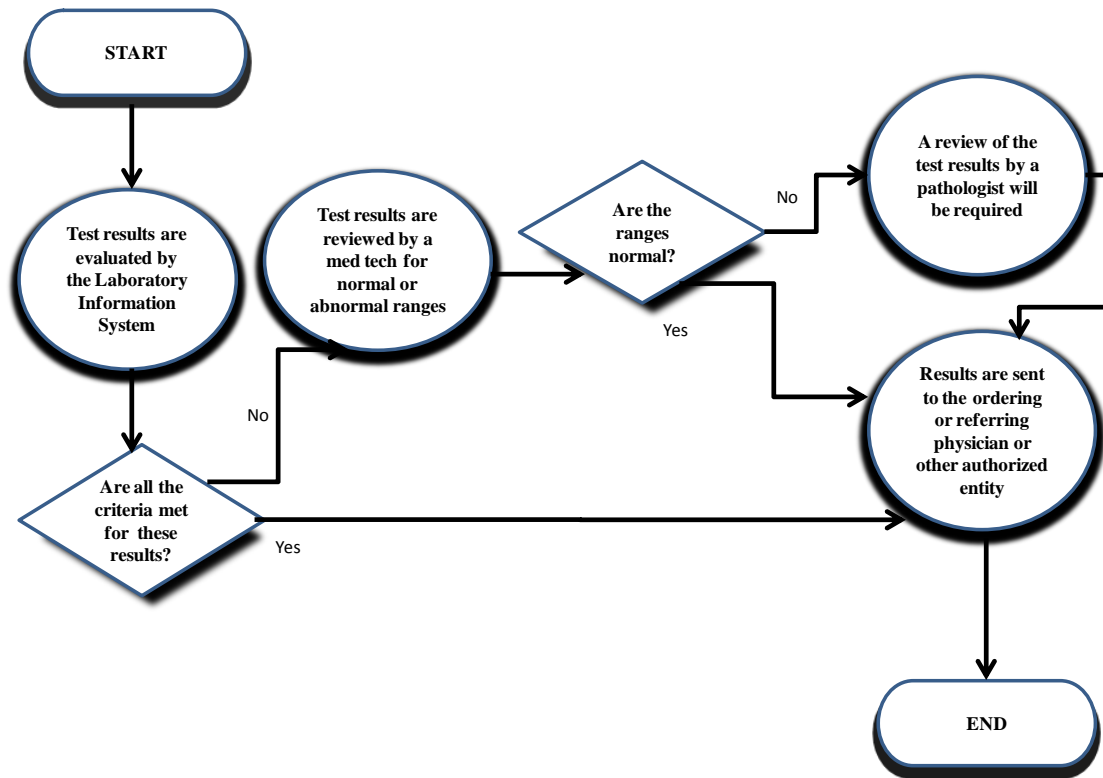


Figure 3: Postanalytical Stage in Hospital Laboratory



THE ANALYTIC HIERARCHY PROCESS (AHP) MODEL

The AHP, which was developed by Thomas Saaty in the 1970s, is a structured technique for analyzing complex decisions. Rather than prescribing a correct decision, the AHP helps decision makers find one that best suits their goal and their understanding of the problem. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

In this methodology, a complex decision problem is broken down into smaller components and then pairwise comparisons are performed to develop priorities in each hierarchal echelon. The pairwise comparisons are made using actual measures or a scale of absolute values that indicate the strength of the preference, and ratio scales are obtained from these discrete and continuous pairwise comparisons within the hierarchal structure. The AHP can incorporate perspectives and purposes to reach one overall conclusion. Listed below are the four steps of the AHP process (Saaty, 2008).

- Step 1: Define the problem and determine the kind of knowledge sought.
- Step 2: Structure the decision hierarchy from the top with the goal of the decision, then the objectives from a broad perspective, through the intermediate levels (criteria on which subsequent elements depend) to the lowest level

(which usually is a set of the alternatives).

Step 3: Construct a set of pairwise comparison matrices. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.

Step 4: Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below. Do this for every element. Then for each element in the level below add its weighed values and obtain its overall or global priority. Continue this process of weighing and adding until the final priorities of the alternatives in the bottom most level are obtained.

The alternatives, evaluation criteria, and pairwise comparisons used in the AHP model development for the hospital laboratory case are as follows:

Establishing the alternatives

For this study, the alternatives consist of the three stages in the laboratory process: preanalytical stage, analytical stage, and postanalytical stage. Therefore, a link is present between the alternatives in this study as they are all a part of the total testing process. Once a test order for a patient is received by the hospital laboratory it must go through all stages of the laboratory process. For this study only one of the three stages can be selected for process improvement and optimization purposes. It is imperative to identify of the three stages that make up the total testing process, which stage is the most critical. Once this is determined, this stage will be selected for improvement.

Establishing the evaluation criteria

Four process improvement techniques are utilized in the AHP Model as the evaluation criteria to determine the amount of improvements each methodology could achieve within each of the three core stages. The evaluation criteria in many studies have been centered on what it is to be accomplished, whether it is cost reduction, marketability, reduction in waste, etc. In this study, instead of only focusing on what there is to be accomplished, the focus is on the improvement tools that can achieve the goals identified previously. The four process improvement techniques are: Theory of Constraints, Lean, Critical Business Process, and Six Sigma. These are widely used improvement techniques that have been used in several areas of the healthcare delivery system. These four process improvement techniques are briefly introduced below.

- **Theory of Constraints:** This is an approach to solve constraints and problems by determining its roots and determining steps to remove the root of the problem. The output of one step depends on the output of one or more previous steps and the system will be constrained, by the least productive steps. The system's constraint specifies the performance and in order to increase the system's performance one must identify and explore the system's constraint. Initially, the constraint is identified. The next step is to focus on how to get more accomplished within the current capacity limitations, which is described as exploiting the constraint. The non-constraint resources must then be lowered. This is done to prevent tasks from waiting at a non-constraint resource that is performing a job that the constraint doesn't require. Once the non-constraint resources

have been subordinated, then it is determined if the output of the constraint is enough to meet the demand. If it is determined there is not enough to meet the demand then it is essential to find more capacity by elevating the constraint. After the output of the constraint is no longer limiting the rate of fulfilling orders, it is no longer the constraint. The final step is to go back to the beginning of this process and identify the new constraint. The five step process is then repeated.

- **Lean:** The basis of this methodology is to maximize customer value while minimizing waste. The objective is to provide perfect service to the customer through a process that has zero waste. To achieve this, lean optimizes the flow of services through value streams. Eliminating waste along all value streams, instead of at specific points, creates processes that require less manpower, less money, and less time to provide a service ensuring much fewer defects.
- **Critical Business Process:** This strategy involves identifying those processes necessary to achieve business objectives. An organized approach to identifying critical business processes requires one to: define the critical business processes; rank the critical business processes; classify independency amongst those defined; and lastly determine the minimum requirements for each of the critical business processes identified.
- **Six Sigma:** This is a business management strategy widely used in many sectors. Six Sigma strives to improve quality by identifying and removing the causes of errors and minimizing variability in processes. This methodology uses quality control and statistical methods. A six sigma process is one in which 99.99966% of all items are statistically expected to be free of defects (3.4 defects per million). The DMAIC project methodology has five phases: Define the problem and the project goals, Measure key aspects of the current process and collect important data, Analyze the data to explore and determine relationships, Improve the current process based on previous steps, Control the sustainability of the improved process to make certain variations from the target are corrected in time to prevent errors.

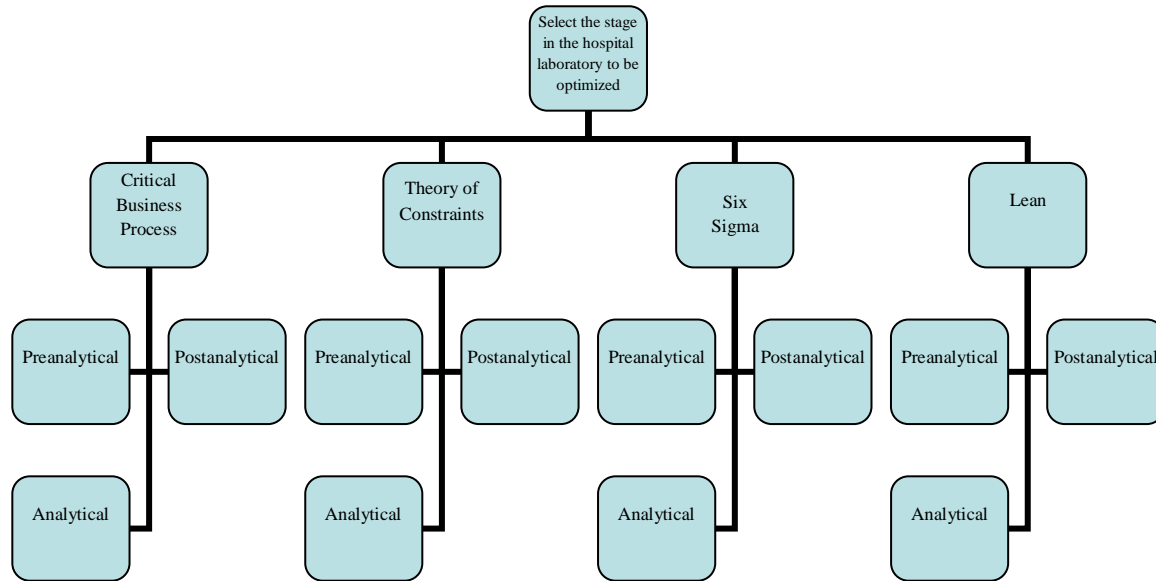
Interdependency has been established and ensured for each of the evaluation criteria due to the fact that these are four totally separate improvement methodologies and each of them will be evaluated separately to determine the impact it will have on each of the three stages of the laboratory process. The objective is to determine how each of these process improvement techniques will affect each of the alternatives and in what capacity, in order to select the most critical stage for optimization purposes.

Pairwise comparisons

The judgment of an expert was used to develop the pairwise comparisons for this study. The expert has approximately 20 years of experience working in and managing hospital laboratories. The decision on the weight of the evaluating criteria and the alternatives has a direct impact on which stage is selected. For that reason, the judgment used had to reflect that of an expert in the laboratory medicine field. Several meetings were arranged with the expert to gain feedback and judgments regarding this study. The AHP Model for this study has been formulated to

demonstrate how the best features of the four improvement methodologies could be used together to develop an approach for prioritizing and selecting the stage for improvement in the hospital laboratory of a healthcare delivery facility. The success of the AHP has been seen in applications where the results produced corresponded with identified answers in the real world or from predicted outcomes. Therefore, this technique is a trustworthy approach for making decisions based on priorities and significance. The AHP model structure is provided in Figure 4.

Figure 4: The AHP Model for the Hospital Laboratory Case



RESULTS AND DISCUSSION

Weights of the Evaluation Criteria

In the AHP model, i is the index for methodology and j is the index for the stages in the laboratory process. w_i denotes the weight for methodology i and w_{ij} denotes the weight for methodology i and stage j . Weight w_i and w_{ij} are determined using pairwise comparisons. These weights are presented in Table 1 and Table 2. Based on the weights, the overall score of each

stage (W_j) is determined by $W_j = \sum_{i=1}^I w_i w_{ij}$.

The expert's response indicated that six sigma had the highest priority, with a ratio of .4792 followed by lean with a ratio of .3027 then theory of constraints with a ratio of .1368. Critical business process had the lowest priority with a ratio of .0813. These ratios indicate six sigma will provide the most improvements to the stages in the laboratory process with the critical business process methodology providing the least amount of improvements.

Table 1: Weights for each Methodology

Methodology	Weight
Lean= w_1	0.3027
Six Sigma= w_2	0.4792
Theory of Constraints= w_3	0.1368
Critical Business Process= w_4	0.0813

Table 2: Weights for Each Methodology i and Stage j

	Preanalytical Stage $j=1$	Analytical Stage $j=2$	Postanalytical Stage $j=3$
Lean $i=1$	0.5492	0.3312	0.1196
Six Sigma $i=2$	0.5515	0.2767	0.1718
Theory of Constraints $i=3$	0.5389	0.2972	0.1637
Critical Business Process $i=4$	0.4670	0.3763	0.1567

Weights of the Alternatives

The results from the final analysis indicated the preanalytical stage, with a weight of .5422, was the most critical stage in the laboratory process. The analytical and postanalytical stages followed, with weights of .3139 and .1539, respectively, as indicated in Table 3.

Table 3: Overall Weight for each Stage

Laboratory Stage	AHP Score
Preanalytical	0.5422
Analytical	0.3139
Postanalytical	0.1539

Applying the Results

Data consistency is critical for the AHP model. The consistency check involved calculating the ratio of the consistency index to the random index. For the AHP model in this study, the consistency index and random index are 0.067 and 0.90 respectively. Thomas Saaty, founder of the AHP model, has proven that if the ratio is greater than 0.1, serious inconsistencies may exist and the AHP model may not yield meaningful results. If the ratio is less than 0.1, the degree of consistency is satisfactory. According to the ratio of 0.0744, it can be concluded the data provided from the expert was of good quality and the results presented from the AHP model are meaningful.

CONCLUSIONS AND FUTURE WORK

As the healthcare industry continues to grow rapidly, obtaining both efficiency and effectiveness within healthcare delivery systems has become a major priority. In order to increase patient satisfaction and patient safety, hospital laboratories must improve their overall effectiveness. Also, reducing errors and waste will significantly reduce overall costs faced in hospital laboratory facilities.

The results from the AHP Model indicated the preanalytical stage is the most critical stage in the laboratory process. This finding confirms what other qualitative studies in the literature have discovered. This study uses AHP modeling to provide a quantitative approach to determining the most critical stage in the total testing process in hospital laboratories.

The limitation of this study is that only the stage selected from the AHP Model will be improved. This is due to the assumption that improving the stage selected will have an indirect effect on improving the other two stages. Although each stage has a separate priority ranking based on the results of the AHP Model in this study, each stage is an important part of the total testing process. Therefore, each stage should be optimized such that all resources are being utilized in the most efficient manner and errors are being considerably reduced to achieve the maximum cost savings. Future work will include developing an Analytic Network Process (ANP) Model and/or another decision making model to compare with the results from the AHP Model developed in this study; this will provide additional validation that the proper stage in the hospital laboratory has been selected to improve.

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EXPERIENTIAL LEARNING THROUGH INTERNSHIPS

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ABSTRACT

Experiential learning activities are important for business students. Internships can be an important part of programs as students prepare for the business world. This paper discusses the ten-plus years of a business internship program noting benefits for students and other groups.

INTRODUCTION

The mission of the School of Management at Lander University is to provide high quality business education that prepares students for positions of leadership and responsibility. The Quality Enhancement Plan (QEP) of the university is the EYE Program (Experience Your Education). The EYE Program is designed to provide students with the opportunity to use academic knowledge to address real world challenges in an authentic setting. The School of Management embraces this philosophy by encouraging internships and participation in community projects.

The School of Management offers an “undergraduate only” business program. The university has an enrollment of approximately 2,900 students and is located in Greenwood, SC, which is in upstate South Carolina. The city has a population of approximately 23,000 and the county has approximately 60,000. The primary service area for Lander University includes a seven county region with a total population of approximately 256,000. Manufacturing, health care, and the service sector are the major economic drivers for the region.

Lander University believes experiential learning is critical for our students and continually seeks opportunities that provide this type of learning. Lander is a “small school” in a “small town” and its location is somewhat remote from any of the larger cities and metropolitan areas of South Carolina. Because of these factors, traditional internship opportunities are not readily available for Lander students. To ensure experiential learning opportunities are available to Lander

business students, a program is offered that allows students to earn course credit for internships that are generally located in the Greenwood, South Carolina, area. We discuss this internship program in detail following the literature review.

LITERATURE

Numerous benefits have been identified in studies on internships. Swanson and Tomkovick [3] consider marketing internships and highlight benefits to students, the university, and businesses providing the experiences. Purposes of the research were to “(1) better prepare students for marketplace success, (2) modify curricula to improve lower-rated skill areas, and (3) to partner with firms looking for marketing interns.” The authors found that communication, positive attitude, work ethic, and willingness to learn were the most important student skills for successful internships. The authors note that students found improvement in social skills to be the most important benefit of internships. Businesses appreciate the opportunities to evaluate potential employees and to build relationships with universities. Faculty work to improve curricula based on results of the study. Weible [4] found that internship programs help in developing and strengthening community connections and that student recruiting is positively impacted by internship activities. Knouse and Fontenot [2] noted that internships lead to better employment opportunities. Their review of the literature on internships found that interns gain valuable experience and knowledge of organizational processes.

In his 1968 seminal article, Gore [1] argues that doctoral programs in business do a poor job preparing candidates, allowing them to complete degrees without meaningful contact with the business world and not knowing what business is like. He notes that business schools and the business community are mutually dependent. A major conclusion of the paper is that “practice is an invaluable aid to formal learning and should accompany rather than follow it.”

THE BUSINESS INTERNSHIP PROGRAM

At Lander the business students earn the BS in Business Administration with an emphasis in Accounting, Finance/Economics, Health Care Management, or Management/Marketing. Internships are available in all four emphasis areas and are required in the Health Care Management area. Figure 1 shows the number of internships over the last ten academic years and depicts the significant growth in the program.

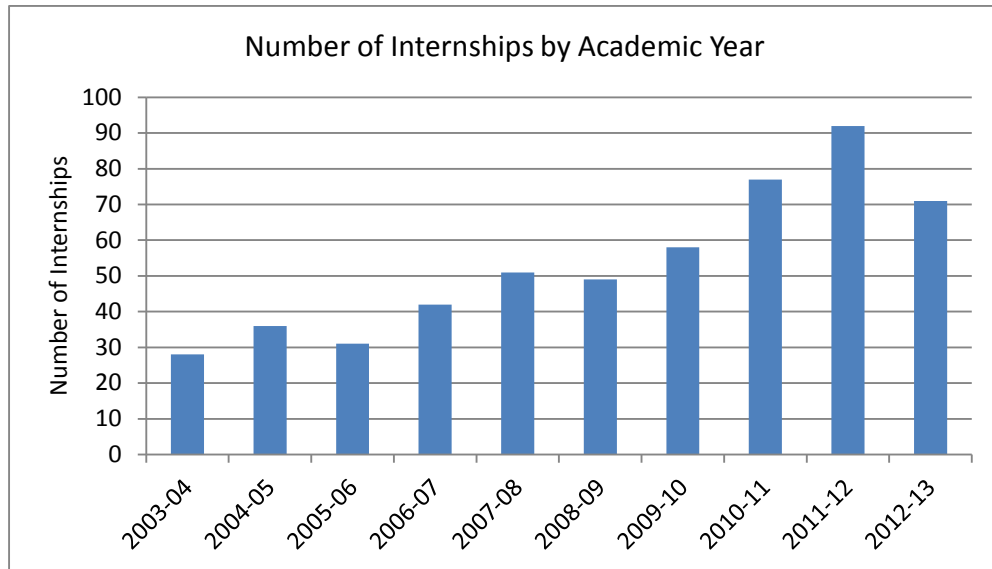


Figure 1

The internship program has existed for many years, but its growth occurred with the University’s commitment in 2008 to experiential education in its QEP and the business faculty’s desire to provide more hands-on learning. The Business Administration program graduates approximately 110 students each year and about 70% complete an internship. In its AACSB accreditation reaffirmation visit in 2007, the internship program was identified as a “best practices” and in the visit completed in 2013, the team again expressed accolades for it. During the last ten years, the program provided 527 internships, but the number in the most recent five years was nearly double the previous five years.

To be eligible for an internship, a student must have junior or senior class status and meet the GPA requirements for the emphasis area. Internships are managed by two faculty members in the School of Management, who are called faculty sponsors, and one interviews each potential intern to gauge the student’s “readiness.” The internship faculty sponsor, the student’s advisor, the School Director and College Dean must all approve a student enrollment in an internship. Students sign up for the internship course during pre-registration for the upcoming semester. The instructor serves as faculty sponsor for the course.

Occasionally, a student locates the internship site, but in at least 95% of the internships the faculty sponsor handles the placement. During the initial interview with the student, the faculty sponsor discusses the student’s interests and learning goals and then attempts to find an organization and manager who will work with the student. The manager role in the internship is called a “preceptor” and will be a mentor to the student. This method requires the faculty sponsors to create a broad network of supportive organizations, but results in a higher probability that the student will have a positive learning experience. The faculty sponsors make it clear to both the preceptors and the interns that the internship work should be meaningful not menial. Companies that sponsored internships over the last five academic years are listed in Exhibit 1.

When a “match” is made between the student and an organization, the faculty sponsor requires the student to set up an internship interview with the potential preceptor. This allows each to

meet the other before a commitment is made by either party. Very rarely does one not want to proceed with the internship; the program's "match-making" has been 99.7% successful. Prior to 2000, internships were pass/fail, but a change was made to a graded course about twelve years ago. This resulted in students taking the requirements much more seriously. All course requirements are detailed in a course syllabus and an Internship Manual that was developed and updated as the internship program evolved. The faculty sponsor makes it clear that the intern is responsible for following the requirements set forth in the Internship Manual. See Exhibit 2 for the Internship Manual "Table of Contents". The Internship Manual is about 25 pages including instructions and forms.

In addition, each intern is required to attend an orientation session at the beginning of the semester and prior to the beginning of the internship. The orientation session gives an overview of the internship requirements covered by the manual. The session also provides an opportunity to discuss dress, conduct and behavior in the workplace. After the face-to-face orientation, communications between the faculty sponsor and the student is handled electronically until the end of the semester when group presentations occur. Of course, meetings can be requested by the student/intern or faculty sponsor if necessary.

The internship "course" requirements for the student are summarized below:

- Complete the required work hours. Internships can be structured for one to six credit hours. A 3-credit internship requires 110 hours of work and the time is proportionately adjusted for more or fewer credit-hours.
- Attend an orientation session. At the beginning of the semester several orientation sessions are held where the faculty sponsors review the course requirements. The only other scheduled face-to-face meeting with the faculty sponsor is at the end of the semester.
- Submit an Internship Profile which is a summary record of the student and preceptor contact information.
- Execute and submit Internship Agreements for the intern and the preceptor. The agreements define the student's responsibilities and the role of the preceptor. The agreements also include a section for the student to define learning goals and objectives and for the preceptor to define the job description and the preceptor's expectations of the student.
- Submit Weekly Activity Reports. The Internship Manual provides a list of the information required as well as a sample report. The emailed report is due by 5:00 pm the Monday after the end of the work week and the preceptor must receive a copy of the report. Required information includes: hours worked each day, cumulative hours worked, schedule for the next two weeks, reflection on the week's work experience and progress toward the student's goals.

- Complete Mid-Point Evaluations of the Intern. These evaluations must be completed by both the student and the preceptor. Evaluation forms are provided in the Internship Manual and the intern is responsible for ensuring the evaluations are completed and submitted to the faculty sponsor. The students are evaluated on the following skills: problem solving/inquiry, communication, collaboration, professionalism, and industry specific skills.
- Complete and present an Internship Project. This is an important course requirement unless the internship does not lend itself to completing a project and the preceptor asks it to be omitted. The subject of the project must be a meaningful topic and provide value to the internship organization. The project must be agreed upon by the intern, preceptor and faculty sponsor. A formal PowerPoint presentation on the project and its results must be made to the preceptor's organization. A rubric for the evaluation of the project is included in the Internship Manual for the preceptor's evaluation of the project. The PowerPoint slides must also be provided to the faculty sponsor.
- Complete an Ethics Exploration exercise, which must be conducted with the preceptor during the second half of the internship. The intern must prepare 5-10 questions to ask the preceptor relating to ethical issues in the workplace and ethical dilemmas faced by the preceptor. After the interview, the intern must prepare a summary memo for the faculty sponsor. The memo must include the preceptor's answers to the questions and the intern's reflections/thoughts about the interview.
- Complete Final Evaluations by the intern and the preceptor using the same evaluation forms discussed earlier in the "Mid-Point Performance Evaluations" section.
- Send a Thank You Note to the Preceptor. This note is sent at the completion of the internship. The "Thank You" must be hand-written on note card stationary or typed on the student's personal letterhead. The note should be mailed or hand delivered to the preceptor and a copy must be submitted to the faculty sponsor.
- Make an End-of-Semester Group Internship Presentation. Each intern must present a summary of his internship experience to the other interns in his group. The Internship Manual is very specific on the presentation requirements and content. PowerPoint slides must be used as part of the delivery and must include advanced features of PowerPoint (e.g., photos, clip art, slide animation, etc.) Content requires the following items: Introduction to Internship Organization, Intern's Work Experience, Highlights of Internship Project, How knowledge gained in coursework was applied in the internship, and How students could be better prepared for the work world.

If the internship site is local, the university expects the faculty sponsor to make a visit to the internship site once during the semester. The visit is a confidential meeting between the faculty sponsor and the preceptor so the student's performance can be discussed.

INTERNSHIP MANAGEMENT BY THE FACULTY SPONSOR

The internship program was designed to minimize the burden on the preceptors and thereby increase the internship opportunities. However, reporting requirements are fairly intensive for each intern and management of the paperwork by a faculty sponsor with multiple interns could be very onerous. In order to efficiently and effectively manage internships, a "paperless" system was developed to manage the reporting by each intern. An electronic folder is established for each intern and includes an Excel Grade Book schedule for the intern (See Exhibit 3). Interns are instructed to send all documents in electronic format, either as an actual electronic document or as a scanned document. As each document is received, it is graded, saved in the intern's individual folder and the assignment grade is entered in the Grade Book. Interns may ask for a copy of the Grade Book at any time.

The internship provides the student the opportunity to apply knowledge, skills, and abilities acquired in the classroom and to grow as a business professional. The students are expected to perform good work, exhibit proper professional behavior, and manage themselves well. The vast majority do all three very well, but occasionally problems arise. All of the internships over the last ten years have been managed by two faculty sponsors and they have noticed a pattern of common issues or problems student/interns experience:

- A few will treat the internship like a course and not a job. They will be late or absent without following proper call-in procedures. Occasionally, they will dress inappropriately or report to work with a hangover.
- A few do not seem to know how to behave in a professional environment and have made inappropriate comments to co-workers or behaved inappropriately (such as texting in front of customers).
- In these situations, the preceptors are encouraged to take the disciplinary steps that would apply to an employee, even to the point of terminating the intern. The faculty sponsors encourage the preceptors to be firm and formative in addressing behavior problems and the faculty sponsor may need to step in and assist.
- Some students do not give the academic requirements enough emphasis. They will miss deadlines and beg forgiveness; they will not read the instructions carefully or appear "clueless" about what is required. The students are told business professionals must be good at self-management and the students are not given much mercy when they do not meet expectations.
- Fortunately, these severe problems are rare. Over the last ten years, three students were terminated and/or failed the internship and about 20 others had significant problems. Over 95% of the interns perform very well, have great learning

experiences and represent themselves and the university in an outstanding fashion.

BENEFITS

The School of Management has sponsored 527 internships during the last ten years. In the end-of-semester presentations each student is asked to summarize what they did and learned during the internship and to provide feedback to the faculty. Nearly every student suggested that an internship should be required of every business major.

The expanded internship program has greatly strengthened linkages between the University and the local community. Over the last five years, students have interned at 96 different organizations and about half of the organizations have had more than one intern. The internship program is clearly creating more direct relationships between the university and many local organizations. The program does not function with job placement as a goal, but 5-10% of the students are offered positions with their internship site.

Exhibit 1: Internships, 2008 - 2013

Internship Sites	Students	Internship Sites	Students
Abbeville Area Medical Center	5	Habitat for Humanity	3
Actaris - iTron	5	Horace Mann Insurance (C. Leo)	5
Alegent Health (Kansas)	1	InMed Diagnostic Services	1
AmeriCare Health	1	Internal Medicine of Greenwood	1
Anderson Area YMCA	1	Jackson Hewitt	1
Anmed Health Medicus Surg Center	1	Lakelands Federal Credit Union	1
Argo & Associates	1	Lander University	16
Ashley House Assisted Living	1	Larson-Allen CPA's	1
Astra/CFX	1	Laurens County Health Care System	9
Ballentine Ford	1	Linda Dolny	1
Blue Star Gas in Santa Rosa, CA	1	Lowe's	1
Burton Center	4	Magnolia Manor Nursing Home	1
Capsugel	4	McCravy Law Firm	1
Carolina Cardiology Associates	1	MEG's House	1
Carolina Pride	1	NHC - Greenwood Nursing Home	4
Chick-Fil-A	2	Northland Cable	1
Clark Eustace Wagner CPA PA	4	Ouzts-Tinney Chiropractic	1
Cliff Stumbo, CPA	1	Performance Tennis at Brookstone Meadows	1
Coldwell Banker Lake and Home	1	Petra Health & Rehab of McCormick	1
Community Initiatives	2	Piedmont Agency on Aging	2
Connie Maxwell Children's Home	2	Piedmont Health Group	1
Cooper Power Systems	2	Pure Tennis USA/ Bonal Consulting	1
CountyBank	1	Quality Automotive Group	1
Covidien	2	R. Dale Padgett Family Practice	1
Crawford's Contracting Services	1	Roger C. Peace Hospital (Greenville)	1
Cutter Outdoor Management	1	Rolling Green Village CRCC	1
Eaton Electrical	10	Ronney State Farm (Abbeville)	2
Eaton Hydraulics	2	S&S Tax Service	1
Elliott-Davis, LLC	9	SC-Bio	6
Emerald Benefit Services	1	Self Medical Group	16
Emerald Gardens Assisted Living	4	Self-Regional Healthcare	53
Financial Advisors of NYC	1	Small Business Development Center	12
First Steps	1	State Farm	3
Future Stars Tennis Program	1	Sterling House Assisted Living	1
Garden House Assisted Living in Anderson	1	Sunny 103.5 FM	3
Generations	1	The Mill House	1
Godwin & Associates CPA's	2	Tinsley & Adams Law Firm	1
Abbeville Chamber of Commerce	1	Turning Point Women's Center	4
Greene & Company	3	United Way of Greenwood & Abbeville Counties	13
Greenville County School District	1	Upper Savannah Council on Governments	1
Greenville Hospital System	1	Velux	6
Greenwood Area Chamber of Commerce	8	Walt Disney World – Coronado Springs	1
Greenwood County Community Foundation	4	Wellness Works	1
Greenwood Fabricating & Plating	2	Wesley Commons	22
Greenwood Genetic Center	2	YMCA of Greenwood	1
Greenwood Partnership Alliance	7	United Way - Volunteers in Tax Assistance	16
Greenwood Regional Rehab Hospital	7	Grand Total	347
Greenwood Regional Tourism & Visitors Bureau	2		
Greenwood Surgical Associates	3		
Greenwood Urology	2		

Exhibit 2: Table of Contents from *Internship Manual*

TABLE OF CONTENTS

	Page
<u>Introduction</u> . This gives a brief overview of the internship.	1
<u>Course Grading and Key Requirements</u> . This section provides information on how the course grading will be managed.	2
<u>Orientation Meeting</u> . Students will be required to attend an orientation meeting regarding the internship course.	3
<u>Internship Agreements</u> . The student intern and preceptor must complete these agreements at the beginning of the internship.	4
<u>Weekly Internship Activity Report</u> . An email reporting on the activities for the past week must be sent to the faculty sponsor.	7
<u>Internship Profile</u> . Each student must submit a database on the internship.	8
<u>Performance Evaluations</u> . At the mid-point and conclusion of the internship the preceptor will provide the student intern with a performance evaluation. Also, the student must do a self-evaluation.	9
<u>Ethics Exploration</u> . Each intern is required to conduct a formal interview of the student's preceptor regarding the preceptor's experience and viewpoints on business ethics.	15
<u>Faculty Site Visit</u> . During the internship, the faculty sponsor will make a site-visit to meet with the preceptor unless the internship site is beyond Greenwood County.	16
<u>Internship Project & Presentation</u> . A "project" must be completed for the preceptor's organization and the student intern must deliver a formal presentation on the project (using PowerPoint) for the preceptor.	17
<u>Thank You Letter to Preceptor</u> . The intern must send the preceptor a thank you note or letter upon completion of the required hours.	19
<u>End-of-Internship Presentation / Review</u> . During the fall and spring semesters a joint meeting of all the interns will be held at the end of the semester. Each student will present a summary of their internship experience to the group and reflect on the educational experience at Lander. Summer school presentations are handled individually.	20
<u>Frequently Asked Questions</u> . This section answers typical questions often asked by interns.	22

Exhibit 3: Sample Internship Gradebook in Excel

Student	Jane Doe				
Course	BA				
Internship Site	Gwd Chamber of Commerce				
	Possible Pts	Pts Earned			
Internship Agreements	50	25			Due the Monday after starting
Orientation Meeting	25	50			Must attend a scheduled meeting on campus
Weekly Activity Reports	300	280			Average score of weekly reports
Internship Profile	50	50			Due the Monday after starting
Performance Eval-Mid-point	100	90			Due before 60% of hours are completed
Project Approval	25	25			Due before 60% of hours are completed
Project PPT Slides (Written)	50	45			Due by the last day of classes
Project Presentation	50	45			Due by the last day of classes
Ethics Exploration	50	40			Due by the last day of classes
Performance Eval-Final	100	95			Due by the last day of classes
Thank You to Preceptor	50	50			Due by the last day of classes
Internship Presentation	150	135			See Manual for requirements\
TOTAL Points	1,000	930			
Total Possible Points		1,000			
% Earned of Total Possible		93%			
FINAL GRADE		A			
Hours Completed			112.0	102%	% Hours completed as of last report
Weekly Activity Reports	Average%	93%		110	= Hours Required by Last Day of Classes
- Once the internship begins weekly reports must be submitted even if no work was done. Each report will be graded based on 100% and then the average score of all reports will be used for the determining the total points earned for the weekly reporting.	Date Due	Score	Hours		
	01/16/12	75%	12.0		Report was one day late
	01/23/12	100%	10.0		
	01/30/12	95%	8.0		Grammar errors in report
	02/06/12	75%	12.0		Report was one day late
	02/13/12	100%	9.0		
	02/20/12	100%	10.0		
	02/27/12	100%	12.0		
	03/05/12	100%	8.0		
	03/12/12	100%	0.0		Spring Break
	03/19/12	75%	11.0		Report was one day late
	03/26/12	100%	8.0		
	04/02/12	100%	12.0		Done with Hours
	04/09/12				
	04/16/12				
04/23/12					
04/30/12					Last Day of Classes
Approved Project:	National Volunteers Week				

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AN ANALYSIS OF ORGANIZATIONAL STRUCTURES WITHIN RURAL MULTI-HOSPITAL SYSTEMS

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ABSTRACT

This study examines rural southern hospitals that are part of a multi-hospital system. Using AHA data, three financial variables: cash-on-hand, operating margin, and return on equity serve as dependent variables in the analysis of covariance models. The treatment variable is the profit/non-profit status of the hospital and the covariate is the size of the hospital, as measured by the number of hospital beds. Results indicate that for-profit hospitals, on average, keep 27.26 fewer days of cash on hand than non-profit hospitals. Operating margins and return on equity are larger for profit than for non-profit hospitals, an average difference of 5.6% and 8.36% respectively.

INTRODUCTION

Considering the increasing challenge to provide access to affordable healthcare in the United States and its effect on the economy, it is critical for patients, healthcare organizations, financial institutions, and federal and state agencies to understand the impact of different organizational structures of affiliated hospitals. The primary objective of this study is to investigate the relationship of different organizational structures within rural multi-hospital systems (MHS) to the hospitals' financial performance.

Currently, healthcare represents nearly 18% of the entire U. S. economy and is one of the few bright spots in terms of job growth. Hospitals are an integral part of our healthcare system. In 2010, there were 5,724 registered hospitals in the United States, 4,972 (86%) of which were community hospitals, 3007 (60%) belonged to a system and 1,535 (30%) were part of a network [2]. In 2010, 1,987 hospitals in the United States (34.5% of total) were classified as rural hospitals, serving primarily rural populations [2]. One of the largest issues with many hospitals, especially ones located in rural areas, has been the financial viability of their business model.

LITERATURE REVIEW

The Hill-Burton Act, helped rural hospitals utilize over \$4.6 billion in grants and \$1.5 billion in loans and grants which helped the construction of about 6,800 healthcare facilities in more than 4000 communities [16]. The federal government attached provisions to any funds that states received. These included: facilities or a soon-to-be updated portion of a facility must be made available to all persons residing within the territorial areas of the application, and a portion of

facilities being built or modernized had to be made available to members of the community who cannot pay for medical treatment [16][23].

A 2004 study found that over half of the converted Critical Access Hospitals (CAHs) were losing money prior to their affiliations and new payment structure allotted as a result of being categorized as a Critical Access Hospital [6][13]. A 2009 study found that rural hospitals that converted to a CAH were able to increase their operating revenue, expenses, and margins significantly [13]. After the conversion, these hospitals increased their profit margin by 2 to 4% [22]. In 2001, one in every nine hospitals was a CAH. A year later, one in every seven hospitals and one in every three non-metropolitan area hospitals were classified as CAH.

Several studies have addressed the issue of organizational structure and its effect on financial performance. For instance, Mullner and colleagues took a look at the closures of 161 CAHs from 1980 to 1987. These hospitals were then match-controlled with 482 rural hospitals that had remained open during this same period of time. This study determined that system affiliation significantly decreased the risk of rural hospitals closing [19]. Cleverly conducted a larger study that explored 5,722 hospitals with complete Medicare Cost Report data for the three year time period of 1986 through 1989. This study utilized a matching function with a comparison linkage to independent hospitals and/or independent hospital systems. This research concluded that system hospitals had a higher return on equity and higher costs per care mix-adjusted discharge, higher profits through more aggressive pricing strategies, and greater capital investments when compared to independent hospitals. [8]

Joining a multi-hospital system can be viewed as a strategic financial decision to assist rural hospitals in mitigating their financial risk. The American Hospital Association (AHA) defines MHS as nonfederal and non-state hospitals that are leased, under contract management, legally incorporated, and/or under the direction of a board of directors, that determine the central direction of two or more hospitals. These hospitals are assigned system identifiers in a given year that retain the same identifier as another hospital [9][15]. The current multi-unit hospital structures are the byproducts of the mergers and affiliations that started in the late 1960s. [14]

Multi-hospital systems can differ on many different dimensions; one main difference is the type of hospital's organizational financial structure. The term "profitability" has taken on different meanings. Some researchers define profitability by its strict accounting definition, while others address it with respect to cash flow. [17] For this study, profitability status defined as either "for-profit" or "not-for-profit" will be based on its true accounting origins.

The two main profit structures are for-profit and not-for-profit. For-profit organizations are ones run by stakeholders and issue stock in these companies. They include investor-owned and private hospitals. Not-for-profit organizations are organizations that do not earn a profit, but are able to hold portions of their earnings in reserve for future expenses. Financial ratios are also an important area within organizations as they provide adjusted benchmarks with respect to how an organization is positioned compared to its peers. These measures include: days cash-on-hand, total operating margin, and return on equity. Days' cash-on-hand is a commonly used liquidity measure that indicates the amount of cash that is readily available for an organization's day-to-day monetary requirements. Total operating margin is the most commonly used ratio to measure

a hospital's financial performance. If total operating revenue is less than total operating expenses, the organization is operating at a loss and will have a negative operating margin. [18] Return on equity provides an indication of how much profit a company earned in comparison to the total amount of shareholder equity outstanding.

A 2003 study found higher cash flow margins in for-profit hospitals compared to not-for-profit hospitals. This stems from better internal factors, most notably lower overhead staffing and benefit expenses. [5] Cash flow is seen as the optimal element within hospitals to indicate financial performance. It is less subjective to variations in accounting practices. In many cases, organizations can utilize different aspects of generally accepted accounting practice to manipulate financial elements of profitability. Additionally, cash is used by organizations to pay expenses and is one of the true benchmarks because it has very little variation between organizations.

Days' cash-on-hand is viewed as an important variable by many financial scholars and represents a measure that helps to predict a company's financial stability. Ultimately the higher the number of days' cash-on-hand, the more funds that an organization has to pay both long and short term liabilities. This financial element especially is important for healthcare organizations, as it helps to predict current and future availability of sustainable funding for all operations. An analysis of current research found no studies that explored the relationship between cash-on-hand and the organizational structure of rural hospitals. [18]

A positive operating margin indicates that the hospital is obtaining patient related income that is above the cost of patient services. In contrast, a negative operating margin would provide information that a hospital is obtaining income from patient care that is below the costs of patient services [3]. Several investors view return on equity (ROE) as a benchmark that indicates how well a company is able to utilize the equity stakes within their organization. Return on equity has been seen by many, especially within the insurance and other financial related industries, as one of the major indicators of the overall financial health of a company [10]

Theoretical Framing

Burns and Stalker originated the elements of contingency theory when they conducted research on internal management practices and environmental factors. [4] Ultimately their research concluded that there were two main structural types: mechanical and organic. The type of structure that an organization initiates should be heavily based on the environment in which they conduct business. In more rigid, stable, and/or predictable environments, a company would choose a more mechanical organizational structure. However, in a more fluid, changing, or unreliable environment, a company should choose an organic organizational configuration. [4] This theory was examined further in a 1962 study by Chandler, which concluded that environmental changes in population, income, and technology are major organizational drivers of change and can cause new methods of conducting business for an organization. [7]

Profitability as a financial term can be somewhat vague and misleading especially as applied to the hospital sector. A hospital that is referred to as "not-for-profit" does not indicate that the hospital does not make a profit; rather, according to the American Hospital Association, it indicates that "not-for-profit" hospitals have been making profits and are for the most part

financially viable hospitals. The profit structure of a hospital, either for-profit or not-for-profit, is a legal distinction that imposes limitations on how the hospital can distribute profits, as well as the hospital's ability to receive tax-deductible donations along with tax-exempt status. Clearly, hospitals are required to maintain profits in order to maintain and/or expand their facilities. [21]

DATA

The data for this study are obtained directly from the 2011 American Hospital Association (AHA) Annual Survey and the American Hospital Directory (AHD) 2012 dataset. Both datasets were secondary data. The researcher had no direct interaction with any hospital. The AHA 2011 Annual Survey dataset was obtained via download directly from HealthDirect. Throughout the year, the data is updated because information may be missing, changed or incorrect. The dataset obtained from the AHD utilized 2012 data. This dataset is the most recent annual dataset available and was based on data obtained from the 2012 CMS Medicare Compare National Dataset. The final dataset was constructed based on the researchers' specifications.

The AHA is a single dataset that includes the most reliable information about hospitals within the United States and associated areas. The survey generates estimates from the previous year's responses and from comparisons to hospitals of similar size and orientation. If there are any unusual variations in reported characteristics from one year to the next, the data administrators will contact the hospital for clarification. The data are a primary source of hospital-level data for government agencies, including the Center for Disease Control and Prevention, Centers for Medicare and Medicaid Services and a number of industry-related companies. These data are viewed as the industry benchmark as they contain valuable insights into our nation's current hospitals. [2]

Currently the AHA dataset tracks hospital demographics and characteristics. This includes information pertaining to hospital leadership, strategic planning, service-line offering, beds, utilization, finance human resource management, information management, process management, patient-centered focus satisfaction, and staffing. An added level of analysis is implemented to ensure the highest data quality. Hospital data are compared to information obtained in previous years with regard to hospital type, size, and geographic location. The data is updated monthly from information obtained directly from Medicare. The preliminary data on hospitals are updated monthly from April to September, with finalized data available in October. [1]

The American Hospital Directory provides online data for over 6,000 hospitals and is a privately owned Subchapter S Corporation incorporated in the State of Kentucky. The company has no third-party relationships that could influence the services provided. The main sources of revenue are subscriptions to the company's website, ahd.com, and the sale of custom data services. Most of the data used on the website or in their custom data services is obtained from Medicare claims data (MedPar and OPPS), hospital cost reports, and other files obtained from the Centers for Medicare and Medicaid Services (CMS). It is important to note that the AHD is not affiliated with the American Hospital Association (AHA) and is not a direct source for AHA data.

This research is exploring rural southern hospitals as most of the current research on this topic explores either only urban multi-hospital systems, all hospitals nationally or select individual hospitals. It attempts to fill a void with respect to the current literature by providing valuable information with respect to a somewhat overlooked, but very valuable part of our nation's healthcare delivery system. Southern states were chosen for two primary reasons: they have shown a large amount of growth over the last ten years, and an overwhelming majority of rural multi-hospitals are located within southern states.

According to the U. S. Census [24], states classified as "South" include Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Delaware, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma and Texas. It should be noted that this dataset does not include any observations from Delaware. Approximately 49% of the southern states in the study were from the southern Atlantic region, while the other 51% were from the east and west south central states.

These hospitals were classified as located in a rural area; there were no hospitals located in an urban area. Rural hospitals were further classified as centralized, decentralized, or semi-centralized; however information on their profit/non-profit status was missing. Therefore, data on the profit status of hospitals was obtained from a nationally recognized website, HospitalsCenter.com. [11] As previously noted in the 2000 article by Rickett and Heaphy, over half of rural hospitals are non-profit or government owned hospitals [20]. The final sample consists of 123 rural Southern hospitals that are part of a multi-hospital system, of which 77 (62.6%) are non-profit and 46 (37.3%) are for-profit institutions. All but four of the hospitals were not critical access. The final sample size was reduced compared to the size of the original data set due to missing values.

Within the sample, agency characteristics of hospitals included not only the actual profit status of a hospital (profit/non-profit), but the size of the hospital based on the number of beds, and if the hospital was critical access (CAH) or not. These traits are known to be important as they help clarify the dynamics of each hospital as it relates to the hospital's main financial indicators of days cash-on-hand, operating margin, and return on equity.

METHODOLOGY

An initial examination for possible correlation between the financial variables days' cash-on-hand, operating margin, and return on equity reveals virtually no multivariate correlation as measured by variance inflation factors of approximately 1. Therefore, although the use of multiple dependent variables would usually suggest the use of a MANCOVA model, the lack of a sufficient degree of correlation (r values considered to be between .3 and .9, or comparable VIFs between 1.43 and 10), necessitates the use of three separate analyses of covariance (ANCOVA) models instead. These models are run utilizing a GLM modeling procedure.

An analysis of covariance procedure evaluates whether population means of a dependent variable are the same for all levels of a categorical dependent variable, while controlling for the effects of a quantitatively measured covariate(s). The means of the dependent variable are adjusted to what they would be if the treatment groups were equal for all covariates. [12] The treatment

effect variable in the model is the organizational status of the hospital, ie whether the hospital is a for-profit or non-profit institution. The covariate, hospital beds (hospsbeds), is a measure of the size of the hospital. Since all but four of the hospitals are not critical access entities, this variable was not included in the model due to a lack of variability.

RESULTS

The results are shown in the three tables on the following page. Overall, all three models were significant with p values of .0012, .0016, and .0137 respectively. Table 1 shows the results of the ANCOVA model for days' cash-on-hand. The treatment variable, profit/non-profit status is significant at a p value ($pr>F$) of .0004. The covariate hospital beds is insignificant ($pr>F=.2433$). Least square means are then computed for the profit ($i=1$) and non-profit ($j=2$) groups. The use of a Bonferoni multiple comparisons test reveals that for-profit hospitals keep 6.084 days of cash-on-hand compared to non-profit hospitals, which keep 33.351 days of cash on hand, a significant difference of -27.26.

Table 2 shows the results of the ANCOVA model with operating margin as the dependent variable. It also shows the profit/non-profit status effect as significant ($pr>F=.0021$). The covariate hospital beds are significant at a p value of .0404. The LS means show an average operating margin of 5.335% for profit hospitals and -.268% for non-profit ones, a significant difference of 5.6%. Over half of the non-profit hospitals in the sample had negative operating margins.

Table 3 results confirm a significant difference between return on equity of profit and non-profit hospitals at a $pr>F$ value of .0038. As with the days cash-on-hand model, hospital beds are insignificant in this equation. The least squares means for profit and non-profit hospitals for ROE are 13.47% and 5.11% respectively, revealing a significant difference of 8.36%.

The assumptions underlying the models were tested. The homogeneity of variances is confirmed, as is the independence of the effect (profit/non-profit) and covariate variables. The former is verified by plotting the residuals of the model against the predicted values. To check for independence of the effect and covariate variables, an interaction term between the two was included in the models. Since the interaction term was insignificant in all three models, it was removed and proof of independence was established. The only assumption that is violated concerns the multivariate normality assumption. Tests of normality reveal p values of <.01, .0694, and .0383 for models 1-3 respectively. All outliers were removed from the original data, so the non-normality in models 1 and 3 is caused by skewness in the data. Since the number of observations in each treatment group exceeds 30 and non-normality is not severe, except for the days' cash-on-hand model, the results should be fairly robust. Caution, however, should be utilized when interpreting the results of the days' cash-on-hand model.

Table 1

ANCOVA for Days Cash- on- Hand (n=119)

Source	df	TYPE III SS	Mean Square	F value	PR>F
Profit	1	20775.72627	20775.72627	13.11	.0004
Hospbeds	1	2178.93406	2178.93406	1.38	.2433

Least Squares Means

Profit Status	Cash LS Mean	Ho:LSmean1-LSmean2=0: pr>T
1 (Profit)	6.084606	.0004
2(Non-Profit)	33.351779	

Least squares means for effect Profit

i j	Difference between means	Simultaneous 95% confidence limits for differences	
1 2	-27.267173	-42.180038	-12.354309

Table 2

ANCOVA for Operating Margin (n=121)

Source	df	TYPE III SS	Mean Square	F value	PR>F
Profit	1	877.1058124	877.1058124	9.92	.0021
Hospbeds	1	379.6014237	379.6014237	4.29	.0404

Least Squares Means

Profit Status	Opmargin LS Mean	Ho:LSmean1-LSmean2=0: pr>T
1 (Profit)	5.335302	.0021
2(Non-Profit)	-.268366	

Least squares means for effect Profit

i j	Difference between means	Simultaneous 95% confidence limits for differences	
1 2	5.603668	2.080450	9.126887

Table 3

ANCOVA for Return on Equity (n=117)

Source	df	TYPE III SS	Mean Square	F value	PR>F
Profit	1	1898.715276	1898.715276	8.75	.0038
Hospbeds	1	15.296925	15.296925	.07	.7910

Least Square Means

Profit Status	Roe LS Mean	Ho:LSmean1-LSmean2=0: pr>T
1 (Profit)	13.479538	.0038
2(Non-Profit)	5.114714	

Least squares means for effect Profit

i j	Difference between means	Simultaneous 95% confidence limits for differences	
1 2	8.364825	2.764505	13.965144

CONCLUSION

The results obtained in this study will help both community and financial stakeholders' understanding of financial viability within rural southern hospitals. The number of community hospitals in rural areas decreased by 11.8% between 1980 and 1998, largely due to hospital closures, mergers, and conversions [20]. Ensuring the hospitals within rural communities not only are financially viable, but also are able to be stable within their community is critical to the sustained success of the rural south. This study is helpful in providing the basis for which future researchers can explore other financial and organizational structure elements, as well as their possible interactions. Future research could expand this study to look at all national rural multi-system hospitals, hospital affiliation and/or a combination of other organizational elements with respect to both rural and urban hospitals.

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Supply chain delivery performance improvement for uniformly distributed delivery time

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Abstract

This paper investigates strategies of supply chain delivery performance improvement. The performance is measured using a cost-based analytical model which evaluates the expected penalty cost for early and late delivery. Delivery time is modeled using uniform distribution. The results demonstrate strategies for improving delivery performance when a supplier uses an optimally positioned delivery window to minimize the expected penalty cost. Theoretical and managerial implications of the findings are discussed.

Keywords: Supply Chain Management; Delivery Performance; Uniform Distribution

1. Introduction

Supply chain management serves as the foundation of an organization's overall competitive strategy for attaining and maintaining competitive advantage (Nollet et al., 2005; Bechtel and Jayaram, 1997). The delivery process is one of many sub-processes that are imbedded within the overall supply chain. Delivery lead time to the end customer in a supply chain is defined to be the elapsed time from the receipt of an order by the supplier to the receipt of the product ordered by the customer and is composed of a series of internal (manufacturing and processing) lead times and external (distribution and transportation) lead times found at the various stages of the supply chain. The timeliness of delivery is a key concern to customers and numerous empirical studies have documented the importance that on time delivery plays in the operation of the supply chain (da Silveira and Arkader, 2007; Iyer et al., 2004; Salvador et al., 2001).

Models for evaluating delivery performance within supply chains can be categorized into two groups: i) index based models (Nabhani and Shokri, 2009; Wang and Du, 2007), and ii) cost based models (Bushuev and Guiffrida, 2012; Bushuev et al., 2011; Shin et al., 2009).

All these models focus on delivery performance evaluation and make no attempt to estimate effect of changing delivery time distribution parameters. After evaluating delivery performance, the next natural step is to find ways to improve delivery performance. In this case, penalty cost based models have huge advantage over index and six-sigma based models, because improvement is easier to understand in cost values than in index values. Moreover, a decision can be easily made if a monetary advantage of the decision is known.

In this paper we will address strategies for improving delivery performance using a cost based delivery performance model. Delivery time is modeled using uniform distribution. The paper evaluates the effect of delivery time distribution parameters on the optimal position of the delivery window and the expected penalty cost. The results are presented in the form of propositions and discussed in the conclusion.

2. Modeling supply chain delivery performance

An integral component found in many supply chain delivery performance models is the concept of the delivery window. Under the concept of a delivery window, contractually agreed upon benchmarks in time are used to classify deliveries as being early, on time, and late (see Figure 1). Early and late deliveries introduce waste in the form of excess cost into the supply chain; early deliveries contribute to excess inventory holding costs while late deliveries may contribute to production stoppage costs, lost sales and loss of goodwill. These costs have been characterized by Guiffrida and Nagi (2006) as “penalty costs” that are incurred in addition to the normal operating costs of the supply chain and are hence considered to be forms of waste. When a delivery is within the on time portion of the delivery window, no penalty cost is incurred.

Guiffrida and Nagi (2006) proposed the expected penalty cost per period for untimely delivery as

$$Y = Y_{early} + Y_{late} = QH \int_a^{c_1} (c_1 - x)f(x)dx + K \int_{c_1 + \Delta c}^b (x - (c_1 + \Delta c))f(x)dx, \quad (1)$$

where $Y_{early} = QH \int_a^{c_1} (c_1 - x)f(x)dx$ is expected penalty cost of early delivery,

$$Y_{late} = K \int_{c_1 + \Delta c}^b (x - (c_1 + \Delta c))f(x)dx \text{ is expected penalty cost of late delivery,}$$

$f(x)$ = the probability density function (pdf) of delivery time x ,
 Q = constant delivery lot size,
 H = supplier inventory holding cost per unit per unit time,
 K = penalty cost per time unit late (levied by the buyer),
 a = earliest delivery time,
 b = latest delivery time,
 c_1 = beginning of on-time delivery,
 Δc = the width of the on-time portion of the delivery window.

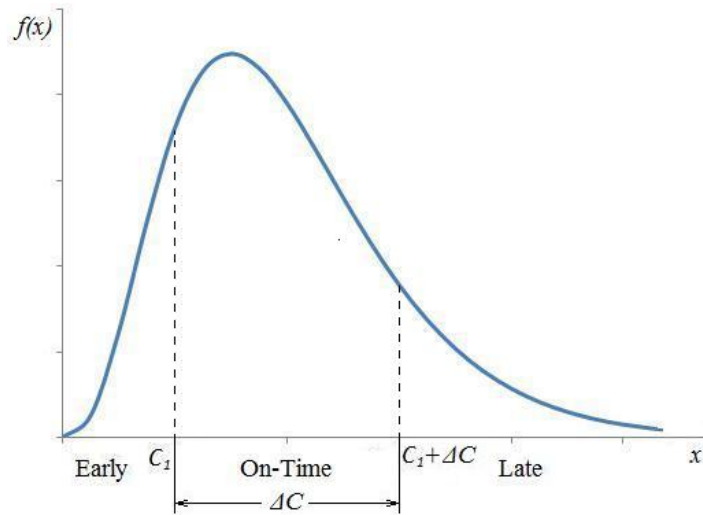


Figure 1. Illustration of a Delivery Window for Gaussian Delivery Times

Legend: $f(x)$ is the probability density function (pdf) of delivery time, c_1 is beginning of on time delivery, Δc is the width of the delivery window.

As demonstrated in Bushuev and Guiffrida (2012), Y is a convex function of c_1 and the optimal value of c_1 (c_1^*) that minimizes Y can be determined by evaluating

$$K \cdot P_{late} = QH \cdot P_{early}, \quad (2)$$

where $P_{late} = \int_{c_1 + \Delta c}^b f(x) dx$ is the probability of late delivery,

$P_{early} = \int_a^{c_1} f(x) dx$ is the probability of early delivery.

Let the delivery time x be uniformly distributed with density function

$$f(x) = \frac{1}{b-a} \text{ for } x = [a,b]. \quad (3)$$

The cumulative distribution function of X is

$$F(x) = \frac{x-a}{b-a} \text{ for } x = [a,b]. \quad (4)$$

When delivery times are uniformly distributed the optimal position of the delivery window is (see Bushuev and Guiffrida, 2012)

$$c_1^* = \frac{K \cdot (b - \Delta c) + QH \cdot a}{QH + K}. \quad (5)$$

Expected penalty cost for untimely delivery:

$$Y = QH \int_a^{c_1^*} (c_1^* - x) \frac{1}{b-a} dx + K \int_{c_1^* + \Delta c}^b (x - (c_1^* + \Delta c)) \frac{1}{b-a} dx; \quad (6)$$

$$Y = QH \frac{1}{b-a} \left(c_1^* x - \frac{x^2}{2} \right) \Big|_a^{c_1^*} + K \frac{1}{b-a} \left(\frac{x^2}{2} - (c_1^* + \Delta c)x \right) \Big|_{c_1^* + \Delta c}^b; \quad (7)$$

$$Y = QH \frac{1}{b-a} \left(c_1^{*2} - \frac{c_1^{*2}}{2} - c_1^* a + \frac{a^2}{2} \right) + K \frac{1}{b-a} \left(\frac{b^2}{2} - (c_1^* + \Delta c)b - \frac{(c_1^* + \Delta c)^2}{2} + (c_1^* + \Delta c)^2 \right); \quad (8)$$

$$Y = QH \frac{1}{b-a} \left(\frac{c_1^{*2}}{2} - c_1^* a + \frac{a^2}{2} \right) + K \frac{1}{b-a} \left(\frac{b^2}{2} - (c_1^* + \Delta c)b + \frac{(c_1^* + \Delta c)^2}{2} \right); \quad (9)$$

$$Y = \frac{1}{2(b-a)} \left[QH(c_1^* - a)^2 + K((c_1^* + \Delta c) - b)^2 \right]. \quad (10)$$

Using (5) we substitute c_1^*

$$Y = \frac{1}{2(b-a)} \left[QH \left(\frac{K \cdot (b - \Delta c) + QH \cdot a}{QH + K} - a \right)^2 + K \left(\frac{K \cdot (b - \Delta c) + QH \cdot a}{QH + K} + \Delta c - b \right)^2 \right]; \quad (11)$$

$$Y = \frac{QH}{2(b-a)} \left(\frac{K \cdot (b - \Delta c) + QH \cdot a - a(QH + K)}{QH + K} \right)^2 + \frac{K}{2(b-a)} \left(\frac{K \cdot (b - \Delta c) + QH \cdot a + \Delta c(QH + K) - b(QH + K)}{QH + K} \right)^2; \quad (12)$$

$$Y = \frac{QH}{2(b-a)} \left(\frac{K \cdot (b - \Delta c) - K \cdot a}{QH + K} \right)^2 + \frac{K}{2(b-a)} \left(\frac{QH \cdot a + QH \cdot \Delta c - QH \cdot b}{QH + K} \right)^2; \quad (13)$$

$$Y = \frac{QH \cdot K}{2(b-a)(QH + K)^2} \left[K(b - a - \Delta c)^2 + QH(a - b + \Delta c)^2 \right]; \quad (14)$$

Knowing that $(x - y)^2 = x^2 - 2xy + y^2 = (y - x)^2$, we have

$$Y = \frac{QH \cdot K}{2(b-a)(QH + K)^2} \left[K(b - a - \Delta c)^2 + QH(b - a - \Delta c)^2 \right]; \quad (15)$$

$$Y = \frac{QH \cdot K}{2(b-a)(QH + K)} ((b - a) - \Delta c)^2. \quad (16)$$

2. Delivery performance improvement

This section investigates the effect of the delivery time distribution parameters on the expected penalty cost function for uniformly distributed delivery time.

Proposition 1. Increasing parameter a of uniform distribution will increase the optimal position of the delivery window and reduce the expected penalty cost.

Proof. The derivatives are

$$\frac{dc_1^*}{da} = \frac{QH}{QH + K} > 0 \quad (17)$$

$$\frac{dY}{da} = \frac{QH \cdot K}{2(QH + K)} \frac{-2((b - a) - \Delta c)(b - a) - ((b - a) - \Delta c)^2(-1)}{(b - a)^2} \quad (18)$$

$$\frac{dY}{da} = \frac{QH \cdot K}{2(QH + K)} \frac{-2(b - a)^2 + 2\Delta c(b - a) + (b - a)^2 - 2\Delta c(b - a) + \Delta c^2}{(b - a)^2} \quad (19)$$

$$\frac{dY}{da} = \frac{QH \cdot K}{2(QH + K)} \left(\frac{\Delta c^2}{(b - a)^2} - 1 \right) \quad (20)$$

For the realistic case $\Delta c < (b - a)$, the derivative is negative. ■

Proposition 2. Increasing parameter b of uniform distribution will increase the optimal position of the delivery window and increase the expected penalty cost.

Proof. The derivatives are

$$\frac{dc_1^*}{db} = \frac{K}{QH + K} > 0; \quad (21)$$

$$\frac{dY}{db} = \frac{QH \cdot K}{2(QH + K)} \frac{2((b-a) - \Delta c)(b-a) - ((b-a) - \Delta c)^2}{(b-a)^2}, \quad (22)$$

$$\frac{dY}{db} = \frac{QH \cdot K}{2(QH + K)} \frac{2(b-a)^2 - 2\Delta c(b-a) - (b-a)^2 + 2\Delta c(b-a) - \Delta c^2}{(b-a)^2}, \quad (23)$$

$$\frac{dY}{db} = \frac{QH \cdot K}{2(QH + K)} \left(1 - \frac{\Delta c^2}{(b-a)^2} \right). \quad (24)$$

For the realistic case $\Delta c < (b - a)$, the derivative is positive. ■

3. Conclusion

The paper investigates an effect of different parameters on the expected penalty cost function for uniformly distributed delivery time. The results allow developing strategies for improving delivery performance from a supplier's perspective and answer the question what supplier should do to decrease the expected penalty cost. Proposition 1 suggests increasing a of uniform distribution to decrease the expected penalty cost. Proposition 2 suggests decreasing b of uniform distribution to decrease the expected penalty cost.

The results presented in the paper can be used by both researchers and practitioners. The managerial implication of the paper is that it can serve as guidance for practitioners undertaking a program to improve delivery performance. The research implication is that this paper proposes a general approach to modeling delivery performance improvement. The model was demonstrated for uniformly distributed delivery time, but can be applied to other distribution forms which can be done in future publications.

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EXTENDING THE DEFINITION OF MANUFACTURING CAPABILITY

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ABSTRACT

Manufacturing strategy theory generally defines manufacturing capability in terms of four primary capabilities: quality, delivery, flexibility and cost; however, some researchers have chosen to expand this definition. This paper reviewed seven empirical studies that have extended the definition of manufacturing capability either by identifying new capabilities or by partitioning one or more of the original four capabilities. The purpose of this review is to uncover any commonalities among the new definitions and to determine why researchers chose to extend the definition of capability. Review findings showed only limited commonality among the new capabilities and varying reasons for their inclusion in the definition of manufacturing capability.

INTRODUCTION

Although many researchers define manufacturing capability in terms of quality, delivery, flexibility and cost, others have chosen to extend its definition either by adopting new capabilities in addition to the original four or by partitioning at least one of the standard four capabilities. Since both extensions alter existing theory, it is important to address the obvious questions that these changes provoke. For instance, why have some researchers found it necessary to extend the definition of manufacturing capability? What new capabilities have they included? Are there any commonalities among the new capabilities? If no commonalities exist, what are the ramifications for theory development?

This paper will address the preceding questions by offering a critical review of empirical studies that have expanded the definition of manufacturing capability by either adding new individual capabilities or by sub-dividing at least one of the original four. The following section will summarize the process used to identify the relevant papers. The third section will classify the papers according to whether they introduced new capabilities or sub-divided existing ones. This section will also examine the specific capabilities of interest. The final section will provide a discussion of the results and suggestions for future research in the area of manufacturing capabilities.

CLASSIFICATION SCHEME

The studies included in this paper were identified after a thorough literature review of manufacturing capability studies. Since there have been so many studies of manufacturing capabilities over the years the authors developed a set of criteria to select the studies for review.

These criteria required: 1) the inclusion of empirical studies only, 2) the inclusion of all four of the original capabilities and 3) the creation of additional individual capabilities.

Empirical studies are important because they measure concepts applied in a real world. Thus, empirical studies are important from a theory building perspective. This paper defined an empirical study as one that utilized actual company data obtained either through interviews or surveys and that also performed statistical data analysis of the data.

This review addresses only those studies that incorporated the four generally accepted manufacturing capabilities – quality, delivery, flexibility and cost. Studies that included fewer than these four were omitted because such papers actually reformulate the traditional definition of capability rather than extending it.

Finally, in addition to the four capabilities, the studies must have either added at least one new capability or sub-divided at least one of the capabilities into two or more component capabilities. Such studies represent a true extension of the widely accepted definition.

Identification of the Relevant Papers

An initial set of seven studies meeting all three criteria were identified [7, 3, 4, 5, 6, 1, 2] (Table 1). All of the studies utilized data from larger manufacturing studies. Data from the Manufacturing Futures Project Survey were used in three of the earliest studies [7, 3, 4]. Both Noble studies [5, 6] used the proprietary database developed by Schmenner [8, 9] and the International Institute for Management Development (IMD) [10]. Avella and Vazquez-Bustelo [1] and Avella, Vazquez-Bustelo and Fernandez [2] used data from Amadeus-Sistema de Analisis de Balances Ibericos (SABI), an independent survey of Spanish manufacturers that was conducted in 2003. One advantage of using existing survey database information is that large sample sizes are available. The smallest sample sizes reported were 180 to 188 from the Manufacturing Futures Project Survey data. These surveys were completed by North American manufacturing executives. The only one of these studies to identify a particular North American country was Kim and Arnold [3] who used only U.S. manufacturers. The database developed by Schmenner [9] and IMD surveyed companies in North America, Europe and Korea. The large sample size of 561 allowed Noble [5, 6] to compare differences in the three regions. Avella and Vazquez-Bustelo [1] and Avella, Vazquez-Bustelo and Fernandez [2] utilized survey information provided by Spanish manufacturing companies employing over 100 workers. Data from 274 firms were used in the analysis.

The seven studies were published in a variety of journals. All but one of these journals had an operations focus. Roth and Miller [7] published their study in *Business Horizons*. Three of the studies were published in the *International Journal of Operations and Production Management* [3, 6, 1]. One study was published in each of the following three journals: the *International Journal of Production Research* [2], *Management Science* [4], and *Decision Sciences* [5] (Table 1).

TABLE 1
STUDY AND PUBLICATION INFORMATION

Author (Year)	Data Source	Data Date	Sample Size	Survey Location	Published
Roth & Miller (1992)	Manufacturing Futures Project	1988	180 manufacturing executives	North America	<i>Business Horizons</i>
Kim & Arnold (1993)	Manufacturing Futures Project	1990	182 manufacturing executives	U.S.	<i>International Journal of Operations & Production Management</i>
Miller & Roth (1994)	Manufacturing Futures Project	1987	188 manufacturing executives	North America	<i>Management Science</i>
Noble (1995)	Schmenner/IMD	1988	561 plants	North America, Europe, Korea	<i>Decision Sciences</i>
Noble (1997)	Schmenner/IMD	1988	561 plants	North America, Europe, Korea	<i>International Journal of Operations & Production Management</i>
Avella & Vazquez-Bustelo (2010)	<i>Amadeus-Sistema de Analisis de Balances Ibericos</i>	2003	274 manufacturers	Spain	<i>International Journal of Operations & Production Management</i>
Avella, Vazquez- Bustelo & Fernandez (2011)	<i>Amadeus-Sistema de Analisis de Balances Ibericos</i>	2003	274 manufacturers	Spain	<i>International Journal of Production Research</i>

MANUFACTURING CAPABILITIES MEASURED

Four Generally Accepted Capabilities

All seven studies measured the four traditional capabilities – quality, delivery, flexibility and cost (Table 2). One of the earliest studies [3] used single-item measures for the four capabilities. Roth and Miller [7] used multiple-item measures but provided no information regarding the particular items included in the measures. Miller and Roth [4] used multiple-item measures for quality, delivery and flexibility but used a single-item measure for cost. Noble [5] developed summated scales for her measures for all four capabilities. She used these same scales in her 1997 paper [6]. Avella and Vazquez-Bustelo [1] developed scales for the four capabilities and these same scales were used in Avella, Vazques-Bustelo and Fernandez [2]. The number of items used in the multiple-item measures and the scaled measures ranged from a low of two to a high of eight.

Sub-Division of the Four Generally Accepted Capabilities

Noble [5] divided delivery into two separate capabilities: delivery and dependability. Although dependability is closely related to delivery, and in some studies they are combined, Noble [5] chose to consider them as separate capabilities to improve specificity. Noble [5, p. 698] argued that the dependability of the production system affects the likelihood that delivery to the customer will be “quick and reliable.” This reasoning led her to develop separate scaled measures for both capabilities. Dependability was measured with a six-item scale; delivery was measured with a two-item scale.

Additions to the Four Generally Accepted Capabilities

All seven papers reviewed in this study added at least one additional capability (See Table 3). Six of the studies added one new capability [7, 3, 5, 6, 1, 2]. Miller and Roth [4] added four new capabilities.

Noble [5, 6] included innovation as a new capability. She measured it with a two-item scale consisting of rapid new product introduction and frequent new product introduction. Noble [6, p.93] modeled productivity as a function of innovation and observed that “innovation possibility plays a key role in the attainment of exceptional labor productivity performance.”

In contrast to Noble [5, 6], Avella and Vazquez-Bustelo [1] and Avella, Vazquez-Bustelo and Fernandez [2] identified environmental protection as a new individual capability. These two studies [1, 2] viewed environmental protection as an integral part of the production process—rather than as an external restriction. According to Avella and Vazquez-Bustelo [1] and Avella, Vazquez-Bustelo and Fernandez [2], there are a number of synergies between environmental protection and the traditional four capabilities. For example, environmental protection practices can improve efficiency and decrease costs by reducing energy use, eliminating waste and preventing environmental incidents. On the other hand, high quality can lessen the need for re-processing and reduce the consumption of environmental resources.

Kim and Arnold [3] and Miller and Roth [4] both introduced service as a new capability. Kim and Arnold [3] described service in terms of four items: 1) after-sales service, 2) product support, 3) customization and 4) distribution. Kim and Arnold [3] argued that service was tightly linked

TABLE 2
VARIABLES/CONSTRUCTS MEASURED

Author (Year)	Developed Scales	Capabilities ¹				Additional Variables
		Quality	Delivery	Flexibility	Cost	
Roth & Miller (1992)	No	U	U	U	U	Market Scope
Kim & Arnold (1993)	No	S	S	S	S	Services
Miller & Roth (1994)	No	Conformance Performance	Speed Delivery dependability	Design flexibility Volume flexibility	S	After-sales service Advertising/promotion Broad distribution Broad line
Noble (1995)	Yes	Improved quality Higher yields Machine “up-time” Quality control/assurance Productivity ideas Percent rework	Quick delivery Reliable deliveries	Product mix Output level fluctuation Throughput change Product customization Production rate flexibility	Material substitution Line speed improvement Work-in-process improvements Materials shortages Overhead Materials/product flows Inventory control Product lines	Dependability Innovation

¹ U = Multiple-Item Measure (no details provided), S = Single-Item Measure

**TABLE 2, CONTINUED
VARIABLES/CONSTRUCTS MEASURED**

Author (Year)	Developed Scales	Capabilities ¹				Additional Variables
		Quality	Delivery	Flexibility	Cost	
Noble (1997)	No	Improved quality Higher yields Machine “up-time” Quality control/assurance Productivity ideas Percent rework	Quick delivery Reliable deliveries	Product mix Output level fluctuation Throughput change Product customization Production rate flexibility	Material substitution Line speed improvement Work-in-process improvements Materials shortages Overhead Materials/product flows Inventory control Product lines	Dependability Innovation
Avella & Vazquez-Bustelo (2010)	Yes	Conformance Consistent reliability High performance Durable reliability Low defect rates	Fast deliveries Delivery promises Manufacturing lead times	Design changes New product Volume changes Mix changes Product variety Product Mix	Manufacturing Costs Labor Productivity Equipment and Capacity Utilization Inventory Levels	Environmental Protection
Avella, Vazquez-Bustelo & Fernandez (2011)	No	Conformance Consistent reliability High performance Durable reliability Low defect rates	Fast deliveries Delivery promises Manufacturing lead times	Design changes New product Volume changes Mix changes Product variety Product Mix	Manufacturing Costs Labor Productivity Equipment and Capacity Utilization Inventory Levels	Environmental Protection

¹ U = Multiple-Item Measure (no details provided), S = Single-Item Measure

TABLE 3
ADDITIONAL CAPABILITIES

Investigators (Year Published)	Capability Added	Measure¹	Construct Items
Roth & Miller (1992)	Market scope	U	
Kim & Arnold (1993)	Service	M	<ol style="list-style-type: none"> 1. After-sales services 2. Support 3. Distribution 4. Customize
Miller & Roth (1994)	Advertising/ promotion Broad distribution Broad line After sales service	S	
Noble (1995)	Dependability	SM	<ol style="list-style-type: none"> 1. Strength of maintenance 2. Strength of materials handling/logistics 3. Strength of production planning/scheduling 4. Strength of production control 5. Percent orders expedited 6. Materials-handling productivity improvement
	Innovation	SM	<ol style="list-style-type: none"> 1. Rapid new product introduction 2. Frequency of new product introduction

¹ U = Multiple-Item Measure (no details provided); M = Multiple-Item Measure; S = Single-Item Measure, SM = Scaled Measure

**TABLE 3, CONTINUED
ADDITIONAL CAPABILITIES**

Investigators (Year Published)	Capability Added	Measure ¹	Construct Items
Noble (1997)	Dependability	SM	<ol style="list-style-type: none"> 1. Strength of maintenance 2. Strength of materials handling/logistics 3. Strength of production planning/scheduling 4. Strength of production control 5. Percent orders expedited 6. Materials-handling productivity improvement
	Innovation	SM	<ol style="list-style-type: none"> 1. Rapid new product introduction 2. Frequency of new product introduction
Avella & Vazquez- Bustelo (2010)	Environmental Protection	SM	<ol style="list-style-type: none"> 1. Make environmentally friendly products 2. Environment-friendly production processes 3. Provide firm with positive environmental image 4. Prevent environmental incidents
Avella, Vazquez- Bustelo & Fernandez (2011)	Environmental Protection	SM	<ol style="list-style-type: none"> 1. Make environmentally friendly products 2. Environment-friendly production processes 3. Provide firm with positive environmental image 4. Prevent environmental incidents

¹ U = Multiple-Item Measure (no details provided); M = Multiple-Item Measure; S = Single-Item Measure, SM = Scaled Measure

to competitive priorities and must be included in the definition of manufacturing capabilities. In contrast, Miller and Roth [4] positioned after-sales service as just one of four new capabilities and linked it to manufacturing choice. The other three new capabilities correspond to advertising/promotion, broad distribution and a broad product line [4]. Miller and Roth [4] used single-item measures for each new capability.

Market scope constitutes the final new capability identified in this set of seven papers. Roth and Miller [7, p. 78] considered market scope a “boundary spanning capability for manufacturing.” They argued that market scope reflects “manufacturing’s interface with customers and markets” and “transcends traditional manufacturing boundaries” [7, p. 78].

Purposes and Results of the Studies

Two of the studies tested the cumulative (sandcone) model of capability usage (Table 4). This model posits that manufacturing firms build overall manufacturing capability by adding individual capabilities in sequence – rather than by trading off capabilities. Noble [5] found that the structure of the data was consistent with the use of the cumulative model. The study examined the use of the cumulative model in Europe, Korea and North American manufacturing firms. The results showed that European firms had the lowest rate of adoption of the cumulative model while Korean firms had the highest rate of adoption.

Avella, Vazquez-Bustelo and Fernandez [2] also tested the structure of the sand cone model. Their study based on Spanish manufacturing firms showed that the sequence of adoption is quality, delivery, flexibility, environmental protection and finally cost efficiency.

Roth and Miller [7] identified two different groups based on the degree to which business goals are met, leaders and laggards. They found that leaders were more likely to meet business goals. Miller and Roth [4] used their set of 11 capabilities to identify three manufacturing strategy types in North American firms. The firms were classified as caretakers, marketeers or innovators. They found that these different strategy types differed in areas such as capability usage and product/service scope as well as performance measures.

Kim and Arnold[3] combined their capability measures to form a new construct, production competence. They found that two business performance measures, pretax return on assets and net pretax profit ratio, had a significant relationship to production competence. Noble [6] used the six manufacturing capabilities developed in the earlier study [5] to examine the relationship between capabilities and labor productivity gains. High productivity firms were more likely to address multiple capabilities than low productivity firms. Avella and Vazquez-Bustelo [2] used their measure of production competence [1] to determine whether production competence was related to two performance measures, sales turnover and return on assets. They found that production competence contributed to both performance measures.

**TABLE 4
VARIABLES AND RESULTS**

Author (Year)	Dependent Variables	Independent Variables	Primary Results
Roth & Miller (1992)	Degree to which business goals are met (identified two groups: leaders and laggards)	Quality Delivery Market scope Flexibility Price	1. Business units with higher manufacturing capability scores (for all five capabilities) are more likely to meet goals
Kim & Arnold (1993)	Pretax return on assets Net pretax profit ratio	Combined capabilities into a measure of Production Competence	1. Both return on assets and profit ratio showed significant (but low R ²) relationship to production competence
Miller & Roth (1994)	Manufacturing strategy types: 1. Caretakers 2. Marketeers 3. Innovators	11 capabilities (low price, design flexibility, volume flexibility, conformance, performance, speed, delivery dependability, after sale service, advertising/promotion, broad distribution, broad line)	Manufacturing types differ in 1. Capability usage 2. Products/services and scope of product lines/markets 3. Performance measures

**TABLE 4, CONTINUED
VARIABLES AND RESULTS**

Author (Year)	Dependent Variables	Independent Variables	Primary Results
Noble (1995)	Labor productivity gain Relative productivity	Quality Dependability Delivery Cost Flexibility Innovation	1. Structure of the data was consistent with the cumulative model 2. Performance was consistent with the cumulative model 3. Korean firms competing on multiple capabilities 4. European firms not using cumulative model
Noble (1997)	Labor productivity gain (identified two groups: high productivity and low productivity)	Quality Dependability Delivery Cost Flexibility Innovation	High productivity firms more likely to address multiple capabilities – provides support for the cumulative model
Avella & Vazquez-Bustelo (2010)	Sales turnover ROA	Production competence measured by cost, quality, flexibility, delivery and environmental protection	1. Cost, quality, flexibility, delivery and environmental protection combine to measure production competence 2. Production competence contributes to firm performance as measured by sales turnover and ROA
Avella, Vazquez-Bustelo & Fernandez (2011)	Delivery Flexibility Environmental protection Cost efficiency	Quality Flexibility Delivery Environmental protection	Tested structure of the sand cone model Sequence is quality, delivery, flexibility, environmental protection and cost efficiency

DISCUSSION

This paper reviewed seven studies that have extended the definition of manufacturing capability and applied it empirically. Results from the review reveal only limited commonality among the new capabilities. Furthermore, the authors of these studies justified their extensions in a variety of ways. Some of these justifications were more straightforward than others and seemed to flow more directly from existing theory than others. These findings suggest that researchers are still struggling with the concept of manufacturing capability and that “one size fits all” is an inadequate approach for continued theory development in the field. In addition to this result, several other research implications emerge from this review.

One interesting finding of the study of these papers is that all of them used large scale databases created from surveys. There are many possible advantages to using these databases. The databases tend to have very large sample sizes and they often span many geographic/political boundaries. There are opportunities for researchers to tap into rich data sources. One possible limitation of the use of databases is that the researchers are limited to the questions on the initial questionnaire. It may be somewhat limiting to develop constructs when only questions included in a particular database may be considered. Another potential limitation is that the researchers are bound by the framing of the questions (the way the question is worded and the Likert-scale used). This situation is especially problematic when creating scaled measures for constructs.

As we continue along the path of theory development in the field, researchers should keep several points in mind. The availability of large-scale databases based on some pre-determined questionnaire items provides a potentially rich source of data. However, researchers with access to these sources must recognize possible limitations of this approach. First, the samples used in these data sources usually come from multiple countries, multiple industries and many different sized companies. This encourages researchers to look for “one size fits all” theories. The field has not seen enough research to prove that this is the case. It is even possible that these broad data sources may mask findings. The second potential problem is that the questions on the surveys are pre-determined and the researchers are trying to fit theory to data that are already gathered. This can be a very risky proposition. Generally accepted methods of research suggest that we gather data to test theories that have been developed by examining the real world.

Another consideration for future research is that researchers need to consider carefully before changing generally accepted theory. When adding additional capabilities, researchers should have adequate reasons for doing so that are clearly based on theory. Quality, delivery, flexibility and cost have been researched over the years and are accepted as manufacturing capabilities. Also, researchers should consider testing theory in smaller, well-defined manufacturing segments rather than testing across the vast array of manufacturing industries. Limitations to manufacturing operations in a particular industry, of a certain size, or in a certain location may provide valuable information for theory building in the field.

Finally, researchers should consider the complexity of the constructs that make up manufacturing capabilities when creating measures. An adequately sized scale does not demand a large number of questions but the questions included in the scale must contribute to the explanation of the

construct. The papers included in this study and many other studies not discussed in this paper provide a great starting point for future scale development.

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SECURITY IN SERVICE OPERATIONS

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ABSTRACT

This study used a frontline perspective to investigate security in service systems. Stewart's [8] systems model was used to classify survey questions into a three part framework: task, treatment and tangibles. Results showed that task (adequacy of training about policies and procedures) was a predictor of overall perceived security, suggesting that adequate frontline worker training is an essential tool in ensuring service security.

INTRODUCTION

Security matters to all service operations regardless of size. When customers perceive a possible threat to their security they may decide to avoid using that particular service and take their business elsewhere – even if no actual security threat exists. An actual breach in security can result in even worse consequences such as customer endangerment and possible disruption of service operations for all customers. Since frontline workers are often among the first to deal with an actual security breach, they realize the importance of preventing security problems or at least minimizing the risk of security failures. Because frontline workers usually notice when the security level at their company is too low, they should play a key role in assessing and improving service security.

This study will use a frontline perspective to investigate security in service systems characterized by a high degree of face-to-face customer contact. These types of service systems have been particularly vulnerable to security breaches in the recent past and the consequences of major security failures in such services can be devastating for customers and the general public. There are numerous service elements that may contribute to better security in high-contact services. Frontline workers can provide valuable insights on the relative effectiveness of these elements. This study describes the development and implementation of a frontline worker survey that addressed service security in an actual service setting. This study will also delineate the components of a systems model used to organize the various service elements related to security at this service operation.

This paper is organized as follows. The next section will discuss the systems model which served as the organizing framework for this study. This is followed by a description of the research context and methodology. Results from the administration of the survey are presented

next. The final section of the paper examines the managerial implications of the study and offers suggestions for future research.

A SYSTEMS APPROACH TO SERVICE SECURITY

Service security involves the prevention of incidents, theft, accidents or an attack by denying unauthorized access by the public or by employees to work areas, equipment and data. When trying to prevent security problems, the service manager must simultaneously consider the many service components that are directly (and even indirectly) related to security. This can prove to be a daunting task in practice – especially in high contact service operations. A systems approach to service security offers a framework with which a manager can logically organize the numerous service elements that may deserve further analysis.

The service management literature contains a number of studies that advocate the use of a systems approach to analyzing service operations. Some of these papers are theoretical in nature; they describe the structure of the proposed systems model but do not test the model in an actual service setting [see, for example, 8, 1, 6, and 4]. Other studies applied the systems approach in actual service contexts to investigate some critical aspect of service delivery. For instance, Song, Lee and Park [7] adopted a systems perspective to assess risk of service failure in an outpatient consultation service. Sulek and Lind [10] utilized Chase and Bowen's [1] systems framework to measure productivity for a set of public transit systems while Sulek and Hensley [9] used a systems approach to updating services in the restaurant industry.

This paper will adopt the systems model devised by Stewart [8] because this particular framework seemed best suited to the study of service security. Three major components comprise Stewart's [8] framework: 1) task, 2) treatment and 3) tangibles. Each of these components corresponds to natural groupings of service elements that can affect security.

The task component of a service security system deals with core activities that employees must complete to prevent security breaches. For example, an airline baggage screener must scrutinize the image of each piece of luggage to be sure the bag does not contain dangerous objects or prohibited materials. The screener's task illustrates the common characteristics of the task component as defined by Stewart [8]: 1) it is easy to pinpoint the start time and the finish time of a specific task, 2) a manager can use time-based metrics and perceptual measures to evaluate task performance and 3) a task may occasionally be planned entirely in advance but more often will not be completed until the service encounter ends.

While the task component may require a degree of customer contact, its primary focus involves specific, clearly delineated activities rather than customers' feelings and perceptions. In contrast to tasks, the treatment component addresses the frontline workers' interpersonal skills [8]. These skills include the employee's ability to empathize with the customers and to reassure them whenever customers perceive a problem or a threatening situation. For instance, if an elderly couple loses the card key to their hotel room, an empathetic front desk employee will not just replace the key with a new one but also explain to the couple that no one will be able to gain entry to their room with the lost card since it is deactivated.

Unlike the task and treatment components, the tangibles component of the systems model entails the management of equipment, inventory and facilities needed to provide the service. Performance evaluation for the tangibles component is a relatively straightforward process that utilizes objective measures [8]. Security of tangible business resources depends on restricting public access to them. For example, a public transit system can restrict passenger access to system vehicles by locking its buses and vans and parking them in a secure lot when they are not in use.

The systems model described in this section allows a manager to organize an array of service elements related to security; however, a classification scheme by itself cannot ensure service security. Direct input from frontline workers is also essential for assessing the current level of security and for determining how various aspects of task, treatment and tangibles affect the security of a service operation. The following section will describe a case study that combines systems modeling of service security with frontline worker knowledge to analyze security in an actual service setting.

CASE ILLUSTRATION

An urban transit system located in the southeast United States served as the application context for this study. This system offers regular bus service on 16 routes Monday through Saturday and operates seven regular routes on Sunday. The system generates 233,000 revenue hours of service annually and covers a 131 square mile area. In addition to regular bus service, this transit system operates a city-wide paratransit system and a campus system for local universities; however, only the drivers on the regular bus routes assessed security from a frontline perspective during this study.

To capture this frontline perspective, the transit director and the director of safety for this system worked closely with the authors to develop a driver survey that addressed service security. Various transit service elements relating to task, treatment and tangibles were considered as survey items. Twelve items corresponding to service elements were included in the survey. Table 1 presents descriptive statistics for these items. As Table 1 shows, five questions related to training were measured on a five-point Likert scale with one defined as very inadequate training for the item and five defined as very adequate training for the item. The descriptive statistics show that drivers gave their highest rating to training for incident handling (mean = 4.0152) and their lowest rating to training on security (mean = 3.7121). The seven remaining questions in this group used a binary scale to address task, treatment or tangibles issues. Table 1 illustrates that while most drivers knew that policies and procedures were documented in a manual (98%), only 76% practiced awareness and reporting of unusual activities as part of security.

Table 2 shows the classification of these 12 items according to the systems framework discussed earlier. Results from this classification reveal that the task category included items related to documentation of policies and procedures and adequacy of training on policies and procedures. In contrast, the treatment category contained items dealing with adequacy of training for security, rider relations, incident recognition, and incident handling and participation in an on-going training program. Finally, the items in the tangibles category addressed issues like vehicle inspection and unattended vehicles.

TABLE 1
DESCRIPTIVE STATISTICS

Question	Mean	Standard Deviation
1. Overall level of security ¹	3.4545	0.9312
2. Training on policies and procedures ²	3.7424	1.1137
3. Training on security ²	3.7121	1.17362
4. Training on rider relations ²	3.8636	1.06535
5. Training on incident recognition ²	3.9394	1.07958
6. Training on incident handling ²	4.0152	1.07406
	Proportion Agreeing	Standard Deviation
7. Is awareness and reporting of unusual activities part of security procedures? ³	0.76	0.432
8. Is inspecting inside and outside of vehicle part of security procedures? ³	0.86	0.346
9. Is making sure vehicle is in secured location when unattended part of security procedures? ³	0.86	0.46
10. Is there an existing Manual of Policies and Procedures? ³	0.98	0.123
11. Are you familiar with the contents of the Manual of Policies and Procedures? ³	0.89	0.31
12. Was familiarization with the policies and procedures part of your initial orientation and training? ³	0.8	0.401
13. Do you participate in an on-going training program? ³	0.83	0.376

¹ Five-point Likert scale from Very Low to Very High

² Five-point Likert scale from Very Inadequate to Very Adequate

³ Yes or No

The survey also asked the drivers to assess the overall level of security at their transit system (question 1 on Table 1.) As Table 1 shows, question one also used a five-point Likert scale with one defined as very low and five as very high. Drivers gave a rather mediocre rating to overall security at this system (mean = 3.45). The correlation matrix in Table 3 suggests that several of the items in the treatment category are significantly correlated with the overall security rating while the two tangibles elements show no significant correlation with the overall security rating. Table 3 also reveals that an adequate level of training on policies and procedures is significantly correlated with overall security.

**TABLE 2
FRAMEWORK**

Framework Category	Survey Question
Task	Training on policies and procedures Documentation of policies and procedures Familiarity with the contents of the manual on policies and procedures Manual contents covered by initial orientation and training Awareness/reporting of unusual activities
Treatment	Training adequately covered security Training adequately covered rider relations Training adequately covered incident recognition Training adequately covered incident handling Participation in an on-going training program
Tangibles	Inspection of the inside and outside of vehicle Parking unattended vehicles in secure locations

To further analyze the relationship of these service elements to perceived overall security, the authors conducted a stepwise regression analysis in which overall security, the dependent variable, was regressed against all twelve service elements. The analysis identified a four variable model containing X_1 (adequacy of training on policies and procedures), X_2 (adequacy of training on security), X_4 (adequacy of training on incident recognition) and X_6 (awareness and reporting of unusual activities part of security practice). The model had an adjusted $R^2 = 0.319$ and was significant (p value < 0.001) (see Table 4). Individual t-tests revealed that all the variables in this model were significant (with p-values ranging from 0.001 to 0.045). Multicollinearity was not a problem because the variance inflation factors were all well below the accepted limit of 10 [2, 3, 5] (Table 5). The regression model may be stated:

$$Y = 2.168 + .3445 X_1 + .370 X_2 + -.263 X_4 + -.428 X_6$$

DISCUSSION

Several managerial implications stem from the results of the case illustration discussed in the previous section. These involve: 1) the relative importance of training versus documentation, 2) the unintended consequences of some task and treatment items and 3) the lack of significance for survey items related to the tangibles component.

The results of the regression analysis revealed that three of the four significant variables in the model were related to the adequacy of training for these frontline workers. Adequate training about policies and procedures emerged as an important predictor of overall perceived security; however, survey items that dealt with the manual of policies and procedures were not. This seems to imply that drivers do not think that simply knowing a manual exists, and becoming

**TABLE 3
CORRELATIONS¹**

Question	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Level of security	--	.471	.600	.296	.242	.270	-.028	-.043	-.033	.061	.116	.202	.044
2. Training on policies and procedures		--	.613	.502	.627	.608	.252	.187	.050	-.029	.231	.505	.153
3. Training on security			--	.657	.508	.492	.164	.091	.069	-.031	.211	.237	.134
4. Training on rider relations				--	.595	.580	.228	.199	-.039	-.016	.142	.224	.250
5. Training on incident recognition					--	.744	.133	.142	.076	-.007	.072	.363	.316
6. Training on incident handling						--	.273	.213	.035	.002	.236	.257	.350
7. Is awareness and reporting of unusual activities part of security procedures?							--	.187	.141	-.070	.035	-.013	.032
8. Is inspecting inside and outside of vehicle part of security procedures?								--	.171	-.049	.150	.247	-.059
9. Is making sure vehicle is in secured location when unattended part of security procedures?									--	-.037	.005	.102	-.133
10. Is there an existing Manual of Policies and Procedures?										--	.360	.250	.277
11. Are you familiar with the contents of the Manual of Policies and Procedures?											--	.324	.110
12. Was familiarization with the policies and procedures part of your initial orientation and training?												--	.085
13. Do you participate in an on-going training program?													--

¹ n = 66 who answered each question; p ≤ 0.05 are bolded

**TABLE 4
REGRESSION RESULTS¹**

Predictor	Beta	P-Value for T-Test
(Constant)	2.168	
Training on policies and procedures	0.345	0.004
Training on security	0.370	0.001
Training on incident recognition	-0.263	0.021
Is awareness and reporting of unusual activities part of security procedures?	-0.428	0.045

¹ n = 80; adjusted R² = 31.9%; model is significant at p < 0.001

**TABLE 5
MULTICOLLINEARITY MEASURES FOR REGRESSION MODEL¹**

Variable	Tolerance	Variance Inflation Factor
Training on policies and procedures	0.475	2.107
Training on security	0.564	1.773
Training on incident recognition	0.567	1.764
Is awareness and reporting of unusual activities part of security procedures?	0.947	1.056

¹ n = 80

familiar with its contents is enough to ensure a high level of security at this transit system. Rather, the drivers preferred in-depth training during which they could ask questions about resolving specific problems or interpreting a certain policy. Similarly, drivers found that in-depth training targeting specific security issues was essential for maintaining a high level of system security. In contrast, adequacy of training for incident recognition did not translate into higher perceived security; in fact, the negative beta coefficient for this variable indicates an inverse relationship exists between these variables. This finding indicates that incident recognition training at this transit system spent too much time on issues unrelated to security concerns. Thus, incident training had the unintended consequence of lowering the perceived overall security level.

The fourth significant model variable – awareness/reporting of unusual activities are part of security practice – also had a negative beta coefficient. The drivers apparently considered most

of this reporting as a distraction from their jobs – rather than an efficient way of promoting overall security.

The two survey items related to the tangibles component – vehicle inspection and secure parking locations – were not significant predictors of perceived overall security at this system. Apparently, the drivers view inspection as a safety procedure instead of a security matter. While keeping unattended vehicles in a secure location does add to security, it does not contribute as much as a thorough understanding of security procedures or knowing how to safeguard the public during service provision. In a high-contact service operation like a public transit system, it is especially important that front line workers can handle a security breach during service provision since many customers may be in harm's way.

This study showed that adequate frontline worker training was an essential tool in ensuring service security. This does not mean that training alone will suffice. Additional research is needed to explore other ways to raise security levels in services. For instance, the use of innovative technology constitutes one approach. Increasing security awareness among customers offers another possibility. Regardless of the course of action that is chosen, input from frontline workers will remain an essential ingredient of service security. Likewise, an organizing principle like the systems model adopted in this study will help both practitioners and researchers address the multitude of service elements that affect service security.

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Utilizing Lagrangean Relaxation for Solution of Hard Generalized Assignment Problems

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We create a test set of hard generalized assignment problems (GAP) that cannot be solved to optimality in less than one hour of CPU time by either CPLEX or GUROBI. We investigate alternate approaches that, when used in conjunction with an optimizer, either allow optimal solutions or improved feasible solutions to be generated in a reasonable amount of time. Good feasible solutions to GAP problems are generally easy to generate within 2-3 minutes of CPU time using GUROBI or CPLEX. We use this generated upper bound to solve variants of the LP relaxation of the GAP where we iteratively find the minimum and maximum cardinality possible in any optimal solution to the GAP. We also find the minimum possible resource used by each agent in any optimal solution. We add these constraints (among others) to the original problem and resolve with CPLEX and GUROBI. We present computational results that improve upon the standard CPLEX or GUROBI results.

SUCCESS IN NASCAR: THE STATISTICAL DETERMINANTS OF POINTS

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ABSTRACT

One of the criticisms of the NASCAR points system in place prior to 2004 was that the accumulation of points was a matter of completing races and therefore completing more laps. This research attempts to determine if laps completed is still the dominant factor that determines NASCAR success as measured by points. We provide evidence in the form of multiple regression analyses for the full 2012 season. Compared to previous research, we find that laps completed is an even more important determinant of accumulated points. In addition, car speed and year-to-year consistency continue to serve as important factors in determining success.

INTRODUCTION

Previous research has identified variables that help to explain the outcomes of individual races and the number of top ten finishes for a season [13]. Allender [1] [2] used regression analyses to determine whether a set of variables were significant in predicting the finish position in NASCAR races. Her findings conclude that a driver's years of experience play a significant role in predicting the outcome of NASCAR races. Additionally, Pfitzner and Rishel [14] developed a theoretical model of success for a season among NASCAR drivers. The empirical estimation of that model reveals that the number of laps completed in a season dominates the statistical explanation of points accrued by drivers. NASCAR has since added a season-ending format called the "chase" with qualified drivers to determine an overall champion for the year. Here we model points accumulated (including the drivers who made the chase) for the top 43 drivers for the 2012 season.

A nearly infinite number of factors affect performance in NASCAR races. The speed and handling of the car, the skill of the driver, and the performance of the pit crew are but a few of the variables that are important determinants of the overall performance of particular car and driver combinations. Many variables outside the control of a particular team, such as the behavior of other drivers, weather, cautions, and the like also influence the final order of finish in NASCAR races. On an annual (season) basis many of the same factors influence success measured over the full season of races.

The variables collected for this research include the dependent variable points and explanatory variables including the number of poles won, average start position, number of drivers on a given

driver's team, variables such as whether the driver was a rookie, and other potentially relevant variables.

A SIMPLE THEORETICAL MODEL

As a first approach to the problem of predicting success in NASCAR's Sprint Cup series, we offer a simple theoretical model. Success (points or, perhaps, money winnings) is posited to be functionally related to variable sets reflecting car speed, driver characteristics, team characteristics, performance in prior years, and other factors. In functional notation:

$$P = f(S, D, T, Y, O), \quad (1)$$

where:

P = Driver points for a given season

S = Car speed

D = Driver characteristics

T = Team characteristics

Y = Performance in the prior year

O = Other factors.

To be sure, the variable categories listed are not distinct from each other. That is, empirical measures of car speed are certainly related to other categories of variables such as driver and team characteristics. The theoretical model serves to provide a framework for the empirical specification of the model.

Car Speed, Driver Characteristics, and Prior Performance

The effects of car speed on race outcomes are obvious. Faster cars will, on average, finish better which results in accumulating more points. Also obvious are the effects of the driver's racing skill and experience. If it is possible to proxy for the driver's racing skill and experience, such proxies should be related to finish position across races. Prior performance is based on the assumption that success breeds success, so if a driver/team combination was successful last year the chances are it will also be successful this year.

Team Characteristics

Team characteristics, in particular team size, require additional explanation. It is an empirical fact that multi-car teams have, in recent years, dominated the Winston Cup series and it is commonly believed that multi-car teams have advantages over single car teams. What particular advantages are possible for multi-car teams?

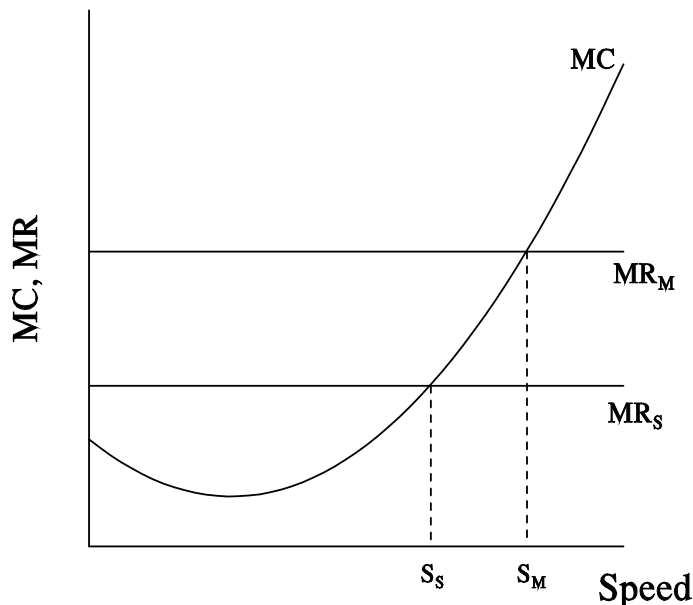
First, the marginal cost of increasing the speed of a car is likely to be very sharply upward sloping [16]. This is due in part to NASCAR rules regarding car shape, size, aerodynamics,

weight, and engine characteristics. While these rules are in place to equalize competition, the existence of this degree of uniformity makes it very difficult and expensive to gain an advantage within the rules. As Bill Elliott, a driver and past owner observes, “It may cost you \$5 million to get to the track, but it may cost you an additional \$3 million for a few tenths better lap time” [6, p. 37].

A team with more car/driver combinations can apply any found advantage to each of its cars. Such advantages then result in better performances for all cars on the team, and hence greater performance revenues. Consider Figure 1 in which marginal cost (MC) increases sharply as car speed increases and such costs are assumed to be the same for multi-car teams as for single car teams. Since newly discovered speed advantages can be applied to all cars on a multi-car team, those teams can generate greater revenues for the team (MR_M = marginal revenue for multi-car teams) than any such advantage generates for a single car team (MR_S = marginal revenue for single car teams).¹ Following optimization principles then, multi-car teams would find it worthwhile to achieve a speed of S_M , whereas single car teams have incentive to achieve a speed of only S_S . If this analysis is correct, multi-car teams would be expected to achieve greater speed in general than single car teams.

Second, it is an empirical fact that larger teams attract greater sponsorship resources, in part because they are more successful. Then, if the sharply increasing marginal costs mean that multi-car teams are more likely to engage in expensive research for given performance benefits

Figure 1: Multi-car versus Single Car Teams



¹ The flat MR curves are offered as an approximation. Additional speed should add increasing marginal revenue (as cars move up in finish order, added revenue increases), but because all cars are attempting to increase speed, the possible increases in revenue will be distributed among the competitors.

and sponsorship revenues depend on performance, the dominance of multi-car teams can be explained (at least in part) by this simple economic analysis.

Third, teams with more sponsorship income are able to offer greater compensation to crew members, hire more experienced and specialized team members, such as aerodynamicists, and can more easily afford expensive technology and testing.²

Fourth, substantial barriers to success for smaller teams (especially single car teams) may also exist because of scale economies. The advanced technology machinery for making racing parts would be an example of the “lumpy inputs” explanation of scale economies thought to be the most common reason for decreasing long run average cost. Larger teams would then have an advantage since the production of such parts for the team would necessarily be larger in scale.

Other advantages also accrue to multi-car teams. Operationally, multi-car teams also have more testing opportunities available to them. Hence, more data can be collected and shared among team members when it comes to setting up the cars for races. Multi-car teams also have built-in drafting partners, although the NASCAR literature suggests that at the end of the race each driver is “on his own,” [3] [4] [5] [11] [12].

EMPIRICAL SPECIFICATION

Data

The data for this project were collected from NASCAR websites:

http://www.nascar.com/en_us/sprint-cup-series/stats.html [7],
https://en.wikipedia.org/wiki/NASCAR_Rookie_of_the_Year [8],
https://en.wikipedia.org/wiki/2011_NASCAR_Sprint_Cup_Series [9],
<http://www.racescorestats.com/Standings.aspx> [15].

The variable we wish to predict is the points accumulated by each driver for the 2012 Sprint Cup season defined as:

points = points earned for the 2012 Sprint Cup season.

The potential explanatory variables for seasonal success in the Sprint Cup series collected for the 2012 season were:

average start = the average starting position for a given car/driver during the 2012 season.

poles = number of pole positions earned during the 2012 season.

² For example, testing for the aerodynamic properties of a car in a wind tunnel can cost more than \$2000 per hour [8].

laps = number of laps completed for all Sprint Cup races for the 2012 season.

rookie = a dummy variable equal to 1 if the driver was a rookie in 2012, and equal to zero otherwise.

drivers = the number of cars/drivers an owner fields at the Sprint Cup level.

points_{t-1} = points earned for the prior year (2011).

chase = a dummy variable equal to 1 if the driver qualified for the chase in 2012, and equal to zero otherwise.

Car Speed

The first two variables from the above list, *average start* and *poles*, correspond to the car speed category from the model outlined in the previous section. Clearly, average starting position represents the outcome of each car's qualifying effort throughout the season and number of poles indicates the number of times a driver successfully qualified his/her car as the fastest. We hypothesize that a lower average starting position (i.e., starting 1st as opposed to 43rd) will result in better finishes, hence accumulating more points. Likewise, if a driver wins more poles he/she has been successful in qualifying and we hypothesize that this will translate into more points and earnings.

Driver Characteristics

The next two variables, *laps* and *rookie*, are driver (and team) characteristics with the first representing the number of laps completed by a driver in the current year, and the variable *rookie* serving as a proxy for lack of experience in the Sprint Cup series. The number of completed laps for the current year represents consistency in starting and completing races (obviously this variable depends on crew and other team characteristics as well). Some observers have suggested that the NASCAR points system has awarded points to drivers too liberally simply for completing laps. Indeed, such considerations caused NASCAR to change the way points are accumulated for the 2004 and subsequent seasons. It is clear that laps completed will be positively related to points and earnings—it will be interesting to test whether other effects are important after controlling for laps completed.

A variable representing a driver's rookie season was included since rookies may not have the skill level that active Sprint Cup drivers have developed over the years, nor will they have the exposure to certain tracks that more experienced Sprint Cup drivers have competed on in the past. Therefore, if a driver is in his/her rookie season he/she may be expected to be less successful in terms of points.

Team Characteristics

The variable *# drivers*, corresponds to the team characteristics category in the model. The number of drivers variable measures the effect of a given owner having multiple cars/drivers or a multi-car team. Generally it is believed (and supported by prior research) that multi-car teams have advantages over smaller teams (see the earlier analysis), therefore we anticipate that multi-car teams will have better finishes resulting in more points.

Performance in the Prior Year

The variable, *points_{t-1}*, are the points accumulated in the prior season. This variable is included to test for year-to-year consistency. It is likely that points earned in one season are positively related to points earned in the following season.

Table I is a summary of some of the statistics collected for the 2012 season. We were able to collect full statistics on 43 individual driver/car combinations. These drivers averaged over 1075 points, with the leading point scorer collecting 2400 points (Brad Keselowski). The mean number of laps completed was 8038, with the leader in this category completing 10406 laps (Paul Menard, who interestingly did not qualify for the chase). The number of drivers per team ranged from 1 to 4. The most number of wins was five, and three drivers accomplished that feat—Keselowski, Johnson, and Denny Hamlin.

Table I: Summary Statistics for 2012 NASCAR Data

<i>Statistic</i>	<i>2012 Points</i>	<i># Drivers</i>	<i>Average Start</i>	<i>2011 Points</i>	<i>Laps Completed</i>
Mean	1075.41	2.465	21.23	1055.49	8038.40
Standard Deviation	836.52	1.01	9.49	864.90	3152.64
Minimum	94	1	8.8	0	804
Maximum	2400	4	39.5	2403.00	10406

RESULTS

We attempted to estimate a general regression equation with points as the dependent variable and some combination of variables from the explanatory set as the independent variables. Such regressions are of the general form:

$$P_i = S_0 + S_1x_{1i} + S_2x_{2i} + \dots S_kx_{ki} + V_i , \quad (2)$$

where:

P_i = points for the 2012 season

x_k = the various explanatory variables

θ = the intercept to be estimated

β_k = the slope coefficients to be estimated

ϵ_i = the standard error term.

Modeling Points

One of the criticisms of the NASCAR points system in place prior to 2004 was that the accumulation of points was a matter of completing races and therefore completing more laps. Since points were awarded for laps accumulated, drivers might be encouraged to drive conservatively to ensure that they finished the race, rather than take chances in an attempt to win the race. All out attempts to win may result in fewer laps completed, since such risk taking increases the likelihood that a car may be involved in an accident, run out of fuel, blow a tire, or blow an engine. Do the data suggest that such was still the case for the year 2012? In fact, a strong statistical case can be made to support the criticism.

The first column (Regression 1) in Table II represents the regression with laps completed and an intercept dummy variable for the chase as the only explanatory variables. This regression represents an almost complete statistical explanation of driver points accumulated over a season. The \bar{R}^2 value of .982 means that less than 2 percent of variation in driver points is left to be explained by factors other than laps completed. We recognize of course that the variable “laps completed” embodies many of the determinants identified in the prior section. That is, driver, team, and car characteristics are important in determining the number of laps a given driver completes for the season. Nonetheless, the regression suggests that staying in races so that the driver completes as many laps as possible is a dominant explanation of points. Figure 2 is the graphical representation of Regression 1. The cluster of data points to the northeast in the graph represents the 12 drivers who qualified for the additional points awarded for the chase. The intercept shift dummy implicitly assumes that the effect (line slopes) of the explanatory variable is the same for the drivers who made the chase and those who did not. The data suggest that assumption is appropriate.

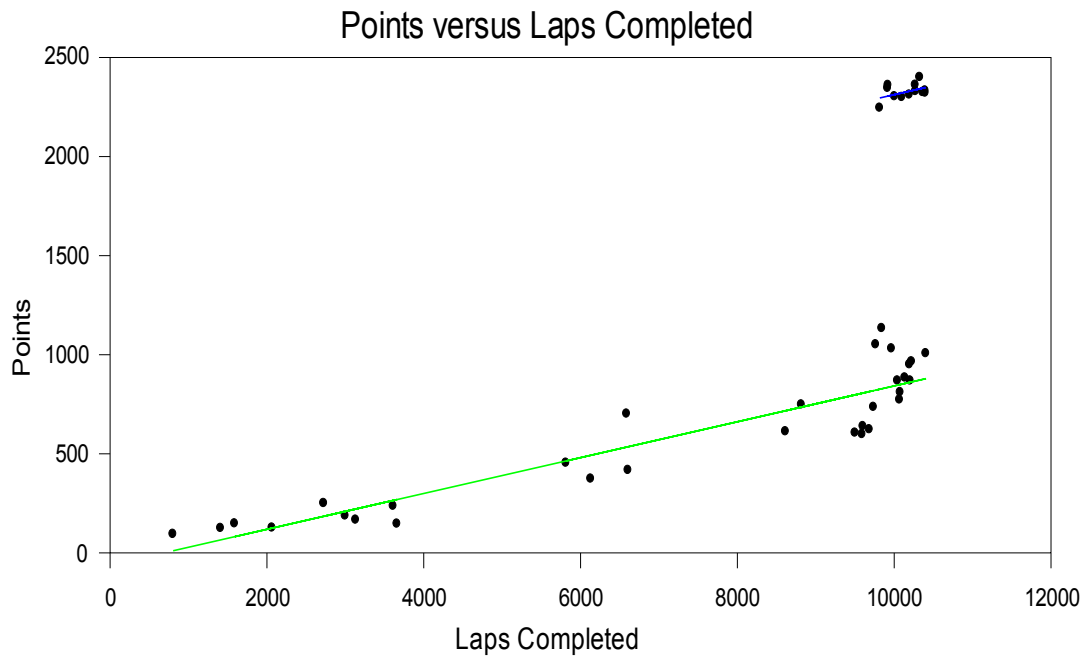
Regression 2 is an attempt to test to see if the other categories of explanatory variables evince statistically important effects, controlling for laps completed. Here we add the number of drivers, average start position (a proxy for car speed) and points from the previous year (a check for consistency). Car speed does indeed play an important statistical role in explaining accumulated points for drivers. The points a given driver collected in 2011 also plays a statistically important role in explaining points across drivers. The coefficient for the number of drivers is signed in accord with theory, but is statistically insignificant. Regression 2 raises the value of \bar{R}^2 to .9943, and note importantly that the standard error of the estimate is considerably smaller (reduced by about one-half) for Regression 2.

Table II: Regression Results: Points Accumulated = Dependent Variable

Explanatory Variable/ Statistic	Regression 1	Regression 2
Intercept	-61.77	268.88
Laps completed	0.0904* (15.00)	0.0722* (18.03)
Chase dummy	1469.80* (41.87)	1344.54* (46.81)
# Drivers		14.71 (1.16)
Avg. Start Position		-10.55* (-6.90)
2011 Points		0.0365** (2.12)
\bar{R}^2	0.9822	0.9943
SEE	111.49	62.96
F Statistic	1162.16	1475.43

(t-statistics are in parentheses below coefficients, n = 43 for all regressions. * = statistically significant at $< .01$, ** = statistically significant at $< .05$)

Figure 2: Points as a Function of Laps Completed and a Dummy Variable for the Chase



We also experimented with a binary variable for number of drivers to test for team effects. That variable was coded as zero if the driver was not a member of a multi-car team, and one if the

driver had any number of teammates. That variable was not significant in any of our attempted regressions. We also included the rookie variable in our regressions. Rookie status also failed to add to the explanatory power of any regression, while controlling for the other variables.

In general we conclude that the empirical formulation of the theoretical model provides almost full explanation of the differences in points among drivers for the 2012 season. We find important effects for laps completed, car speed, and drivers also show some consistency from year-to-year. Statistically speaking, laps completed is the most important variable in determining points accumulated by drivers.

CONCLUSIONS

Evidence is offered here in the context of regression analyses on the important determinants of success on the NASCAR circuit for the year 2012. Laps completed for the season play an important, even dominant, role in the accumulation of points. We also find consistent and important effects for car speed (proxied for by average start position), and there appears to be evidence of year-to-year consistency, with points in the prior year serving as the proxy for consistency. Compared to our research in 2006, laps completed is an even more important determinant of accumulated points, despite the “chase” model now in effect for the NASCAR championship.

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SERVICE ECONOMICS: BASIC CONCEPTS

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ABSTRACT

Service is the backbone of developed nations and constitutes approximately 90% of their GNP. Most professional persons, such as physicians, lawyers, and educators are actually service providers, because service is core to their everyday activities. Moreover, practically all business, governmental, and educational endeavors actually provide service, as do most products and social activities. This paper takes the view that service is the main driving force behind modern society, and builds on the groundbreaking work of Adams, Mill, Jevons, and Fawcett and explores how the knowledge of service principles can serve as the basis of a complex civilization.

THE SERVICE LANDSCAPE

In its most general sense, *service* is regarded as a provider/client collaboration that creates and captures value for both participants. Both entities contribute in the interchange and both benefit, even though the sense of participation is diverse and varies between different forms of service execution. [9] A prototypical example is the relationship between a doctor and patient that relies on the participation of both persons, since both entities are required in order for the service to be instantiated. Moreover, a doctor's service varies between patients and yields different results, depending on the situation. This characteristic is typical of most service. The entity supplying the service is known as the *service provider* and the entity receiving the service is known as the *service client*. The domain of service providers includes individuals, teams, products, electronic systems, groups, and ad hoc units organized to execute a particular service delivery scenario. Similarly, service clients include persons, groups, social organizations, governments, and commercial entities. In some cases, the object receiving the service is the responsibility of the client, as in cleaning and repair services. In this instance, the entity receiving the service is known as the *service object*. Many forms of service delivered to objects under the jurisdiction of a service client exist in everyday life, as in automobile repair, child-care, and so forth. A service is often complex requiring supplementary and subsidiary services, so that a complex chain of services, called a *service system* is necessary to achieve a particular result. The modalities of service systems include the following operational scenarios: *tell me*, *show me*, *help me*, and *do it for me*. [12] Thus a service system is analogous to a wide range of activities and artifacts, such as a missile system, an educational system, or a medical system. Many commercial activities, such as airline transportation are based solely on service, and in other cases, service is only a part of a complicated commercial arrangement, such as vehicle retailing. Many business firms specialize in providing service. Service design is also a field of study in art and design curricula. Governmental and educational work is a service, and religious groups provide a service. Military personnel are designated as being in the service. The manufacturing process uses services to assemble products that essentially supply a service. The ubiquitous use of the term "service" in everyday communication is so pervasive that the significance of the concept is

diluted through overuse. Even though most social, commercial, educational, and governmental activities are actually service, most people mistakenly think they know all they need to know about the subject. People like to submit to their own intuition when providing service without knowledge of basic service concepts and are surprised when results do not turn out as expected. Actually, a complete knowledge of the interaction of the various and diverse forms of service, together with its developmental hierarchies, would require a lifetime of study. [6]

Societal Needs

Services are derived from societal needs, such as medical care, fire and personal safety, and educational assistance. So, how do services in the proverbial sense differ from products that are purportedly also derived from people's needs? A service is derived from a specific need and is created at the point of instantiation, that is, when the service experience actually occurs. A product is created, on the other hand, from an anticipated need and is created independently of the specific entities that will eventually use it. Accepting the fact that some products are constructed as special orders, the majority of products are manufactured beforehand and held until purchase. That said, products are in fact services, because the use of a product provides a service. A vehicle that entails transportation provides a service. A famous painting, displayed in a suitable place, also provides a service to the owner, although its value is totally different, and ordinarily supplies an intangible benefit.

Tangible and Intangible Service

A *tangible service* is a provider/client event that results in demonstrable value to the service participants. In people or possession processing service, value is created through the work performed on behalf of the client by the provider. With information services, the value of the service is derived from the transfer of information from the provider entity to the client entity. The value proposition for a product is determined from the service it provides, rather than from the intrinsic value of its specific components. A tangible service is something that is observable in the real world and delivers results that are utilitarian and measurable.

An *intangible service* provides an affective value for a service participant through the feeling one obtains from a service interaction or the ownership of a product. Certain products, such as premium automobiles, special jewelry, and elegant real estate are typically associated with this category. The results from intangible service are affective and hedonistic. Often, the education or affiliation of a service provider supplies intangible value over and above tangible value. Many forms of service incorporate both tangible and intangible components. [10, 11]

Naïve Service Science

The study of service is the upcoming discipline for the 21st century, because it is the prevalent activity of persons and organizations, and yet, very little is known about the subject. There are no theories, best practices, and no principles of precisely what constitutes good service. From a business viewpoint, service sustainability has not even been considered in most instances. People are interested in service and its academic basis known as *service science*, because it will eventually change the predominant economic focus in developed countries from products to

service. The subject is important to providers and consumers of service, since most service providers, such as individuals, businesses, governments, and other organizations, are also consumers of service.

At the elementary level, service is straightforward and a conceptual view of the subject matter is easily acquired. *Service is work performed by one person or group that benefits another person or group.* Clearly, the provider and client have differing roles and they need to exchange information to execute the service event. If one were to consider the interactive component of basic service, it would be considered to be a social activity that is consumed at the point of production. The service provider and the service client co-produce a service. Thus, service is a process, usually referred to as a service event, characterized by customer participation, simultaneity, perishability, and heterogeneity. *Customer participation* refers to the fact that the customer brings an asset to the event and that is the domain within the event takes place. *Simultaneity* refers to the unique instance where the service is produced and consumed at the same time. *Perishability* denotes that if the opportunity to engage in the service event by the provider or client is not taken, then the opportunity is lost. Lastly, *heterogeneity* specifies that each service event is unique. [9]

In the case of business, the nature of service is the same, as in the elementary form, but the scope is often greater and requires organizational as well as functional skills. When a business process is given to an outside party, the activity is called *outsourcing*, which can occur at the local or global level. Some firms are in the business of providing services that normally are governed by an explicit or implicit service-level agreement.

Service Process and Organization

At the global level, an organizational entity that provides a service normally goes through a service lifecycle consisting of service commitment, service production, service availability, service delivery, service analysis, and service termination. As such, the service organization can be characterized, as being composed of a layered set of activities that constitute a value chain for services, comprised of people, technology, and organizations. This is essentially a process view of generic services supplied by a governmental or economic entity, such as a governing body, a business, an institution, or an individual acting in a service capacity. *Service commitment* refers to the formal agreement that provides a class of services to a service audience by a principal or trustee with proper administrative control over the service domain. The agreement, such as a charter, to provide fire service by a municipality and the establishment of a health clinic are common examples. The mayor of a city is a common example of a service principal. *Service production* pertains to the operational aspects of service provisioning that encompass service design, infrastructure, availability, quality management, and back-office processing. The producer is the agent of the principal in a prototypical principal-agent scenario. The principal and the agent may be the same economic entity or different entities in a distinct service relationship. The producer is responsible for insuring the resources are available to execute a service, including those persons charged with actually performing that service. *Service availability* denotes the time when a service is available, including initiation and termination dates. *Service delivery* is the comprehensive class of activities usually regarded as the “service” and is the layer where the service client comes into the picture. The doctor/patient relationship is

a good example of this layer. The service provider, who could have a dual role as a producer, is an agent of the producer as the primary source of service revenue and is the primary provider of service. Service delivery normally consists of several inherent services constituting a service value chain. *Service analysis* refers to the measurement activities and the determination of value propositions needed to sustain service operations. *Service termination* reflects the inevitable consequence of evolving services where a total service operation has to be retired, because of insufficient activity or realigned opportunities. [7]

BASIC CONSIDERATIONS FOR SERVICE ECONOMICS

In the traditional world of economics, the efficiency of labor, production processes, marketing, and sales is paramount to a successful and sustainable enterprise. The concepts apply as well to non-profit organizations as they do to profit-making business, and equally well to education and government. Everything else being equal, an inefficient worker can extend the length of employment or provide an opportunity for additional workers. The implication is that capital, needed to sustain economic activity, is unlimited. With automation, of course, the significance of capital changes. Fewer positions are needed, and the character of the workplace is improved. Thus, the employers and employees benefit. In service, the interactions are more complicated in that the initial success of a particular service, within a specific domain, engenders an increased demand that leads to additional service provisioning and also a larger client population.

Service Economy and Service Economics

Service economy and economics are related terms concerned with the value proposition of a service and how it is provisioned and consumed. *Service economy* is the study of the nature of services that underpin the activities of persons, organizational entities, institutions, governments, and nations. It is based on derived value that enables one entity to be more successful as a service provider than another. *Service economics* is the study of the interactions of service entities that essentially constitute a service experience. Service economy operates at the general level, and service economics operates at the detailed level. A service economy is concerned with how a service is formulated through a life cycle of commitment, production, availability, delivery, analysis, and termination. Most services adhere to this life cycle. The service interaction in service economics incorporates activities, primarily based on the client, that include service acquisition, invocation, execution, and service termination. These topics will be expanded upon in subsequent pages.

Learning and Applying Service Concepts

It is important to recognize that service is a science, as is chemistry or biology, in the sense that knowledge of the subject matter increases the ability to provide and consume service. [6] There is a body of knowledge supporting the subject of service science together with characteristic problems and a wealth of appropriate solutions. The mistake that people make about the subject matter is that they think they can learn all they need to know about service without studying it, because a good service process or product is often viewed as an end result, rather than a process. It is commonly thought that all that is needed is the desire and the wherewithal to execute the

service and somehow the results will be commensurate with the perceived needs. “It is my service,” they say, “and I’ll perform it as I want to. Take it or leave it.” The key point is that people, in general, do not become familiar with a subject until the underlying principles have been exposed. The nature of service should be considered when any political, financial, or business question arises.

There is a body of knowledge, however, that supports the conjecture that a set of principles governs the operation of services, and that the information contained therein has a basis in modern Philosophy. In social *constructivism*, individuals and groups participate in a perceived reality, and create an element of knowledge, as espoused by the philosophical doctrine of Equal Validity. [2] Equal Validity suggests the notion that other means of knowing exists in addition to the factual predominance of scientific investigation. As an example of constructivism, consider a simple wooden chair developed in antiquity. A chair is often made from wood that has been determined as useful to the purpose. Clearly, wood exists as a natural phenomenon, independently of its various uses. The precise form and substance of a chair, however, is a socially constructed form of knowledge that none but the hardened skeptic would deny is a valid form of knowledge. So it is with service. Service systems are socially constructed forms of interaction wherein entities exchange beneficial forms of action through the combination of people and technologies that adapt to the changing level of information in the system. Thus, service is a social reality constructed through a dynamic process replicated and maintained by social interactions within a service and between services.

Service economics, and by extension service provisioning and service utilization, is different than other sciences used to make the lives of individuals more healthy and prosperous. For organizations, it might be a matter of success or failure. Service economics deals with the value derived from services, how that value is derived, and how it can be enhanced by modern technology. Certainly, wealth derived from service provisioning is an important consideration in the availability of service, but there are other non-monetary benefits to be derived from service, such as success, happiness, opportunity, and possibly mere existence.

Structural Dynamics of Service

Most services adapt a common structure that essentially determines how the provider and client interact in order to execute a service process. Ordinarily, the total service process incorporates several well-known steps that constitute what is commonly regarded as the service: service acquisition, service invocation, service execution, and service termination. More will be said later about this service process lifecycle. Clearly, this is a provider view of service. The prevailing opinion is that the client is involved as a secondary participant. However, what would occur if there were no clients? Without clients, a doctor is a person with an MD degree, and a bricklayer is someone that knows how to position bricks or similar objects. Thus, a client provides a service to the provider by engaging in the service process as being a receiver of service. The concept is that there is a certain duality in services, wherein the client depends on the provider and the provider depends on the client. We will refer to this phenomenon a *service duality*. Thus, the common practice of denoting the client as a secondary participant is not valid in the modern view of service execution. The provider and the client, in the most general sense regarding service, are on an equal footing.

In many instances, the provider and client are not singular but are groups. A group of service providers, known as a *provider set*, is a collection of service systems designed to support a particular endeavor in its respective domain, such as a university, medical group, or even a newspaper. Each element in the set provides a specific service to a client. Associated with the provider set is a *client set* composed of elements that functions in a complementary manner with provider set elements to instantiate a service event. A service is thereby an interaction between an element from the provider set and an element from the client set, represented as a mapping between the sets. Accordingly, the collection of mappings is known as a *service set*. It follows that a *service collective* is a 3-tuple consisting of a provider set, a client set, and a service set, all of which can interact through an eclectic platform designed to sustain a unified service system. A unified service system is created when a client set is combined with the provider and service sets, and the inherent process is called *unification*.

Examples of service collectives are commonplace. A university, for example, provides services to students. The provider set would consist of administrative, student, and academic services. The students comprise the client set. Similarly, a newspaper consists of sections, such as sports news, national news, international news, financial news, and so forth. Readers are the clients. In both instances, not all clients require the use all of the services, and a section of providers do not supply all of the services.

A *service value chain* is a progression of activities adopted to materialize a service. Not all service resources perform functions that are specifically evident in a provider/client interaction. In fact, there are three major stages in a service value chain: service commitment, service production, and service delivery. The three stages are collectively referred to as service provisioning. When practitioners refer to service, they normally intend the service delivery stage.

In many cases, the provider set operates as a connected service system that interacts through shared information to provide a service. Two forms are clearly distinguished: flow and interactive. In a *flow system*, information is passed between service providers in a sequential basis. Operationally adjacent providers are coupled to provide service delivery, where coupling reflects dependency, as opposed to cohesion that reflects stickiness. Essentially, one provider performs the initial step in a service procedure; a second provider performs a second step; and so forth. In an *interactive system*, members of a collection of providers interact on a needs basis to execute a service. Thus, the provider set can be viewed as a partitioned set in which sections demonstrate coupling or cohesion.

Duality and Collaboration

In the classic view of service, the roles of the provider and client are not symmetrical. In the most general sense, and even though the provider supplies a service to the client, and the client provides a service to the provider by being a client, the roles each entity plays is markedly different. In actuality, a team of providers may supply the service, and the client may be a singleton. For example, a team of doctors may service a single patient. The converse is also true, in the sense that is mayor provides leadership to an entire town. As mentioned earlier, the

client provides a reciprocal service to the provider. This is an example of *service duality*. Clearly, the question is “Does the mayor provide service to the town or does the town provide service to the mayor?” It is conceivable that service duality is a form of exchangeable value in service. [8]

In some instances, a set of service providers collaborates to execute a service. A *primary service* is the core service for which the provider and the client interact to produce demonstrable value. Accordingly, the key person, in a human instance, is the *primary service provider*, and in all but exceedingly simple cases, that person has helpers that provide secondary services. A *secondary service* is a service that ordinarily does not exist separately as a primary service and plays a supportive role to a core service. A doctor that supports a surgeon is functioning as a *secondary service provider*. *It is important to note at this point that the name “secondary service provider” does not imply capability, but what is actually performed during the execution of a service process.* The notion of a secondary service traditionally encompasses separate functions involved in the performance the core service process, existing in close physical and temporal proximity. A core service is dependent upon a secondary service, and the reverse is also true. The cohesion between core and secondary service processes is high. (See below.) When this phenomenon occurs, the core and secondary service providers are regarded as collaborating in the service process. Examples of secondary services are numerous and have a substantial variation. Three instances are the weigh in and blood pressure checks associated with a doctor’s visit, the acceptance and delivery of garments at a dry cleaning establishment, and the routine support functions performed in support of an automobile mechanic.

When two service providers are cooperating to perform a task, or set of tasks, but working independently as with a couple of masons building a structure, the concept of core and secondary service processes does not necessarily apply, since the cohesion of the two participants is low.

There are two additional forms of supporting service: facilitating service and auxiliary service. A *facilitating service* is disjoint from a primary or secondary service and enables a client to obtain utility from a service, such as instruction on how to use an automobile or a computer. Another example is a ticket agency that provides access to a tangible event, such as the theatre or an amusement park. An *auxiliary service* is independent from a core service and takes place before or after the core service. A referral event, for example, would be an auxiliary service.

Coupling and Cohesion

Coupling is a measure of the interrelatedness of two services and reflects the degree to which changes in one service process entail adjustment in the other. In a medical setting, the coupling between a core service and a secondary service is high, whereas the coupling between a core service and an auxiliary service would be lower. Thus, a change in the primary service process would probably necessitate a change to a secondary process.

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 attributes between providers are similar when the cohesion is high, as between the practice of two orthopedic surgeons. When the service attributes are not similar, the cohesion is low, as between an Internist and a Chiropractor.

Service Process Lifecycle

It is useful to identify the key events in the operational service, because this is how value is created. The *service lifecycle* can be viewed as those activities that exist between service acquisition and service termination – from both structural and operational viewpoints. From the *structural* point-of-view, the set of layered activities incorporate the service commitment, service infrastructure, service availability, service delivery, and the eventual termination of a service, as delineated previously. From an *operational* point-of-view, the layered activities describe service events and incorporate those transactable actions that constitute the essence of service.

Based on the above definitions, the lifecycle of a service process consists of a loosely defined set of steps intended to co-create value for complementary service participants. It is useful to conceptualize a generic lifecycle for domain ontology as consisting of the following steps: Service acquisition, Service invocation, Service execution, and Service termination. *Service acquisition* refers to the process of identifying a service provider with the requisite infrastructure, and its corollary, the process of attracting clients. *Service invocation* involves the scheduling and logistics part of the service process. *Service execution* entails the actual steps in the service process including supplementary services. *Service termination* incorporates referral, warranty, and archiving activities. The requisite infrastructure for sustaining the service process lifecycle is referred to as the *service platform* and is related to the activities of the producer in the upper ontology, covered previously. The service process lifecycle can be viewed as a set of layered events. One would ordinarily supplement the service process lifecycle with service analytics that are descriptive of the end state of a service event.

Service Acquisition. The generic steps that comprise service acquisition represent the handshaking needed to establish a service relationship. From the client perspective, acquisition consists of an awareness that some form of service is needed, known as *service awareness*, followed by the discovery of a suitable delivery vehicle, called *service discovery*, perhaps using Web Services, and finally the development of a service level agreement, usually known as *service negotiation*. From the provider perspective, service acquisition is fueled by a service commitment, service availability, and a variety of service conditions incorporated in the DNA of that service category. Prototypical examples of service acquisition are finding a doctor in a new town or locating a shop for automobile repair.

In a discrete service, the service provider assumes the role of the “service producer” and the service client assumes the role of the “service requestor,” in the sense that the client takes the initiative in the acquisition process. In professional and technical services, the service provider often assumes the role of the requestor by directly approaching from a business perspective or through direct advertising.

Service Invocation. An exogenous condition is needed to initiate a service process by the service provider on behalf of a service client. [4] It is termed a *triggering event* that can take one of a variety of forms, such as:

- An independent event requiring attention, such as a medical situation or a fire

- A request by the client, or its representative, to have a service performed that the client doesn't want to do, can't do, or the provider can do more efficiently
- A required service, perhaps by law or convention, initiated by the client or a governing body

The triggering event is typically followed by a *service scheduling* process that establishes a spatiotemporal location for service delivery. Some service providers use appointments to manage demand as a means of achieving service efficiency. The steps that facilitate core or primary service invocation are customarily regarded as a secondary service.

Service invocation involves back-office administrative record keeping and coordination, such that the provider and client can interact on a planned basis. The service delivery, availability, and demand dimensions of the service DNA sequence reflect the dynamics between provider and client in a service event. Appointments with professional service providers are formally scheduled, whereas arrangements with nonprofessionals are commonly scheduled on an informal basis.

Service Execution. *Service execution* is the phase of the service process lifecycle where the service provider engages the service client to achieve a goal state that reflects both provider and client perspectives. Alternately, the service object may be a service entity over which the client has legal or social responsibility. In general, the service object can be a person, a possession, information, or an abstract entity such as a financial investment. We are going to refer to the provider, the client, and the service object as *service participants*.

The primary objective of a service event is referred to as the *core service* that has tangible value to the service participants. The core service is conventionally comprised of primary, secondary, and auxiliary services. We are going to establish five categories with which the execution of a service event, per se, can be determined:

<i>Category</i>	<i>Alternative</i>
Modality	discrete, continuous
Diversity	heterogeneous, homogeneous
Temporality	active, passive
Complexity	low complexity, high complexity
Duration	short, long

Modality denotes whether the texture of the service takes place as a single interaction (*discrete*), such as a doctor's visit that is over when it is over, or it takes place over an extended period of time (*continuous*), such as an insurance policy. *Diversity* refers to whether the service can be performed by a specific provider (*heterogeneous*), such as particular attorney or accountant, or any one of a group of providers (*homogeneous*), such as a bank teller. *Temporality* specifies whether the service is one in which the provider and client actively participate (*active*), such as a dentist's visit, or one in which the service participants are not actively engaged (*passive*) until a

triggering event occurs, such as an insurance policy or a municipality's fire service. *Complexity* refers to whether the service is completed in a few similar steps (*low complexity*), or many different steps (*high complexity*). A hospital procedure or a home remodeling would reflect a high complexity; an appointment at the eye doctor's or a car detailing would exhibit low complexity. *Duration*, not to be confused with modality, refers to whether the service execution takes place in a few hours or less (*short duration*), or whether it takes place over a few days or longer (*high duration*). In medicine, a doctor's visit would have short duration, and a hospital stay would have long duration. In transportation, a ferry ride would have short duration, and a trans-Atlantic cruise would have long duration. Clearly, the collection of categories is generic, and it reflects the underlying complexity in attempting to be specific with ubiquitous social phenomena, such as service.

FUNDAMENTALS OF SERVICE ECONOMICS

Service economics is a subject that studies the nature of wealth generated by service. [3] It is an important subject because the modern view of the service economy must be considered when any political, financial, or business question arises. People do not generally become familiar with a topic until its underlying principles have been identified. Service is largely a utilitarian discipline [14], wherein a coherent set of underlying principles are not yet available, so that in everyday affairs, it is not prudent to defer analyzing the subject until those principles have been verified or confirmed. Every social question involves service, so that service economics would necessarily involve the following endeavors: production, exchange, distribution, and commerce. Another consideration is that the focus of economics has changed from land, labor, and capital to participants, knowledge, and capital. Capital is an important component, but not a defining characteristic, and necessarily encompasses wages and infrastructure.

Wealth and Service Value

Wealth is an important part of the end result of any commercial activity. Like service, wealth is a term with a many different meanings. In business, wealth refers to money and things that have exchangeable value. In government, wealth refers to the capability of having commercial and political power using money as a facilitator. In education, wealth is usually reflected in facilities and instruction. A wealthy country would have more exports than imports resulting in an importation of money, using the precise form of money available at the time. Mill [13] wrote that the wealth of a country is dependent on the skill that its labor is employed, and Smith [17] remarked that labor is the basis of all production. *This leads, of course, to the modern reflection that an increase of wealth is not only an increase in money, but it is the potential for providing service.* Early political economists considered wealth as anything with exchange value. [3] However, many things with useful purpose, such as the air and sunlight, are not wealth unless modified by human intervention. Money, as a public instrument, is solely a measure of value and a medium of exchange. A wealthy person or organization has a large collection of desirable or necessary items, or the means of obtaining them, provided that they are not provided by nature without some form of labor. Another consideration is that wealth is increased by producing where and by whom it is produced most expeditiously. [15]

Although service can and does involve products, it is not a material product of nature, so that service wealth, in its most basic form, is useful activity that produces value through human involvement. Service wealth lies in the potential for providing service, so that service-provisioning agents are the basis of all service. Clearly, humans, products, and informational resources can provide service. Thus, *value is established by an exchange of service through a provider-client relationship*. Service is usually associated with business, where value is produced through the manipulation of goods, capital, people, and events. Thus, service is a refinement of the business process.

A vertical is used to establish the value of service, consisting of value, price, and cost. The difference between cost and price yields the margin, and the difference between price and willingness to pay is the service value.

There is no explicit exchangeable value in service, per se, because you can't purchase someone else's service. A service is established at the point of instantiation and ends when the service is complete. The particular service under consideration is then finished. It no longer exists – only a record (or memory) of that service persists, along with tangible or intangible results, as determined by the specific incident. Separate from the actual service process, the facility of obtaining service, in the general view of society, can be scheduled, rescheduled, unscheduled, transferred, and purchased. The access to service is transferable, but the actual performance of service is not. Moreover, it is possible to purchase the ability to obtain a service, and it is possible to pay for actually receiving a service by the client or a client's advocate.

A clarification is in order. One might view the purchase of an airline seat or of an automobile, as a product that can provide a service, as something of exchangeable value. The purchase of a seat or an automobile is an entity capable of providing or sustaining a service is a *service facilitator*, but it is not a service per se. A *service* is the execution, or more properly the instantiation, of a process that provides the service, as in the airline or automobile form of transportation.

On the other hand, there must be some explicit value in service, since it serves as the basis of the modern economic system. Thus, the wealth inherent in service results from the co-creation of value. The execution of a service yields two or more distinct values: the *act* of performing or receiving the service and the *result* of having the service process performed. Accordingly, a service value can have two related components: *commercial value* and *personal value*. The result may be tangible or intangible, as covered previously. During the act of performing a service, it is useful to recognize two things: the provisioning dimension and the “receiving” dimension, to which we can add the service object dimension that may coincide with the receiving dimension.

When a service provider executes a service, including auxiliary and supplementary services, it is done for an economic value – salary, a fee, or another form of compensation. When a service client receives a service, it is often the case that a personal value is obtained – a state that is inconvenient or impossible to achieve independently.

The reasons are clearly evident, since most services result from one or more of the following circumstances: (1) Something you can't do; (2) Something you don't want to do; and (3) The

opportunity cost of the client performing the service. There are, of course, two points of view: that of the element of the provider set and the element of the client set. From the provider's perspective, the service value lies in the performance of the service process, and from the client's perspective, the service value results from the end state after the service is performed.

The Domain of Service

It is clearly obvious that the work of a professional entity is a service. Retailing is a service by changing the ownership property of an item within its domain. Employees of an organization provide a service, as does the mayor of a city or governor of a state. Federal, state, and local governments provide a service to their constituents. Police and fire departments provide a service. The religious clergy provides a service. Educators and parents provide a service. Products provide tangible and intangible services. Most forms of commercial and social activity involve service of some sort. Yet, we, as a society, actually know very little about service; we can elicit no principles of good service behavior, and very little evidence of best practices – in spite of the fact that at least 80% of persons are engaged in service – through commercial or social activity.

Service Structuralism

The thesis of *service structuralism* concerns the concept that what really matters about service is not the concrete elements of provider, client, and object, but rather the manner in which the elements relate to each other. Thus, a service system is a collection of abstract objects with relations on how the objects interact to each other, so that a structure is an abstract form of a system. [5] Only when concrete objects are abstracted from the service system can principles of behavior be developed.

A property is an attribute or characteristic of a service element. There are two forms of study: *conceptualism* and *realism*. In the former case, properties exist but are dependent upon the mind. In the latter case, properties exist independently of the mind. We are concerned with realism for the development of principles that govern service. Again, there are two forms. With *in rebus* realism, a property exists only if it has instances. With *ante rem* realism, a property can exist if it has no instances. [1] This paper takes the ante rem view of service economics. To sum up, what we are concerned with in service economics is not the characteristics of the provider, client, and service event, but the relationship between the various constituent elements.

Service Requisites

Service economy is a discipline that investigates the operational conventions that govern the production, exchange, and distribution of value resulting from the execution of service process, service event, or use of a service artifact. Value is a demonstrable result of the application of the operational conventions.

The value of a service essentially incorporates three entities: the service provider, the service customer, and the service object. The important element, as least at this point, is the junction where the three entities interact. Recall that the customer is typically more concerned with the

result than the service process. The service provider is more concerned with the service process, because if the service is performed correctly, then the result will be satisfactory. The service object is independent of the service process, unless it coincides with the customer.

The basis of classical economics stems from the writings of Smith [17] and Mill [13] and is recorded in the publication of Fawcett [3], and is synthesized from the coordination of land, labor, and capital, serving as the input to production. Within a background of classical economics, the tenets of service provisioning are specialization, division of labor, and comparative advantage. A client arranges for service with a specific provider to obtain the knowledge and experience in a particular domain. The service process is designed to utilize the notion of service itself – the division of labor – to enhance efficiency and achieve quality of the service experience. Comparative advantage results from the practice of employing a service provider with the most prudent infrastructure to achieve the highest quality results from the service process.

The basic tenets of service model those of classical production that have stood the test of time. *Specialization* allows the service producer to take advantage of existing abilities. [3] *Division of labor* allows specialization to be applied where it is most applicable, and *comparative advantage* permits outsourcing to be employed to provide service efficacy. The three basic tenets expedite large-scale provisioning, yielding a better quality of service and efficient operations.

Focus of Service Economics

The view of service economics was described earlier as being focused on the participants, knowledge, and capital. The *participants* in a generic view of service are the provider and the client sets that result in the notions of collaboration and duality. Technological, organizational, and human elements are traditionally combined to create service.

Knowledge, as in the case of professional endeavors, and *capabilities*, as in the case of manual procedures, are paramount to service. Knowledge and capability supersede specialization, provide the basis for division of labor, and often constitute the requirement for outsourcing.

Capital takes on its traditional value, as the part of wealth that is advanced to establish infrastructure, stock, and supplies and to cover wages until service renders a return on investment. Owners of capital will ordinarily appropriate funds unless they are rewarded with a share of the value generated by service – referred to as the *profits of capital*. It has three components: interest on the money expended, compensation for risk, and the variability of the service domain. If the profits derived from the capital investment are not greater than the interest on the funds, for example, then clearly the investment would not be made – unless special exogenous considerations apply.

Participants, knowledge, and capital are the forerunners of further work on service economics.

SUMMARY

It is generally recognized that *service* is a provider/client collaboration that creates and captures value for both participants. Both entities contribute in the interchange and both benefit, even though the sense of participation is diverse and varies between different forms of service execution. An example is the relationship between a doctor and patient that relies on the participation of both persons, since both entities are required in order for the service to be instantiated. Moreover, a doctor's service varies between patients and yields different results, depending on the situation. This characteristic is typical of most service. The entity supplying the service is known as the *service provider* and the entity receiving the service is known as the *service client*. The domain of service providers includes individuals, teams, products, electronic systems, groups, and ad hoc units organized to execute a particular service delivery scenario. Similarly, service clients include persons, groups, social organizations, governments, and commercial entities. In some cases, the object receiving the service is the responsibility of the client, as in cleaning and repair services. In this instance, the entity receiving the service is known as the *service object*.

Most commercial and social activity involves service, yet very little is known about the subject. This paper covers the structure and operation of services, as well as a lifecycle of service processes. The relationship between service and traditional economics is explored as a basis for the study of service economics.

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OUTSOURCED: ROMANTIC COMEDY MEETS WORLD ECONOMIC DATA AND CROSS CULTURAL MANAGEMENT CONCEPTS IN HEAT MAPS

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ABSTRACT

Outsourced is a popular film about an American business moving their call center to India. Throughout the film, the young U.S. manager, Todd Anderson, makes decisions that have both good and bad consequences. Students in an introductory Management course have a brief, but memorable introduction to life in India from an American point of view. Along with viewing the film, they must research a range of comparison statistics on the US, India, and another country of their choosing and offer reflections as to whether the film accurately depicted these statistics. While most of the categories fit their observations, some do not, and the results provide opportunities for discussion.

INTRODUCTION

Introducing students to International Business in the Principles of Management or Organizational Behavior course challenges textbook authors and faculty members. Most textbooks cover basic ways to be involved in international business, protectionism, and a few cultural categories. Students need examples to help guide them through the descriptors. While textbooks and professors can offer mini-cases, the richness of a full length romantic comedy about international business provides an ideal sandbox to showcase both glaring and more nuanced cultural differences.

Champoux notes that “film scenes can offer a visual portrayal of abstract theories and concepts.” [4] *Outsourced* shows the sometimes funny and surprising twists the protagonist faces as he arrives in India to manage a call center. Although the film is an entertaining comedy, Indian students at Michigan State University have verified that these encounters are quite realistic [2]. Briam observed that *Outsourced* as a film, successfully avoids simplistic cultural caricatures in a PG-13 environment [3].

As students reflect on the differences between the US and India in the film, they can draw from categorizations in a wide range of sources. Adler notes that categories “help us simplify our environment, become the basis for our interpretation, and allow us to function in an otherwise overly complex world.” [1, p. 80] She also advises that stereotypes ‘never accurately describe individual behavior; rather they describe the behavioral norm for a particular group.’ [1, p. 81]

Comparing countries with easily available data helps students

1. Learn what categories exist and reflect on their own behavior relative to others.
2. Generalize about typical behaviors in countries they are interested in based on existing ranges of categories.

3. Apply and interpret newly learned economic concepts such as GDP per capita or the Gini coefficient through comparing these values between or among countries.
4. Explore other data about countries such as the role of emotions, religion, racial tolerance, and ethnic diversity.

OUTSOURCED FILM SUMMARY

Todd Anderson is a manager at a US novelty catalog company whose call center is outsourced to India. Todd travels to meet his new team who operate in a relative run-down building by US standards. Throughout his time in India, Todd's attitude changes from an ethnocentric American puzzled by the stark differences between countries to a more well-rounded global citizen who embraces the Indian culture and makes the most of his assignment.

There are plenty of funny scenes where American slang is not understood by the fluent English speaking Indian staffers. Todd romances Asha, one of his team members, who has been engaged for most of her life to someone her parents chose for her to marry. The movie's PG-13 rating makes it palatable to most moderately conservative college viewers even though Todd and Asha have an intimate relationship.

The 106-minute 2006 film can be purchased for less than \$20 and is also currently available on Netflix instant play. Although most students said they watched it on Netflix, the local campus Media Center personnel played the film on one of the on-campus TV stations so that students could watch it at pre-arranged times on campus.

OTHER RESEARCH USING *OUTSOURCED* FOR CLASSROOM DISCUSSION

Several articles and websites exist showing how other faculty are using *Outsourced* as a springboard for discussion culture with college students. BizEd profiled Anil and Karen Mishra's classroom use of the film without going into detail about their assignments. [2] The Mishra's offer their discussion questions and study guide online for sale for \$85. [8] This author did not purchase the guide.

Pandey used *Outsourced* along with *My Big Fat Greek Wedding* to teach a course in Cross-Cultural Management [9]. The author included student reactions on learning effectiveness about culture shock, cultural adjustment and adaptation, cross-cultural competence, and cultural intelligence to support its continued use as adding value to the course. The article also cautions about the limited time horizon that the movie will be considered current and relevant.

As part of a course in Intercultural Communication taught in the United Arab Emirates, Carol Briam wrote about the value of including *Outsourced* in the curriculum [3]. The author enriched the experience by introducing cultural dimensions earlier in the course and later asking students to explore these dimensions as depicted in the film. Though the course was not explicitly about business, the author indicated that many students were business majors.

Frankie Sutton, a British-American teaching in Abu Dhabi, includes an *Outsourced* study guide on her Cultural Diversity blog. [12] She also provided answers to many questions, including defining low-context cultures, individualism/collectivism, power distance, uncertainty avoidance, and task/social orientation. She gave examples from the film of how these cultural dimensions played out in India in ways that were consistent with India's ranking. For example, India is a high power-distance country, illustrated by Indian employees calling the American manager "Mr. Todd" and "Sir." And as a collectivist country, multi-generational Indian families live together rather than having single people live alone.

While these resources are good as a springboard for faculty generating assignments, it is also important to know that students can access them as a way to find publicly available answers to some questions faculty members might pose.

THE ASSIGNMENT

Students watched the film and responded in writing to a series of four questions as part of an outside class assignment. The questions varied each semester to restrict recycled answers from reappearing and to keep the assignment fresh with updated data.

Typical questions included a mix of observations from the film, analysis and application of international data, and personal reflections about cross-cultural experiences. Eight typical questions follow along with references to maps and other resources. An explanation of why this question works well and how students typically respond follows in italics.

1. Was the company's attitude toward international staffing ethnocentric, polycentric, or geocentric at the beginning? Describe some of the challenges resulting from this selection. How did it change at the end?

This question helps students understand the difference between the three types of international staffing and apply the definitions in the film's context. At the beginning, Todd shows a very ethnocentric attitude. By the end of the film, he warms to the Indian ways and shows a more polycentric attitude as he promotes an Indian national to take his place. There are no third country nationals, so a geocentric attitude is not an acceptable answer. Learning the definitions of these three concepts is difficult when students simply memorize them, but seeing them in action forces them to apply the definitions and helps them stick.

2. Identify and briefly comment on at least five cultural differences Todd faces as a manager in India. There are dozens in the movie. You may choose some that are specifically work-related and others that are more general.

While websites make many of these differences publicly available, students who watch the film cannot help but notice the obvious cultural challenges and report them enthusiastically. Many students are shocked by the taboo of not eating or passing food with the left hand since it is considered the "bathroom hand." Most students receive full credit for this question.

3. Using Hofstede's four primary cultural dimensions (omit long-term orientation), describe the differences you saw between US and Indian culture related to that dimension in the film.

Compare the film's portrayal of the differences to the actual ranking differences between India and the US.

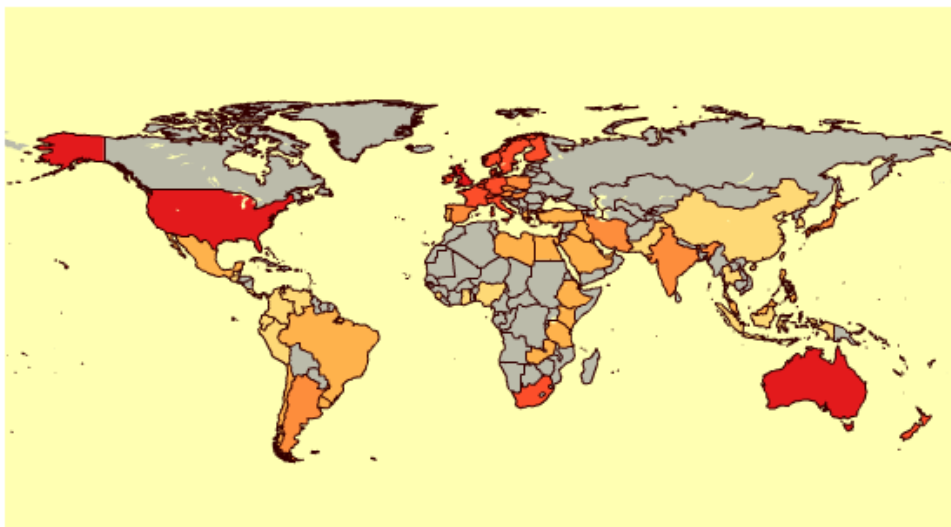
Students must show mastery over the Hofstede concepts found in the textbook in order to identify these examples. Todd shows up as an independent individualist American who finds the collectivist nature of Indian culture hard to comprehend. Throughout the film, he becomes more collectivist as he engages with the culture. Figure 1 shows the Hofstede heat map from the website. Each of Hofstede's dimensions shows up in both obvious and subtle ways. India is a more feminine culture than the US, and Todd learns to care for the weak in society by offering his neighbors leftover food rather than throwing it away.

In responding to this question, sometime students do not show mastery over the Hofstede concepts even though they might accurately reflect information from the movie. For example, they might refer to "feminine" culture as simply giving equal rights to women or having women leaders rather than the Hofstede-defined term meaning modesty, nurturing, and caring for the weak in society. Hofstede defines masculine cultures as assertive, competitive, and materialistic. Therefore, grading this portion requires careful attention to their explanations.

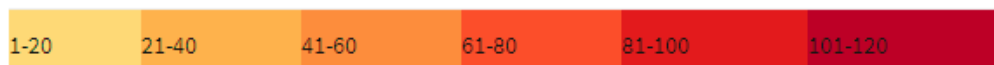
Each of the four Hofstede dimensions has its own heat map and ranking in this website. Figure 1 shows the Individualism/Collectivism ranking, an easy one to identify from the film. The US is the most individualistic culture of all those ranked, while India is more collectivist. An example of this difference is the fact that Todd does not keep up with his parents regularly while Indians often live in multigenerational groups. Todd also observes that Indians share leftover food with a poor neighbor even though Americans do not typically pass along leftovers. By the end of the film, Todd adopts this practice in India.

<http://www.clearlycultural.com/geert-hofstede-cultural-dimensions/>

Figure 1. Hofstede's Individualism/Collectivism ranking in 66 countries. The US is the most individualistic nation in the survey.



Individuality



4. What ethical challenges does Todd face and how does he respond? Identify at least three. In your response, write about other choices he could have made and whether they might have been better choices.

In the introductory Management class, the ethics chapter precedes the International Management chapter, and students will be familiar with identifying and analyzing ethical dilemmas. There are some obvious ethical challenges, including whether Todd pursues a romantic relationship with Asha, his employee who is betrothed to another man. Todd also asks his employees to lie to customers saying they are located in Chicago. This question requires students to think about alternative approaches.

In grading this component, it is important to consider the differences between cultural differences and ethical dilemmas. While there is some overlap, most students discern the distinctions. Lying to customers is clearly an ethical issue, while food-related choices are more cultural in nature.

5. Go to the Population Reference Bureau website below and choose three dimensions to compare India, the US, and a third country (your choice). Name the map and identify how these three countries compare on this dimension. How did these dimensions show up in the Outsourced film?
<http://www.prb.org/DataFinder/Topic.aspx?cat=5>

This website provides links to dozens of different types of international economic, demographic, educational, health care, and environmental data, including a heat map with specific numbers that pop up as you hover over each country. [5] Two sample charts shown below give examples of the kind of very specific data. Few US students can fathom the kind of poverty India experiences. While the film does not show poverty in a guilt-inducing way, it makes the viewer aware of the stark contrast. The data and maps underscore these differences.

Figure 2. Motor Vehicles per 1000 population in 2008. India has 18 motor vehicles per 1000 people compared the 787 per 1000 in the US.

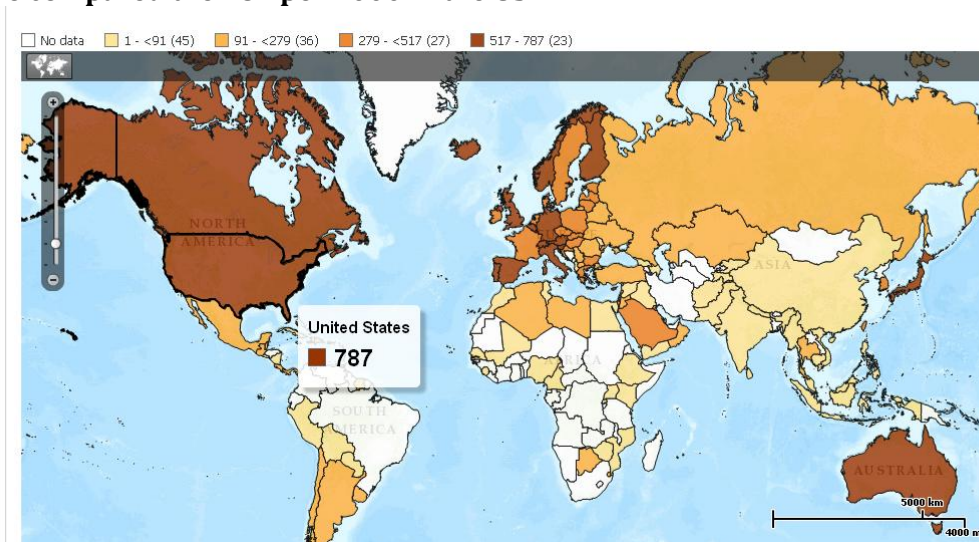
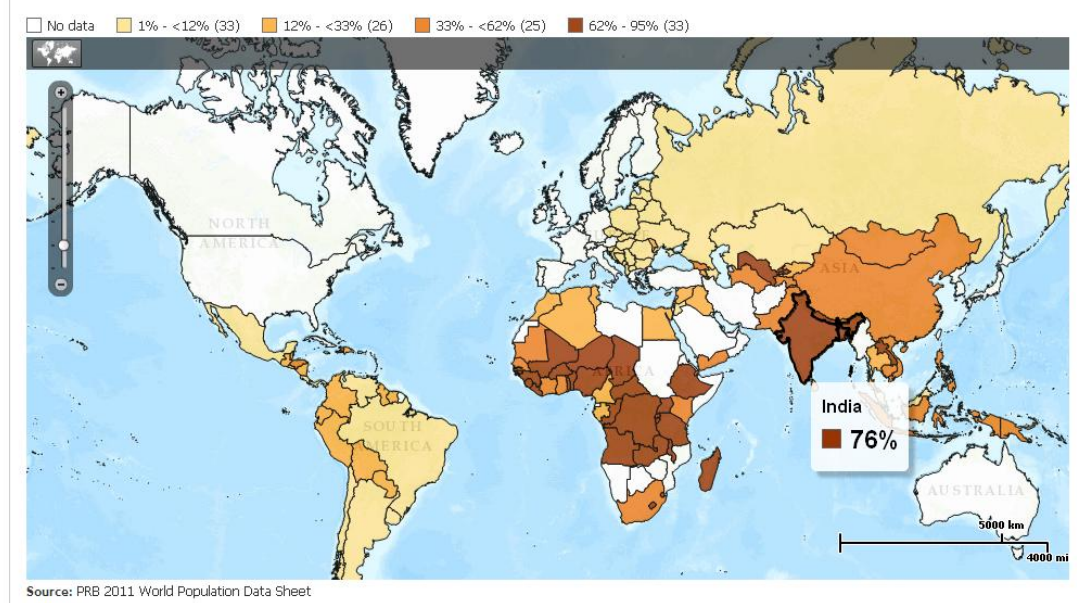


Figure 3. Percent of the population living on less than \$2 per day. India's 76% compares to the US's 0%.

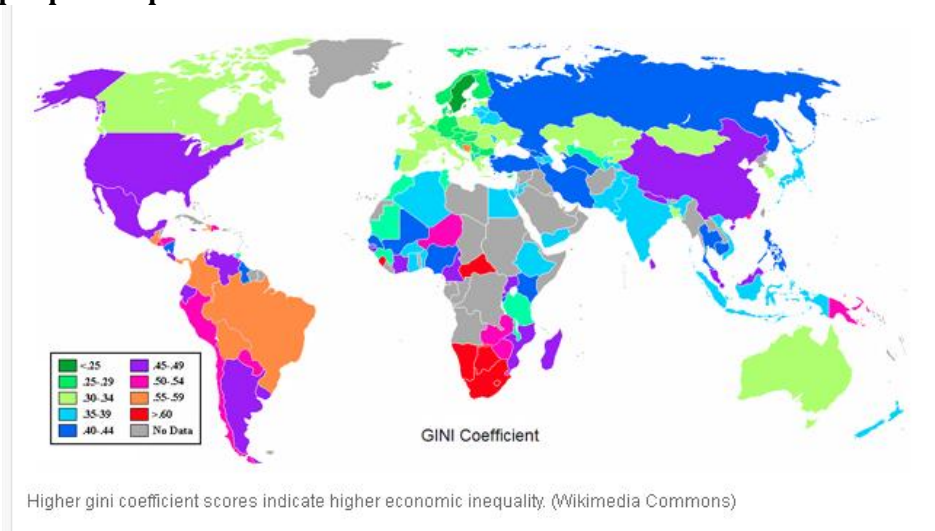


- Go to the 40 Maps That Explain the World website below and choose three maps to compare India, the US, and a third country (your choice). Give the map number and title of each map at the beginning of your response. Interpret the differences among the three countries according to each of your three maps and give at an example of how those differences played out in the movie between India and the US.
<http://www.washingtonpost.com/blogs/worldviews/wp/2013/08/12/40-maps-that-explain-the-world/>

This website provides a wide range of maps on religion, optimism, economic inequality, ethnic diversity, opinions of the US, world writing systems, and many other sometimes quirky rankings. [5] Students can see that India's income is more equally distributed than the US (Figure 4). That fact surprised them because they often hear more about Indian computer programmers and pharmaceutical companies and meet Indian doctors and professors in the US. The reality is that the majority of the country's population is very poor, so income disparity is low relative to the US.

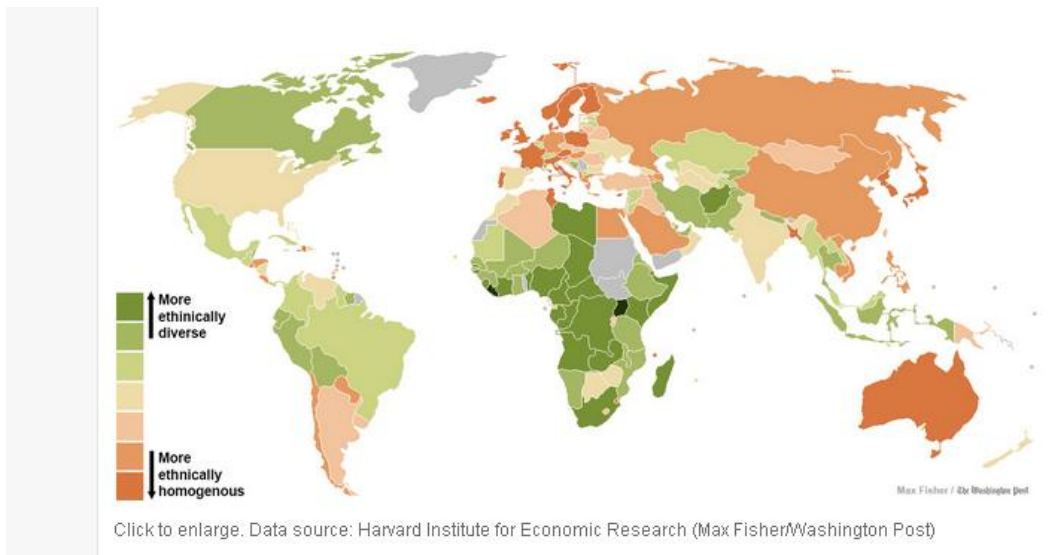
Most students who follow instructions receive full credit for this component.

Figure 4. Economic inequality around the world as measured by the GINI coefficient. India has lower income inequality or higher equality than the US, primarily because so many people are poor.



Another dimension that students also find surprising is ethnic diversity (see Figure 5). Students observe in their papers that there was almost no ethnic diversity in the film, but the map suggests that India is every bit as diverse as the US. The disconnect there can be explained by the fact that ethnicity and race are two separate constructs, which is a new idea to most US students. It opens the conversation for discussing the fact that Africa is the most ethnically diverse continent based on how people self-identify their ethnic group.

Figure 5. The world’s most and least ethnically diverse countries. The US and India both rank in the middle, which surprises students since they tend to think of ethnic diversity in terms of race alone.

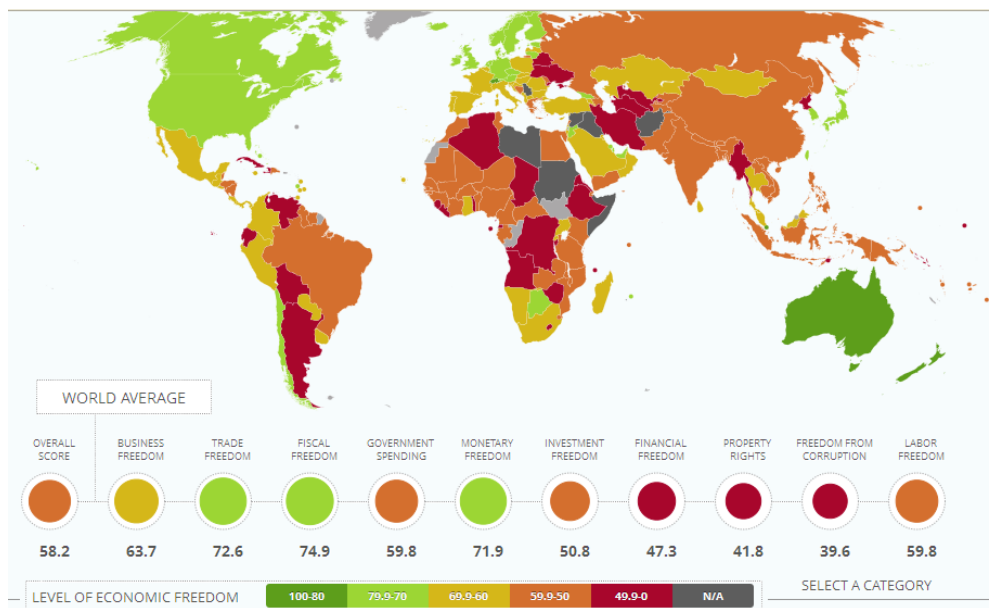


- Go to the Heritage Foundation’s Index of Economic Freedom website below and choose three dimensions to compare India, the US, and a third country (your choice). Name the map and identify how these three countries compare on this dimension. How did these dimensions show up in the Outsourced film?

<http://www.heritage.org/index/heatmap>

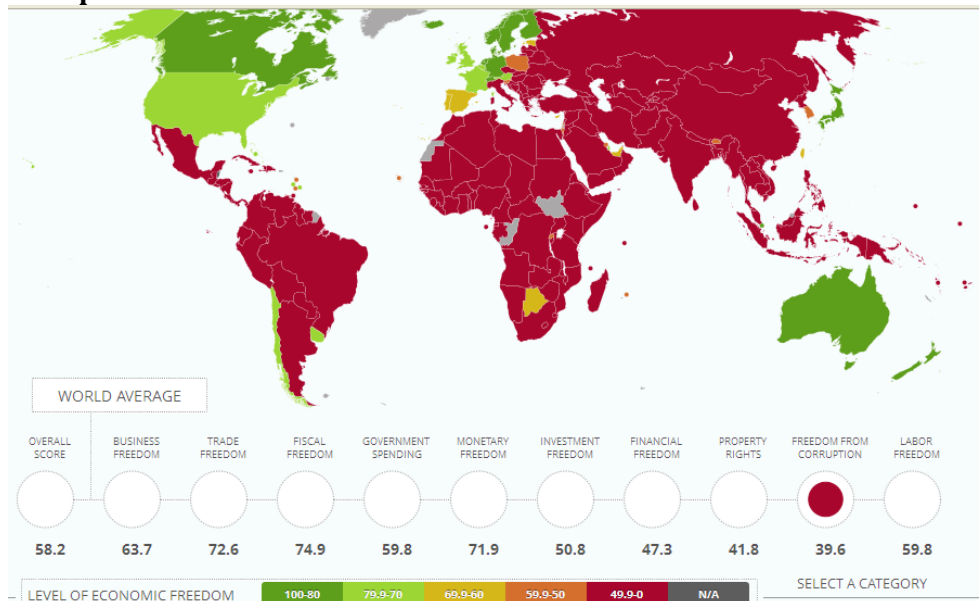
The Index of Economic Freedom is an average of ten individual freedoms which include business, trade, fiscal, government spending, monetary, investment, financial, property rights, corruption, and labor freedoms. [7] Clicking on each of the ten yields a new heat map which shows the contrasting freedoms for that dimension around the world. Figure 6 shows the overall average of the ten. Figure 7 shows the freedom from corruption. This map is important in the film as there are examples of Indians deceiving Todd. Corruption takes place at many levels, some of which can't be seen in the film. Todd also tells the Indians to lie about their location in an effort to deceive their American customers. In this example, the American is less honest than the Indian employees.

Figure 6. The Heritage Foundation's World Average Economic Freedom Heat Map. The US is among the more free countries while India's freedoms are somewhat restricted.



While the film did not showcase all of these dimensions, these statistics are helpful to bring out at this point because students are comfortable thinking through Indian differences. There are no mentions of taxes, welfare, labor laws, private property, or government spending. It does appear that Indians have less control over private property in that neighbors share outside walls.

Figure 7. Freedom from Corruption. This map shows that, while India may be more corrupt than the US, they are consistent with neighboring countries in their level of corruption.



8. If you have traveled abroad or if your home country is outside the US, please write a few sentences reflecting on the biggest differences you observed between the US and another country. In the process, tell where you went, how old you were (approximately), and how long you were there.

If you have not traveled abroad, write a few sentences about where you would most want to go, what you'd like to see and do, how long you'd like to stay, and why you'd choose this place.

This question invites students to share their own personal reflections about cross-cultural experiences. In a typical undergraduate class of 30 students, about 5-6 are internationals (mostly European), and among the remaining Americans, more than half have traveled abroad at some point in their lives, either as part of a family, church, or school experience. They often reflect on the population density in the urban environment, the poverty in developing countries, the language challenges, and relative friendliness of the people.

Students who have not traveled abroad usually want to go to Europe, Australia, or Brazil to explore historical sites, kangaroos, or beaches. While these reflections may not show a deeper understanding of a culture just yet, it is a starting point to get them thinking about study abroad and international travel as a possible option.

This question provides a platform for international students to reflect on cultural differences. Their insights are a fascinating look at the way they view Americans. Here is an unedited example of a response to this question from a French student in 2013:

I am a French student so I will compare my home country and the United State where I will live for a year. They are both countries with an occidental culture, but it stills a lot of differences. First and principally, the consumption of everything. In France we try to save money on our energy, water, electricity, air conditioner, on our fuel, we are careful about all our expenses. We drive little car with little economic motor and we don't use the air conditioner when we are not in our room. Here, everything is big, the building, the cars, the malls ... Then, French people used to live in plants [perhaps he means high rise apartments], here everybody want his house, with the garden, the garage... It's a very typically trait of American culture.

Next, people in America speak more easily together than in France, here, everybody say to me "hey what's up" or "how are you doing", In France when you walk and you cross someone, most of the time you just smile and that's all, you don't speak with everybody every time. Another big difference is the school, and their budgets. In France, to be clear, we don't have building like Spring [our student center], where we can eat the night and play pool or watch the TV, we don't have fitness place and when you eat to the cafeteria, you can choose only between 2 meals and if you want a coke, you have to purchase it.

Also, the sport is a very important thing here, we can make some different sport every where every time, and the week end people come see our teams play. In France we are ridiculous about that, nobody come watch you, you don't have 2 or 3 coaches per team and you have to pay to use the fitness place. To conclude, I really think that the life here is more comfortable and that Americans have a better level of life than French people, but because maybe we share more our wealth together than Americans.

CONCLUSION

This project counts just 5% of students' grades, but they will long remember the film and their encounters with the data because of the visual storytelling aspect of the movie. It is difficult to memorize numbers or ranks without context, but having the story behind the maps gives students a good foundation for understanding more about doing business in India without traveling there.

One benefit of this project is exposing students to the wide range of data sources publicly available. When students choose research projects for upper level classes, they may call on these data sources to support or expand their work.

A natural challenge in using a single number to describe attributes of an entire country is to help students avoid stereotyping. Having class discussions about the range of values these categories represent shows that not all individuals, companies, or sub-regions necessarily follow that rank.

At some point, this 2006 film will start to feel old and dated. Companies will continue outsourcing to lower cost countries, but trends suggest that the outsourcing boom to China in 2002-2008 is reversing, with some companies moving manufacturing jobs back to the US and others moving to other, lower cost Asian countries. In 2013, India remains a top location for outsourcing technology jobs and will likely stay there for a few years.

Outsourced won five Film Festival awards around the world in 2007 and was nominated for many more. Will Hollywood or Bollywood continue making films which educate and entertain students and business leaders alike in areas of cross-cultural communication? Often popular movies with business backdrops have a political ambition to portray corporate leaders as corrupt and greedy as in the pair of Wall Street movies. Michael Moore has made his name bringing down corporate reputations, and others in the film industry often intentionally show an anti-business bias. Perhaps the film industry will notice the ongoing influence of this film as a way to entertain in a culturally positive way and make more in this genre.

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A TUTORIAL ON A DATA ANALYTICS TOOL

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ABSTRACT

Big data is a current hot topic that will only increase in importance over time [3] [4] [8]. Big data has been described as "... the data sets and analytical techniques in applications that are so large (from terabytes to exabytes) and complex (from sensor to social media data) that they require advanced and unique data storage, management, analysis, and visualization technologies." [2, p. 1166] Many sectors in the U.S. that could make advancements with the application of analytic techniques on the large quantity of unstructured data available within the sector including e-government and politics, science and technology, smart health and well-being, and security and public safety [2]. The current issues is that data scientists, people with the unique skill set (math, statistics, probability, programming, and business skills) to deal with big data, are scarce[4]. Universities need to develop degree programs to address the issue of a lack of graduates with the skills necessary to deal with the massive amounts of data that are being produced.

OVERVIEW

Within these new degree programs, a focus on analysis of data is needed. Based on an examination of the literature, the primary core skills for a career as a data scientist include programming, math, and statistics and probability theory as well as good communication skills, core business skills and an understanding of the data in the organization employing the individual. Based on an examination of some university curriculum for graduate programs in big data, the conclusion would be the same with the addition of courses in data mining, business analytics and, in some cases, a course in the tools specific to handling big data [1] [5] [7].

The focus of the proposed workshop is the analytic tools that could potentially be used within the information technology (IT) part of a data science degree program, as opposed to the statistics or programming portions. An outline of the analytic tools with regards to data used at one university within a proposed data science degree in an undergraduate IT degree program is provided. An outline along with a brief explanation of each tool is provided in the Section 2.

In addition, a demonstration will be provided in this workshop on analytic methods using Excel, a familiar tool that many students and organizations are already comfortable using. Specifically the data mining (DM) add-in to Excel. A description of each of the features of the DM add-in for Excel is provided in Section 3.

ANALYTIC TOOLS USED FOR IT PORTION OF DATA SCIENCE DEGREE

At the author's institution, the Microsoft SQL Server suite of tools is used for teaching courses related to data analytics, including a course in database, data mining and data analytics.

The database course is a traditional course where ER-diagrams, normalization, logical database design, and SQL are covered. The Microsoft SQL Server 2012 is used in the database course as the tool for creating and querying databases. The database engine is installed in a server setting and the front-end client, SQL Server Management Studio, is installed on all of the lab machines to access the databases stored on the server.

The data analytics course covers data warehousing and data marts, OLAP cubes, ETL, reporting, and dashboards. The analytics course uses the tools in SQL Server for business intelligence called SQL Server Data Tools (SSDT), formerly known as the Business Intelligence Development Studio (BIDS). SSDT consists of a Visual Studio shell that can be used to generate three types of projects: SQL Server Integration Services (SSIS) projects, SQL Server Analysis Services (SSAS) projects and SQL Server Report Services (SSRS) projects. The data mining course covers data mining algorithms. SSAS projects are used in the course to build the mining models. A brief description of each of the tools used follows.

Microsoft SQL Server Data Tools (SSDT)

SQL Server Integration Services (SSIS)

SSIS is used to perform extract, transform and load of data (ETL) from data sources to a data destination without any or with minimal coding. The data source and data destination do not have to be Microsoft based. The data can be imported or extracted from databases such as Access, Oracle and MySQL or from flat files or Excel spreadsheets. The data can be written or loaded to the same types of files. In addition, SSIS provides many built in transformation tools to change data types and perform data conversion.

SQL Server Analysis Services (SSAS)

SSAS is used to perform on-line analytical processing (OLAP) in the form of building multidimensional structures and to build data mining models.

SQL Server Report Services (SSRS)

SSRS is used to design, build, deploy and manage reports within an organization. Reports can be built based on a variety of data sources.

Additional Tools Used

In addition to the SQL Server suite of products, students should be taught to be proficient in basic Excel tasks related to analytics including how to design a spreadsheet using appropriate cell referencing to enable changing of key parameters, if and other functions, graphs and charts, pivot tables, and formulas with focus on cell referencing. Two additional tools that integrate well with the SQL Server products that are used in the analytics courses at the author's institution include PowerPivot and the data mining add-in to Excel. Finally, students are taught to build basic dashboards in Excel.

EXCEL DATA MINING ADD-IN

In addition to a discussion of the basic building blocks in the Microsoft suite of business intelligence products, a demonstration of the DM add-in in Excel will be provided as well as context for when it should be used as a tool for analytics. Time permitting, the capabilities of PowerPivot will be demonstrated as well. A summary of the capabilities of the DM add-in as well as PowerPivot follows.

The data mining add-in requires SQL Server Analysis Services (SSAS) as the engine to perform the analysis provided by the tool. The add-in provides the following tools: analyze key influencers, detect categories, fill from example, forecasting, highlight exceptions, scenario analysis, prediction calculator, and shopping basket analysis [6]. A brief summary of each tool follows.

Analyze Key Influencers Tool

This tool analyzes the correlation between a specific column that one is interested in predicting, such as will a customer buy or not buy or is a customer likely to churn or not, and all other columns in the spreadsheet [6].

Detect Categories Tool

This tool groups like rows of data, where rows represent instances or records in a data source, together. This is a similar task to clustering in data mining [6].

Fill From Example Tool

This tool extends the auto fill tool in Excel to not only fill the contents of blank cells based on the contents of the selected cells, but by detecting patterns based on the content of other cells in the same row and other similar rows in the same table of data [6].

Forecasting Tool

This tool analyzes numeric information to detect patterns in the series, specifically trends, periodicities and cross-correlation, and uses these patterns to forecast future events [6].

Highlight Exceptions Tool

This tool is used to find highlight outliers, potential errors and noise in the data [6].

Scenario Analysis Tool

This tool simulates how changes in one column can impact the target column (to buy or not buy, to churn or not churn) [6].

Prediction Calculator Tool

This tool is a scorecard tool where a score for the target column can be calculated based on the scorecard produced using each of the other columns in the table [6].

Shopping Basket Analysis Tool

Providing the data is formatted correctly as transactions, the tool analyzes transactions to find groups of items that occur together in the same transaction [6].

Each tool provides multiple reports that further the understanding of the output for that tool. The tools as well as the reports will be demonstrated in the workshop.

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A GOAL PROGRAMMING FORMULATION OF DISASTER RELIEF SUPPLY CHAIN DESIGN PROBLEM

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ABSTRACT

We formulate a goal programming model for the disaster relief supply chain (DRSC) design problem, which consists of finding the optimal emergency response facility (ERF) location and allocation scheme. In the strategic stage of designing DRSC, all demands should be designed to be covered with the minimum costs. But, if coverable distance by ERF is greater than the maximum coverage distance after emergencies, maximizing the number of covered demand for relief items at the unexpected disasters should be an important measure. Our model will consider a tradeoff between a minimum logistics cost and the maximum number of covered demand.

INTRODUCTION

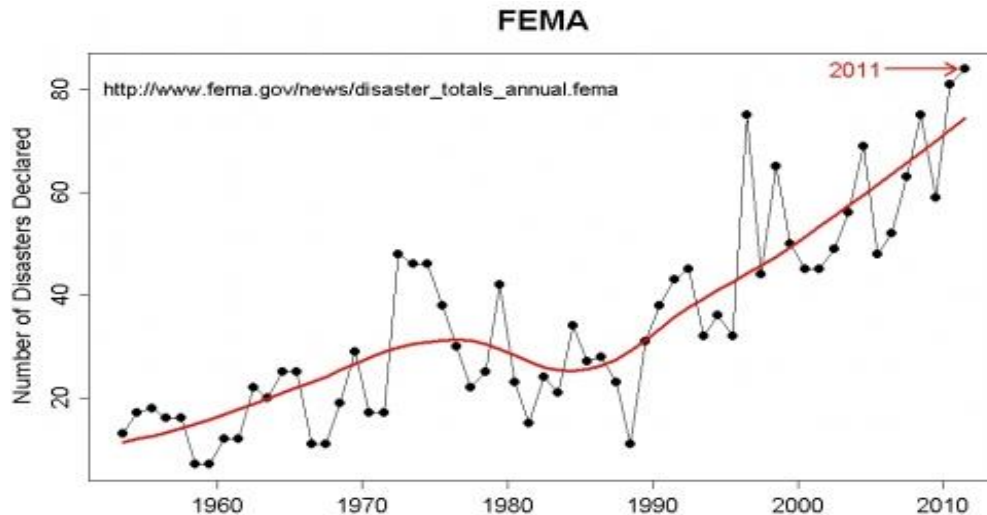
Recent natural and man-made disasters underscore the need of a resilient and agile disaster relief supply chain to mitigate the damages and save people's lives. In this respect, a disaster relief supply chain (DRSC) design has become an important strategic decision, due to the major damage inflicted by several natural disasters events, such as Hurricane Katrina in 2005 that made 1,300 death tolls and 200 billion of damages. Indeed, it was the costliest disaster and was one of the five deadliest hurricanes in the history of the United States. In 2012 alone, Hurricane Issac's slow, rainy march through Louisiana caused as much as \$2.0 billion in insured losses, leaving extensive flood and wind damage in several states. Issac left more than 644,000 people without power in Louisiana, Mississippi, Alabama and Arkansas. Figure 1 indicates the trend of the number of declared disasters in the U.S. by Federal Emergency Management Agency (FEMA)[3]. The data in Figure 1 illustrates the reason why the need for an efficient DRSC design is increasing.

The weather-related emergencies have brought issues of natural disaster planning again. Indeed, after emergencies, it is critical through emergency response facilities (ERFs) to distribute emergency supplies to the affected areas in a timely and efficient manner for rapid recovery. The distribution of emergency supplies from the emergency response facilities to the affected areas must be done via a transportation network. The emergency response facilities considered in this paper include (i) distribution warehouses (*DWHs*), where emergency relief goods are stored, (ii) intermediate response facilities termed Break of Bulk (*BOB*) point or Commodity Distribution Point (*CDP*), where people can more effectively gain access to relief goods, and (iii) neighborhood locations in need of relief goods.

The rest of this paper is organized as follows. After literature review in the next section, a goal programming model is formulated. Following the description of the model formulation, case study is conducted and the resulting analysis is presented. The last section summarizes the

developed models and research findings. It also provides recommendations for future research directions.

Figure 1. U.S. Disasters Trend by Federal Emergency Management Agency (FEMA)



LITERATURE REVIEW

Facility location models have been extensively researched for decades. Dekle *et al.* [2] developed a two-stage modeling approach based on a set-covering model to identify the optimal *BOB* sites. Their objective is to minimize the total number of *BOBs*, subject to each county's residents being within a certain distance of the nearest *BOBs*. Horner and Downs [6] presented a similar study to optimize *BOB* locations. They formulated a multi-objective integer programming with two objectives – the first objective is to minimize the transportation costs of servicing *BOBs* from *DWHs*, and the second one is to minimize the transportation costs between *BOBs* and neighborhoods in need of relief goods. The same structure is adopted in this paper.

Shukla *et al.* [7] used a mathematical model to study the trade-off between efficiency and robustness in the supply chain design consisting of a manufacturer, warehouses, and customers. They defined the operation cost-based efficiency and expected disruption cost-based robustness. To our best knowledge, this is the first paper which separately discussed the efficiency and robustness in the strategic logistics network. However, their definition of robustness does not reflect any perturbation of transportation costs since it purely used a probability-based disruptive event. In fact, their concept of the robustness is similar to that of risk used in our study. Hong *et al.* [4] presented three different distribution strategies in the same logistic network structure as in this study – 1) a *BOB* is supplied by a specific *DWH*; 2) by primary and secondary *DWHs*; and 3) by any *DWH*. They evaluated these strategies under diverse *DWH* shutdown scenarios, and reported that overall the third strategy generated the most robust result in terms of the transportation cost. Our research is built upon the work done by Horner and Downs [6], Shukla *et al.* [7], and Hong *et al.* [4], and is also motivated by the recent trend in facility location studies

to consider risks caused by critical infrastructure disruptions. Jeong et al. [5] compared DRSC structure to that of FEMA's in the United States.

We extended the one-stage model developed by Horner and Downs [6] – they optimized the location of *BOBs* only – to a two-stage integrated facility location model, and this two stage model simultaneously optimizes the locations of *DWHs* and *BOBs*. The basic framework designed by Shukla *et al.* [7] is adopted with some extensions. Specifically, they only considered the strategic level design (SLD) phase. However, this study provides a two-phase based framework – SLD and operational level design (OLD) phases – and uniquely defined the robustness in the OLP phase based on diverse post-disaster scenarios. They also considered only single manufacturer with multiple warehouses and multiple customers. Hence, the problem mainly focused on the distribution of products from warehouses to customers. However, in our study, the complexity is much higher, since we consider multiple *DWHs*, *BOBs*, and neighborhoods. We consider the actual covered demands in case of disruptions rather than expected values of disrupted demands that Jeong et al. [5] considered, since the actual covered demands of emergency supplies after disastrous events is more practical and important factor in DRSC design.

MATHEMATICAL MODEL

Let M be the set of all neighborhoods and potential distribution warehouse (*DWH*) locations, indexed by $m \in M$. We separate M into two sets: $M = \{N, I\}$, where I denotes the set of potential *DWH* locations, $i \in I$ (indexed by $i = 1, 2, \dots, w$) and N represents the set of neighborhoods (indexed by $n = 1, 2, \dots, p$). In this research, we assume *BOBs* can be located at any neighborhoods and potential *DWH* locations, while *DWH* can be built at candidate *DWH* locations only, since *DWH* locations must satisfy realistic requirements. Based on these two assumptions, let J be the set of potential *BOB* locations indexed by $j \in \{M\}$, where $j = 1, 2, \dots, p, p+1, p+2, \dots, p+i, \dots, p+w$. The notation used in the formulation is as follows:

- a_i – Fixed cost for constructing and operating *DWH* i
- b_j – Fixed cost for constructing and operating *CDP* j
- B_j – 1 if neighborhood j is selected as a *CDP, 0 otherwise (decision variable)*
- d_{ij} – Distance between *DWH* i and *CDP* j
- d_{im} – Distance between *DWH* i and location m
- d_{jm} – Distance between *CDP* j and location m
- B^{\max} – Maximum number of *CDPs* can be built (set to 5)
- CAP_i^{\max} – Capacity of *DWH* i (2500 K for each *DWH* in this study)
- CAP_j^{\max} – Capacity of *CDP* j (set to 1500 K for each *CDP* in this study)
- h_m – Demand of location (can be either neighborhood or *DWH*) m ;
- W^{\max} – Maximum number of *DWHs* can be built (set to 3 in this study);
- V_i – Maximum number of locations *DWH* i can directly handle (up to 2 in this study);
- v_i – Minimum number of locations *DWH* i can directly handle (0 in this study);
- k_i – Minimum number of *CDPs* a *DWH* must handle (set to 1 in this study);
- K_i – Maximum number of *CDPs* a *DWH* can handle (set to 5 in this study);
- l_j – Minimum number of neighborhoods a *CDP* needs to cover (set to 2);

L_j – Maximum number of neighborhoods a CDP can cover (set to 7);
 W_i – 1 if a candidate warehouse i is selected, 0 otherwise (decision variable);
 x_{ij} – 1 if CDP j is covered by DWH i , 0 otherwise (decision variable);
 x_{im}^d – 1 if location m is covered by DWH i , 0 otherwise (decision variable);
 y_{jm} – 1 if location m is covered by CDP j , 0 otherwise (decision variable);
 $z_{ijm} = 1$ if location m is covered by DWH i through BOB j , 0 otherwise (decision variable).

The first goal is minimizing the related logistics costs. Given this problem setting, the total logistics cost (TLC) is given by (see Hong et al. [4])

$$\begin{aligned}
 TLC = & \left[\sum_{i \in I} a_i W_i + \sum_{i \in I} \sum_{j \in M} \left(\sum_{m \in M} h_m y_{jm} \right) d_{ij} x_{ij} \right] \\
 & + \left[\sum_{j \in M} b_j B_j + \sum_{j \in M} \sum_{m \in M} h_m d_{jm} y_{jm} \right] + \left[\sum_{i \in I} \sum_{m \in M} h_m d_{im} x_{im}^d \right]. \quad (1)
 \end{aligned}$$

In the case of emergency, each location should be within a certain distance of the nearest BOBs to be served (see Dekle *et al.* [2]). Letting D^c denote the maximum coverage distance in case of emergency, the covered demands, CDM , can be expressed as

$$CDM = \sum_{m \in M} \sum_{j \in J} h_m a_{jm} y_{jm} + \sum_{i \in I} h_i x_{ij} + \sum_{m \in M} \sum_{i \in I} h_m a_{im} x_{im}^d, \quad (2)$$

where indicator parameters, a_{jm} and a_{im} , are

$$a_{jm} = \begin{cases} 1, & \text{if } d_{jm} \leq D^c \\ 0, & \text{if not} \end{cases}, \quad (3)$$

and

$$a_{im} = \begin{cases} 1, & \text{if } d_{im} \leq D^c \\ 0, & \text{if not} \end{cases}. \quad (4)$$

Let the deviation variables, δ_{TLC}^+ (≥ 0) and δ_{CDM}^- (≥ 0), denote the amounts by which each value of TLC and CDM deviates from the minimum TLC_{min} and maximum CDM_{max} , respectively, we formulate as a goal programming (GP) model as follows and call it **Economic-Max Covered Demand (EMCD)** model.:

$$\text{Minimize } G_1(\alpha) = \alpha \frac{\delta_{TLC}^+}{TLC_{min}} + (1 - \alpha) \frac{\delta_{CDM}^-}{CDM_{max}} \quad (5)$$

Subject to

$$\sum_{i \in I} W_i \leq W^{max}, \quad (6)$$

$$W_i + B_{p+i} \leq 1, \quad \forall i \in I \quad (7)$$

$$W_i + \sum_{j \in M} y_{j(p+i)} + \sum_{g \in I} x_{g(p+i)}^d = 1, \quad \forall i \in I \quad (8)$$

$$\sum_{j \in M} y_{jn} + \sum_{i \in I} x_{in}^d = 1, \quad \forall n \in N \quad (9)$$

$$W_i k_i \leq \sum_{j \in M} x_{ij} \leq W_i K_i, \quad \forall i \in I \quad (10)$$

$$\sum_{i \in I} x_{ij} = B_j, \quad \forall j \in M \quad (11)$$

$$\sum_{j \in M} B_j \leq B^{max}, \quad (12)$$

$$y_{jm} \leq B_j, \quad \forall j \text{ and } \forall m \in M \quad (13)$$

$$B_j \cdot l_j \leq \sum_{m \in M} y_{jm} \leq B_j \cdot L_j, \quad \forall j \in M \quad (14)$$

$$\sum_{m \in M} h_m y_{jm} \leq CAP_j^{max}, \quad \forall j \in M \quad (15)$$

$$\sum_{j \in M} \sum_{m \in M} h_m z_{ijm} + h_i W_i + \sum_{m \in M} h_m x_{im}^d \leq CAP_i^{max}, \quad \forall i \in I \quad (16)$$

$$v_i \cdot W_i \leq \sum_{m \in M} x_{im}^d \leq V_i \cdot W_i, \quad \forall i \in I \quad (17)$$

$$\text{Max}\{0, x_{ij} + y_{jm} - 1\} \leq z_{ijm} \leq \frac{x_{ij} + y_{jm}}{2}, \quad \forall i \in I \text{ and } \forall j, \forall m \in M \quad (18)$$

$$\text{CDM in (2)} + \delta_{CDM}^- = \text{CDM}_{max}, \quad (19)$$

$$\text{TLC in (1)} - \delta_{TLC}^+ = \text{TLC}_{min}. \quad (20)$$

The GP objective function in (5) shows the weighted sum of the percentage deviations. Constraints (6) require that at most W^{max} DWHs can be constructed. Constraints (7) ensure that the potential DWH location will not be selected simultaneously as both DWH and BOB. Constraints (8) ensure that if a potential DWH location i is not selected (i.e., $W_i = 0$), its demand must be satisfied by a BOB or a DWH. Constraints (9) make certain that each neighborhood ($n \in N$) is assigned to either a BOB or a DWH. Constraints (10) limit the minimum and maximum number of BOBs to be served by each DWH. Constraints (11) ensure that DWHs only supply the selected BOBs. Constraints (12) limit the total number of selected BOBs to be less than or equal to a user-specified number, B^{max} . Constraints (13) ensure that neighborhoods or unselected DWH locations can only be assigned to the selected candidate BOBs. Constraints (14) ensure that the selected candidate BOB j must cover a minimum number

of l_j neighborhoods and can only cover a maximum of L_j neighborhoods. Constraints (15) and (16) show the shipping capacity of *BOBs* and *DWHs*, the amounts, respectively. Constraints (17) ensure that a *DWH* can directly supply at least v_i and at most V_i neighborhoods/unselected *DWH* locations. Constraints (18) show the upper and lower limit of a linearized variable, z_{ijm} . Constraints (19) and (20) define the deviational variables representing the amount by which each goal deviates from its target value, CDM_{max} and TLC_{min} .

CASE STUDY AND OBSERVATIONS

To demonstrate the applicability of the mathematical models and the framework presented, we conduct a case study using major disaster declaration records in South Carolina. Forty six counties are clustered based on proximity and populations into twenty counties. Then, we choose one city from each clustered county based on a centroid approach and assume that all population within the clustered county exists at that city. The distance between these cities is considered to be the distance between counties.

When a man-made or natural major disaster occurs, the President determines the need of providing supplemental federal aid. Based on it, there are major relief and recovery activities conducted for the affected areas where a major disaster is declared. According to FEMA database (FEMA, 2012), South Carolina (SC) has experienced fifteen major natural disaster declarations from 1964 to 2011. The database also provides a list of counties where a major disaster was declared. The table lists the potential five locations for *DWHs*, Aiken, Charleston, Columbia, Florence, and Greenville, in the last five rows starting from the 16th row.

Since the main purpose of this paper is to demonstrate how the proposed GP model works, we simplify the objective function given by Equation (1) by excluding the fixed cost terms for *BOBs* and for *DWHs*. Also, the numbers of *BOBs* and *DWHs* to be built are pre-specified. For real-world applications, once the real data are available, such restrictions can be readily relaxed to generate meaningful results. Thus, the following parameters are predetermined for case studies. The maximum numbers of *BOBs* and *DWHs* that can be built, D_B and D_W , are set to 5 and 2, respectively. The minimum and maximum number of *BOBs* that a *DWH* must handle, k_i and K_i , are set to 1 and 10, respectively. Each *BOB* must handle at least 2 neighborhoods ($L_j = 2$) and at most 7 ($U_j = 7$). For simplicity, we set $H_i = 0, \forall i$. The capacity of a *BOB* and a *DWH* is set to 1,500 K and 2,500 K in terms of the quantity of relief items. We set D^c in (3) and (4) equal to 35 miles in this study.

Using Excel Risk Solver platform, we solve the GP model for various values of α and present the results of facility locations and distribution scheme in Table 2. As can be seen in Table 2, the minimum TLC ($\alpha = 1$) and the maximum CDM ($\alpha = 0$) turn out to be \$283,976 K and 3,545 K, respectively. The resulting supply chain network for the most cost effective model ($\alpha = 1$) is displayed in Figure 4, which shows the selected *DWH* locations, *BOB* locations, and distribution schemes between *DWHs* and *BOBs* and between *BOBs* to neighborhoods. Figure 5 displays these selected locations and distribution schemes for the maximum covered demand model ($\alpha = 0$). For the minimum TLC case, Columbia and Greenville are selected as *DWHs* and Anderson, Lexington, Orangeburg, Spartanburg, and Sumter are selected as *BOBs*, whereas, for the maximum CDM case, Aiken and Florence as *DWHs* and Conway, Lexington, Moncks Corner,

Rock Hill and Greenville as BOBs. Note that the selection of EFRs, DWHs and BOBs, and shipping/distribution schemes between ERFs and neighbors depends upon the goal of DRSC design.

Table 1. Data for Locations

No	City	County	Population (K)
1	Anderson	Anderson/Oconee/Pickens	373
2	Beaufort	Beaufort/Jasper	187
3	Bennettsville	Marlboro/Darlington/Chesterfield	96
4	Conway	Horry	269
5	Georgetown	Georgetown/Williamsburg	93
6	Greenwood	Greenwood/Abbeville	92
7	Hampton	Hampton/Allendale	33
8	Lexington	Lexington/Newberry/Saluda	318
9	McCormick	McCormick/Edgefield	35
10	Moncks Corner	Berkeley	178
11	Orangeburg	Orangeburg/Bamberg/Calhoun	123
12	Rock Hill	York/Chester/Lancaster	321
13	Spartanburg	Spartanburg/Cherokee/Union	367
14	Sumter	Sumter/Clarendon/Lee	157
15	Walterboro	Colleton/Dorchester	135
16	Aiken*	Aiken/Barnwell	184
17	Charleston*	Charleston	350
18	Columbia*	Richland/Fairfield/Kershaw	461
19	Florence*	Florence/Dillon/Marion	203
20	Greenville*	Greenville/Laurens	521

*potential locations for *DWH*

Notice that there is a significant change in selecting sites for DWHs and BOBs when α is changed from 0.5 to 0.4. From Table 2, we can also observe that TLC and CDM do not increase as α increases, which implies that minimizing TLC does not necessarily maximizing CDM. Thus, the goal programming approach proposed in this paper can be a useful tool for the effective design of DRSC in both the strategic and operational levels. The behaviors of TLC and CDM are depicted in Figures 6 and 7, respectively.

SUMMARY AND CONCLUSIONS

In this paper, we consider a disaster relief supply chain (DRSC) design problem, where the total logistics cost and the total amount of covered demand in case of emergency are major performance measures. We develop a goal programming model for ERF location and allocation problem, taking those performance measures into consideration simultaneously. We formulate it and solve it using Excel Risk Solver Platform. Case studies are conducted to demonstrate the developed model's capability to deal with uncertainties in DRSC. From the numerical results, we observe that the developed models perform well and these models can help federal and local emergency response officials develop efficient and robust disaster relief plans.

For future research, it would be interesting to include minimizing the expected number of the disrupted relief item (EDRI) as another goal in our objective function in (5) and to investigate the effect of each goal on the optimal locations and allocation among ERFs.

Table 2. Numerical Results for EMCD Model

α	0	0.2	0.4	0.5	0.6	0.7	0.8	1
<i>TLC in K</i>	\$418,516	\$418,516	\$329,360	\$293,224	\$293,234	\$293,005	\$283,976	\$283,976
<i>CDM in K</i>	3,545	3,545	3,040	2,725	2,725	2,725	2,320	2,320
WPD(TLC)	47.38%	47.38%	15.98%	3.26%	3.26%	3.26%	0.00%	0.00%
WPD(CDM)	0.00%	0.00%	14.25%	23.13%	23.13%	23.13%	34.56%	34.56%
$G_1(\alpha)$	0.00%	9.48%	14.94%	11.56%	11.21%	9.22%	6.91%	0.00%
Anderson	0	0	1	1	1	1	1	1
Beaufort	0	0	0	0	0	0	0	0
Bennettsville	0	0	0	0	0	0	0	0
Conway	1	1	1	0	0	0	0	0
Georgetown	0	0	0	0	0	0	0	0
Greenwood	0	0	0	0	0	0	0	0
Hampton	0	0	0	0	0	0	0	0
Lexington	1	1	0	1	1	1	1	1
McCormick	0	0	0	0	0	0	0	0
Moncks Corner	1	1	1	1	1	1	0	0
Orangeburg	0	0	0	0	0	0	1	1
Rock Hill	1	1	0	0	0	0	0	0
Spartanburg	0	0	0	1	1	1	1	1
Sumter	0	0	0	1	1	1	1	1
Walterboro	0	0	0	0	0		0	0
Aiken	1	1	0	0	0	0	0	0
Charleston	0	0	0	0	0	0	0	0
Columbia	0	0	1 ^B	1	1	1	1	1
Florence	1	1	1	0	0	0	0	0
Greenville	1 ^B	1 ^B	1	1	1	1	1	1

^{1B}: Location of BOB in the potential DWH candidate site.

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A SEMIOTIC FRAMEWORK FOR KNOWLEDGE MANAGEMENT SYSTEMS DESIGN

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ABSTRACT

The design of Knowledge Management Systems (KMS) has been approached from two broad perspectives: one focusing on the technological capabilities of KMS, and the other focusing on their functions and use. Given the high failure rate of KMS projects, it is important to consider both while designing a KMS. Drawing upon the semiotic ladder model, this study develops a framework for KMS design that consists of four levels of inquiries including empirics, syntactics, semantics, and pragmatics. Each level addresses distinct issues in the KMS design and together they help enhance the design performance for the expected organizational and behavioral outcomes. Based on the framework, several guidelines for KMS design are proposed.

INTRODUCTION

Knowledge Management Systems (KMS) refer to a class of Information Systems (IS) that are designed to support organizational knowledge management [1]. Their importance to Knowledge Management (KM), such as improved knowledge sharing, storage, retrieval, creation, and application, is widely accepted. This drives substantial research on the design of KMS to achieve the expected outcomes. Studies on KMS design are conducted from two broad perspectives: one focuses on the technological capabilities of KMS such as using Information Technologies (IT) to code, store, and retrieve knowledge (e.g., [10] [15] [17] [20]), and the other focuses on the functions and use of KMS for knowledge creation, sharing, and application (e.g., [1] [11] [25] [26] [27] [28]). A few studies attempt to integrate both within particular contexts (e.g., [7] [29] [33]), but generalization is a potential issue in those studies. The result is that the gap between the two perspectives is still wide, which may explain why some KMS projects and initiatives failed [34].

Scholars have long been aware that IT inspires but does not deliver KM [23] since IT acts as the catalyst for the introduction and initial buy-in of KM programs, but future success depends on the continuous use of KMS in line with a defined KM strategy [34]. This suggests that for KMS to be useful, its technical capabilities must fit the KM tasks and the actual users [21]. Given the still limited progress in this area, more efforts are needed to integrate the technological and organizational aspects of KMS in its design.

In this study, we conduct a design science research [22] to examine critical issues related to KMS design and to recognize strategies to deal with the common issues. Such a design science research is related to but distinct from KMS design, as it does not particularly design a KMS artifact but analyzes the principles that need to be followed or the requirements that should be

fulfilled to successfully design such an artifact [2]. Drawing upon the semiotic ladder model [30] [31], we develop a framework for KMS design that encompasses four levels of inquiries including empirics, syntactics, semantics, and pragmatics. Each level focuses on certain aspects in KMS: empirics deals with the symbolic representation of knowledge in KMS that best matches its content in the organization; syntactics deals with the structure of knowledge in KMS so that it can be consistently processed in KMS; semantics deals with the actual meanings of coded knowledge in KMS; and pragmatics deals with the use of knowledge in organizations. Based on the framework, several guidelines for further KMS design are proposed.

The structure of the paper is as follows. First, a literature review on KMS design is presented, which summarizes the major approaches in available studies and highlights the gaps. Then, the theoretical basis of the design research is introduced. Next, the framework for KMS design research is developed, which is followed by the proposition of a few design guidelines.

KMS DESIGN RESEARCH: A LITERATURE REVIEW

KMS design research addresses the design, use, and organizational and behavioral impacts of KMS [1]. To date, many design features and underlying technologies have been studied. Based on the key features examined, the design research can be categorized into three groups including: technological design research that focuses on the IT capabilities of KMS, functional design research that focuses on the functions and use KMS, and integrative research that emphasizes both. The progress in each group of studies is briefly summarized as follows, and the unresolved problems are also recognized.

Technological design research

In terms of technological design, studies were conducted to investigate IT capabilities for KMS. One type of capability is to quickly find the needed knowledge from the system. To this end, Chang and Yang [8] propose using intelligent agents to find knowledge documents in KMS that match user's search habits. These intelligent agents, such as user agents, surfing agents, data mining agents, searching agents, and monitoring agents, help to improve the knowledge search performance via indexing, classifying, and retrieving documents relevant to a user group based on the group's habitual domain. On the other hand, Li et al [20] propose using fuzzy linguistic method and fuzzy text classification to model knowledge to enhance knowledge recommendation. The key is to build expert profile by modeling expert's knowledge or expertise using the linguistic algorithms. Apparently Chang and Yang's solution focuses on knowledge users while Li et al's solution focuses on knowledge sources.

Another type of IT capability deals with effective knowledge representation in KMS. Cheng et al [10] develop an ontology-based approach to KMS design that supports knowledge application in the financial domain. They suggest inserting the data conversion layer and data storage management layer between the raw data and user, so that the raw data are converted into user-friendly formats for ready use. Joo and Lee [19] propose using the Semantic Web technology to address limitations (such as inconvenience, incompleteness, and user dissatisfaction) in traditional KMS, because Semantic Web helps to improve the machine processability of knowledge. Although the proposed Semantic Web-driven KMS is expected to improve all KM

functions, such benefits are not empirically tested. Han and Park [15] propose using the process-centered knowledge model (i.e., a graphic representation of the business process) to represent knowledge that keeps the knowledge inseparable from its original context, which helps to enhance knowledge storage and retrieval. These solutions provide supplement to the general ontology of knowledge in KMS.

Other studies focus on the access and circulation of knowledge. For example, Chen [9] develops an approach to secured knowledge access in KMS, where user knowledge privileges are assigned based on user types or roles, which limits the kinds of knowledge a user may access and thus enhances the security of the knowledge documents (including organizational knowledge, process knowledge, and product knowledge). Hirai et al [17] propose the work breakdown structure (WBS) and the document management to enable the transfer (i.e., circulation) and reuse of project knowledge between projects. In doing so, they combine WBS and process language to create documents for each process.

The above studies contribute to the understanding of IT capabilities in KMS design, but problems exist. A major concern, as mentioned above, is that IT only enables KM but cannot deliver KM success. In fact, the above technological solutions focus on the processing of knowledge (e.g., coding, storage, and access) in the system, but they do not particularly address knowledge contribution at the input end (i.e., providing new knowledge or expertise to the system) or knowledge use at the output end (i.e., applying knowledge in problem-solving and knowledge creation) of the process, because knowledge contribution and use fall in the organizational domain rather than the technological domain. If users find the system fails to support their knowledge work within the organization, they will eventually abandon the system.

Functional design research

In terms of functional design, studies were conducted to investigate the functionalities and use of KMS. Early on, Alavi and Leidner [1] summarize four main functions of KMS including knowledge creation, storage, sharing, and application, and gave semantic illustrations of the knowledge creation and transfer processes. Tiwana and Ramesh [32] develop a KMS solution to facilitate knowledge creation in information products development (IPD), which contains design features such as distributed annotation and visibility of artifacts over time that address unresolved issues in traditional IPD. Salisbury and Plass [28] then develop a conceptual framework for a web-based KMS, which facilitates knowledge creation through collaborative cognition among organizational members, and it contains six main capabilities including: reference materials, search, communication, instruction, decision support, and knowledge acquisition. Later, Hall and Paradise [14] introduce a learning-oriented KMS consisting of four major components for intelligence, design, choice, and knowledge storage; this system facilitates knowledge creation, sharing, and application in decision-making.

Chua [11] from a different viewpoint introduces three main services of a KMS architecture, including infrastructure services (i.e., knowledge storage and communication), knowledge services (i.e., knowledge creation, sharing, and reuse), and presentation services (i.e., knowledge personalization and visualization). Although the main services in this architecture are consistent with the KM functions studied in other research, the new services such as knowledge

presentation require design features from the technological perspective. Another KMS architecture introduced by Gopal and Joy [13] includes knowledge repositories, collaborative platforms, networks, and culture. Finally, Richardson et al [27] propose twelve principles that aim to build purposeful, ethical and adaptable KMS that enables knowledge creation through communicative action. While knowledge creation seems to be a central theme of many of the design features, the overlapping is obvious between knowledge creation and other KM processes such as knowledge sharing and use, due to the relatedness of these processes [1].

Except for a few studies, other studies in this approach seldom address the technological bases for the KMS functions. Instead, many have applied existing technologies such as search engines and collaborative tools to support those functions [34]. This approach is not problem-free: as Joo and Lee [19] show, it suffers from the problems of poor system quality such as knowledge search and integration issues, slow response, and instability. This suggests that the technological capabilities or restrictions should be considered when designing a KMS.

Integrative design approach

A few studies address both technological and functional aspects in KMS design. For example, Butler et al [7] develop a knowledge-sharing KMS called portable Knowledge Asset Development System or pKADS based on the web technology, and study the representation of knowledge in the system (using XML documents and conceptual schema) and the technological architecture of the system. Tserng and Lin [33] develop a KMS for knowledge storage and sharing among construction contractors, which consists of three major functions (including content management, experience management, and process management) built upon a number of knowledge processes (including knowledge approval, classification, storage, backup, and publishing). They also use the IDEF (Integrated DEFinition) diagrams to map the architecture of such a system. Savvas and Bassiliades [29] discuss the building of a web-based KMS using semantic web and XML documents to manage operational procedures in public administration. Such a system is built on the process ontology that represents the knowledge structure of the procedures for easy storage and transfer. Becerra-Fernandez [3] provides a brief survey on using artificial intelligence to build People-Finder (similar to expert profile; see Li et al [20]) KMS for improved storage and retrieval of expert information. These studies make a balance between the selected functionalities of KMS and their technological basis.

In sum, significant progress has been made in the design of KMS to support organizational KM activities, but a gap still exists between the technological and functional design of KMS due to limited theoretical bases to bridge the gap. In the next sections, we draw upon the semiotic ladder model to develop a unified framework for KMS design.

THEORETICAL BASIS

As KMS are information systems designed to manage organizational knowledge, the theoretical frameworks for IS design apply to this area. Particularly, Stamper's [30] [31] semiotic ladder model provide a comprehensive basis for IS design. This model suggests that IS design encompasses four consecutive levels of inquiries including, from low to high: empirics, syntactics, semantics, and pragmatics. Each level focuses on certain aspects in IS design. Table 1

presents a brief explanation of each level; some exemplary questions for KMS design are also presented. A fundamental assumption of the model is that information and knowledge are represented in some forms of signs, and IS and KMS are used to process the signs that convey the information and knowledge. For example, XML documents are commonly used to represent knowledge in KMS to enhance its processing and interpretation [19] [29].

Table 1. Semiotic levels of information

Level	Definition (adopted from [24])	Exemplary questions for KMS design
Pragmatics	The study of the actual use of signs and systems of signs, such as the relations between signs and behavior.	What can KMS do to address organizational issues? How does it improve organizational performance such as learning and innovation?
Semantics	The study of the meaning of signs, i.e., the relationship between signifier and signified.	What factors influence the interpretation of knowledge coded in KMS? How does a user correctly identify a piece of knowledge to solve a given problem?
Syntactics	The study of formal structures and systems of signs and their properties.	What syntactic structure is appropriate for the coding of knowledge? How does the syntactic structure of knowledge symbols influence its processing (such as storage and retrieval) and interpretation?
Empirics	The study of sign transmission and the statistical properties of the repeated use of signs.	How is knowledge symbolized in KMS? What is the most efficient way to code and store knowledge? How can the codes or symbols of knowledge be efficiently and consistently processed in KMS? How can the knowledge symbols be processed across systems or modules?

At the empiric level, studies focus on the manipulation of signs to represent information and knowledge, such as symbols, data, messages, and documents. Stamper [30, p. 18] suggests that of these terms, sign is all-embracing as it includes other terms. Mingers [24] then provides a typology of multiple forms of signs and suggests three basic forms used in IS including graphic, numeric, and linguistic data. Corresponding, knowledge can be represented by these three forms, such as knowledge maps [18], XML data [8], and documents [9]. The use of these signs influences other levels of information manipulated in KMS, such as the structure of the signs and its processing and interpretation.

At the syntactic level, studies focus on the formal structures of signs to represent information and knowledge, such as linguistic syntax and computer syntax. In terms of KMS, it suggests that the syntactic structures of signs that convey knowledge influence the representation, processing, and interpretation. For example, Hirai et al [17] study a knowledge representation syntax called Work Breakdown Structure (WBS), showing how it is used to embody knowledge flows. Chen [9] introduces three types of ontologies to represent knowledge at the organization, process, and product levels. The completeness and readability of the syntactic structure of knowledge symbols influence its processing at the semantic level.

At the semantic level, the focus is on the meaning of signs, i.e., what information or knowledge the sign stands for. In terms of KMS, it specifies the meaning or understanding of the knowledge symbols, especially in the eyes of the users. For example, to address the context-dependency of knowledge representation, Han and Park [15] use the process-centered knowledge model to keep the knowledge inseparable from its original context, which helps to reduce errors of limited or distorted understanding of knowledge carried in the models.

The last pragmatic level deals with the use of signs, i.e., how the information conveyed in the signs is used for adaptive behavior such as decision making and problem solving. In terms of KMS, it implies the application of knowledge, conveyed in signs in the KMS, to fulfill organizational goals such as problem-solving and knowledge creation.

The four levels in the semiotic ladder model address different but interrelated matters in information and knowledge processing. Of the four levels, empirics and syntactics deal with the IT platform for information and knowledge, and semantics and pragmatics deal with the use and organizational impact of IT [5] [30]. The four levels have different implications for KMS design. As shown in Table 1, typical design questions at the empiric level include: how to code knowledge in KMS, how to improve the inter-operability of knowledge symbols among systems or modules, and how to improve the efficiency of knowledge storage and retrieval? At the syntactic level, the focus falls on the structure of the symbols, i.e., the efficient and effective way of organizing symbols such as XML knowledge-based schema [8] or process ontology [9] [29]. The semantic level requires accurate interpretation of knowledge, for which the context is needed [15]. A key design question at this level is: is this the piece of knowledge the user looks for? Finally, the pragmatic level focuses on the use of knowledge, and a typical question is: does the use of KMS help to achieve the expected KM goal, such as enhanced knowledge sharing and innovation?

Each of the levels was addressed in prior KMS research, but the whole model has yet been used to support the whole design process, which caused the gap in literature. In the next section, we develop a framework based on the semiotic ladder model to address the KMS design issue and build the connection between the technological and functional aspects in KMS design.

A SEMIOTIC FRAMEWORK FOR KMS DESIGN

According to March and Smith [22], design science attempts to create things that serve human purposes. The design research outputs called artifacts [16] include constructs, models, methods, and instantiations; the design research process includes building, evaluating, theorizing, and justifying the design artifacts. In our study, the central output is the KMS design method built upon the set of levels in the semiotic ladder model, including empirics, syntactics, semantics, and pragmatics. Design issues at each level are first analyzed, and general guidelines are summarized later.

As the empiric level is the basis of managing knowledge in KMS, we start from this level. As mentioned above, this level deals with the specification of symbols for representing knowledge. To date, a variety of symbols have been applied to represent knowledge in KMS, including knowledge map, XML document, process model, and data. The above review shows examples of

their applications in KMS design. Other symbols examined in IS literature are also proper candidates for knowledge representation: for example, knowledge visualization [6] may be an alternative to represent knowledge if the linguistic approach does not sufficiently represent knowledge. These various symbols differ in their efficiency and effectiveness in knowledge representation and use, such as the speed and accuracy in knowledge search and retrieval. On one hand, visual symbols such as knowledge maps and visualization tools contain more information than textual symbols such as XML document and data, and are therefore more effective for representation and easier for interpretation. However, the processing of visual symbols in knowledge search and retrieval is less efficient in IT, as it is more difficult to locate the right knowledge piece in its visual form. A popular solution is to index the visual symbols using metadata [12] such as identification numbers and then search based on the metadata, which actually adds textual symbols to the visual symbols of knowledge representation. On the other hand, textual symbols such as XML document (for Semantic Web) and data may contain less information (and therefore less effective) but are far more efficient in knowledge processing (especially for knowledge retrieval), determining that both are popular approaches to representing knowledge in most KMS.

At the syntactic level, proper syntactic structures of knowledge representations, such as XML schema, are needed to organize symbols for easy understanding, faster processing, or both. This ensures that the system of symbols can be consistently and reliably processed or interpreted by KMS and the users. For example, Enser [12] develops the syntax for indexing general images, including tabular forms of the metadata that described the key information of the images, which are straightforward and easy to understand. Similarly, Joo and Lee [19] adopt RDF (i.e., Resource Description Framework) as the standard metadata to organize information on the semantic map of knowledge, which helps to address the search and integration limitations in KMS. Multiple syntactic structures, usually known as knowledge ontology, have been studied in prior literature, as the review section shows. The key is to design or apply the syntax that not only matches the symbols used to represent knowledge at the empiric level but also provides the structure that enables the machine-processing of knowledge, such as the popular Web Ontology Language in Semantic Webs.

The empiric and syntactic levels are the primary concerns of the technological capabilities of KMS. However, their impact on KMS performance can be influenced by the semantic meaning of the symbols (i.e., the knowledge represented) and their pragmatic use by knowledge workers. Many KMS failed not because the system itself was not well designed, but the knowledge it managed was of no use to the users or hard to find. To understand the actual KMS use, the semantic and pragmatic levels need to be analyzed within particular task environment that the KMS reside in.

The semantic level of KMS deals with the comprehension of knowledge conveyed in the structured symbols. Such comprehension requires at least three components: the symbol itself, the user, and the knowledge object the symbol stands for. In Li et al's [20] study, for example, expert profile is the symbol that conveys the information of knowledge or expertise the expert provides; the accuracy of the profile therefore determines how efficient the user is in locating the needed knowledge. The quality of the knowledge managed in KMS, based on the particular symbols, therefore influences the semantic meaning of the symbols. The distinction between the

visual and textual symbols discussed above suggests that a balance is needed between the information richness in some symbols and the processing efficiency in the others when determining how knowledge should be properly coded.

The last pragmatic level deals with the functions of KMS to support organizational processes such as knowledge creation. Alavi and Leidner's [1] four functional areas of KMS (including creation, storage, sharing, and application) provide a standard template for building KMS, based on which specific KMS functions could be adjusted depending on the need of the user. For example, Cheng et al's [10] KMS design focuses on knowledge application, while Hirai et al's [17] design focuses on knowledge sharing.

We illustrate in Figure 1 the four levels of issues in KMS design and their interrelationship. The following guidelines are summarized:

- 1. The symbolic representation of knowledge should be selected to balance the efficiency and effectiveness in knowledge processing.* While semantic data are overemphasized in contemporary KMS design due to the popularity of the Semantic Web, the limitation of this type of knowledge representation should be noticed as it ignores many tacit aspects of knowledge. Therefore, visual, audio, and multimedia representations of knowledge should also be considered if necessary, and these symbols should be further strengthened (such as indexed) with semantic data to enhance efficiency (such as keyword-based search).
- 2. The syntactic structure of knowledge symbols should be selected by not only the machine processability of the symbols (such as Web Ontology Language for semantic data) but also the readability by the users.* An example is adding interacting classes and mutual properties in knowledge ontology to enable users to effectively identify knowledge across symbols [4].
- 3. The semantic structure of knowledge in KMS should be organized based on the users, such as users' habitual domains [8].* Although expert profile [20] may be created while coding knowledge in KMS, such profile should be organized that matches the cognitive capability of the knowledge users.
- 4. The pragmatic purposes of KMS should be clearly specified under the KM strategy to guide the design at the other three levels.* This level of design should closely follow the overall KM strategies and ensure that the KMS functionalities are aligned to the strategies. In fact, KMS may be designed for various KM purposes such as knowledge sharing, storage and creation, and the corresponding features may differ significantly. For example, People-Finder is a commonly used KMS for knowledge sharing [3], which requires a list of experts with information of their expertise; such a system does not require the expertise to be fully coded in the knowledge base for later retrieval, so that the storage and processing requirements are relatively low. On the other hand, knowledge creation in projects [17] usually has a high demand on the coding and storage of knowledge, which requires sophisticated knowledge representation. These pragmatic purposes determine the complexity of the other levels of design work.

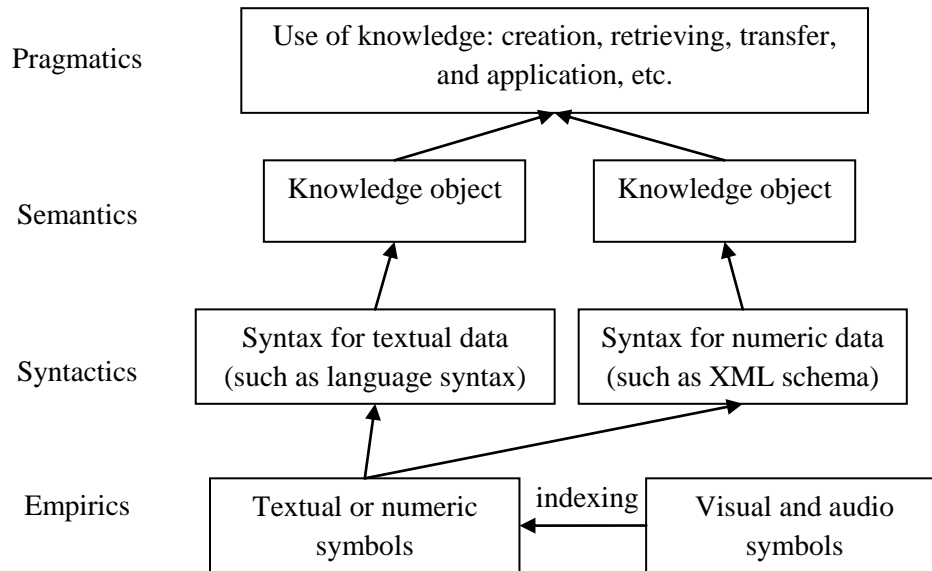


Figure 1. A semiotic framework for KMS design

CONCLUDING REMARKS

In this study, we conduct a design science research to address issues related to KMS design. We notice a potential gap between the technological design and the functional design of KMS, and draw upon Stamper’s semiotic ladder model to develop a framework to unify both design approaches for an improved KMS performance. Four guidelines are proposed to match the four levels of inquiries in the semiotic ladder model, which interpret how knowledge is represented and processed in KMS. Further research is needed to apply the guidelines to actual KMS design work and empirically test the values of the guidelines with case studies or experimental research.

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PERCEPTIONS AND CONCERNS OF SOUTHEASTERN NONINDUSTRIAL PRIVATE FOREST LANDOWNERS OF THE WOODY BIOMASS AND BIO-ENERGY MARKETS

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ABSTRACT

A growing demand for biomass to create renewable energy generated from food-based feedstocks have led to concerns regarding food security and the negative environmental impacts that would occur from massive scale production. These concerns have prompted woody biomass markets to increase because of multiple advantages, such as healthier forests and rural economic development. Forty-percent of the United States' timberlands are in the Southern states and 71-percent of these lands are owned by nonindustrial private forest landowners, so it is important to address the various factors that would influence marketing traditional timberland products as biomass and bio-energy feedstocks, including economics.

INTRODUCTION

The United States produces the most pulpwood in the world, 50 million metric tons annually [10], and the Southern states produced 30 million metric tons (60-percent of the US total) verifying the South's intensity of forest and timber production. About one-third of the US is in forested land with 29-percent of the South in timberlands [7]. Of the forested lands, 48-percent of the US total is owned by nonindustrial private forest landowners (NPFL), and 71-percent of the Southern tracts are held by NPFL [8].

The South is known as the 'wood basket' of the country, and is considered a large source for woody biomass for future bioenergy production. The South recently increased the number of pine plantations; however because of low pulpwood markets and prices, many are still small diameter and unthinned plantings. The National Renewable Energy Laboratory estimated 93 million green tons is available annually in Southern NPFL forests to produce bioenergy. However, since the majority of timberlands in the South are NPFL, who generally make decisions based on personal utility, and without a well-defined biomass market, it is difficult to predict the amount of wood that would be readily available as a bioenergy or biomass feedstock.

Wood prices during the economic recession dropped to levels not seen in three decades. In fact, adjusted for inflation, that means wood in post-recession was bringing what it did in the 1930s. Some private landowners were considering the opportunity costs of keeping their land in forests rather than yielding to the temptation of converting to row or specialty crops, according to Lynn Michaelis, the former chief economist for Weyerhaeuser. As a result, inventory in the Southeast rose 30-percent over the past five years. The rise in inventory in the South is due to an increase

in the number of pine plantations. Because of the low pulpwood market prices, many of the trees are still small diameter and unthinned and having minimal value as milled planks. Normally, price rations the supply, so with an increase in inventory (supply), prices would be expected to fall further. However, demand will increase over the next few years and inventory levels will fall, and prices will be pushed up over current levels. Lumber prices fell to about \$300 per 1,000 board feet in late 2012, but are expected to nearly double over the next three to four years. Several factors are driving the upswing in demand: an increase in biomass and bioenergy needs; a slight but significant increase in residential and commercial real estate sales; a do-it-yourself rise in remodeling and renovation of existing real estate; housing starts and commercial building permits on an uptick; wood pellets being sought and used as an alternative fuel, especially for the European export market; and a booming timber demand for export to Asian markets.

Bioenergy, as an alternative market for Southern NPFL, is becoming a growing industry, and specifically biomass concerns have increased within the last few years. Biomass is regarded as any plant-based material used for electricity, biofuel production or thermal heating [1]. Within that category forest biomass is commonly defined as the by-product of forest management, restoration, and hazardous fuel treatments, including trees and woody plants, residues from primary and secondary wood-processing facilities, biomass from dedicated energy crops, and wood construction material.

Bioenergy consumption falls into three main categories: thermal energy, electricity, and transportation fuels. By 2009, renewable energy accounted for 8.1-percent of the total energy use in the United States, or which half of the renewable energy (4.1-percent) was from biomass [11]. Increasing bioenergy production provides an alternative to traditional fossil fuels which have been of concern to national energy security, economic growth, and climate change or global warming. Although cost of wood fuel varies regionally, prices for woody biomass have not risen as dramatically compared to oil. Much of the current renewable energy is being generated from food-based feedstocks such as corn and soybeans, and increased concerns regarding food security and the negative environmental impacts, such as soil erosion and loss of biodiversity, that could occur due to massive scale production to biomass conversion. This has promoted woody biomass as an energy source as it is not associated with negative impacts on food supply and has multiple advantages, such as healthier forests and promotion of rural economies.

Most of the total renewable energy that comes from biomass is currently consumed primarily by the forest products industry for generating heat, steam and electricity. Forest biomass that is used in wood –based energy production often comes from young trees, species not of high value, deformed or diseased trees, salvaged trees, or logging residues [8]. Some advantages of utilizing woody biomass for energy are: higher net energy balance, reduction of greenhouse gas emissions, maintenance of healthy forests by removing lower quality trees, reducing forest susceptibility to wildfires and pests, and economic opportunities in rural communities. Biomass harvested from sustainable forests is also considered ‘carbon neutral,’ meaning the carbon emitted from production, harvesting, and combustion (the carbon contribution) is offset by the carbon captured or sequestered in new forest growth.

Objectives and Methodologies

The objective is to conduct a literature review of the perceptions and concerns of southeastern NPFL as to developing a wood energy market as well as what management factors would

contribute to a wood energy market and the effect wood energy will have within the current southeastern forest industry. The geographic focus is on the ten Southern states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. Initial internet inquiries found literature and surveys focusing primarily in Arkansas, Florida and Virginia for a sampling. These surveys identified factors that would increase the potential amount of feedstock contributed to biomass, such as NPFL willingness to accept price offers for wood biomass, NPFL policy preferences related to bioenergy, willingness to supply wood biomass for bioenergy, and incentives to cooperate with adjacent NPFL. The effects of forest biomass utilization policies to the NPFL are also considered and reviewed.

Nonindustrial Private Forest Landowners (NPFL) Observations and Assessments

Multiple studies have shown NPFL decisions are dependent on market price, landowner types, land objectives, size of forest tract, environmental preferences, and variable demographic and forest management characteristics [8]. The question on availability of feedstock in the South targets the NPFL willingness to supply biomass for bioenergy. Willingness to supply was found to be related to owner objectives, size of the tract, composition of the forest, and the demographic characteristics of age and residency [8]. A majority of landowners find dependence on imported fuel critical for national security and a healthy economy, however most were not aware of cellulosic (woody) biomass to generate energy. NPFL are more likely to supply biomass when they are young entrepreneurs with larger pine plantations or with wildlife objectives, and with higher levels of education. Also NPFL are more willing to supply woody biomass if bids are at least equivalent to pulpwood prices. Older landowners (65+ years of age) and with timber production objectives are less likely to supply woody biomass. One difference observed was as acreage increased, NPFL were more likely to prefer basic clear-cutting over biomass utilization strategies.

Previous studies indicated NPFL generally were utility maximizers rather than profit maximizers, causing a landowner to decide to harvest when offered a market price equal to or greater than an individual-specific reservation price [6]. At the market price of pulpwood, less than 30-percent of NPFL are willing to supply biomass but the popularity of supplying biomass increases to over 50-percent at higher prices, revealing NPFL generally favor profit maximization. However, older landowners are typically less willing to supply biomass even at the highest price offers. The most willing NPFL to supply biomass at either market pulpwood prices or highest offered prices were those with timber production objectives or with a large percentage of small diameter trees.

Concerns whether woody biomass for wood energy will increase wood harvesting and displace current pulpwood markets has been challenged and disputed by a study with the National Alliance of Forest Owners. Forisk Consulting examined historical wood production, forest growing stock, and evaluated economic scenarios to allow for total pulpwood rotation conversion, and determined an improbability of significant impacts of wood energy markets to switch landowner strategies [4]. In the South, demand for bioenergy would conservatively need to increase 435-percent to raise pulpwood prices to a minimum tradeoff price that would allow for landowners to consider switching from saw timber rotations (33 years) to pulpwood rotations (23 years). There are currently over 100 bioenergy mills proposed, under construction, and/or operational within the Southeast, providing a multitude of market locations for NPFL [3].

Examining how adjacent landowners influence the decision making by NPFL as well as how incentives to cooperate can be critical to increase the biomass supply in the market. The factors evaluated whether the NPFL would consider jointly planning future forest management activities with neighboring landowners and whether NPFL would consider harvesting at the same time as the neighbors if there is a 20-percent price increase received, assuming both stands are similar in age [12]. The survey results indicated less than 40-percent of the NPFL are willing to consider jointly planning future forest management activities, but more than 40-percent are willing to harvest timber at the same time of their neighbors with a 20-percent increase in price received. When neighbors are more familiar with each other and the land characteristics of both properties or they use neighboring properties for recreational activities, NPFL are more willing to enter into joint agreements on forest management. Increasing the number of private individuals bordering the tract also increased NPFL willingness to consider joint planning. If a landowner inherited their land, they would be less likely to participate in joint agreements with neighbors.

Renewable Portfolio Standards (RPS) require a certain percentage of electricity generation come from renewable energy sources. RPS policies vary by state either as mandatory, voluntary, or there is no RPS [2]. The most recent RPS policies were established in June 2013. When assessing public preference for woody biomass based electricity and its environmental benefits, a majority of respondents to a survey were willing to pay a premium for green electricity [9]. Individual with higher education levels and who tended to use energy saving devices had a higher willingness to pay premium; however, as the premium increased, the probability of paying the premium decreased, even as environmental benefits increased. Neither the size of households nor age of respondent was significant in regards to willingness- to-pay a premium for green electricity.

Concerns regarding massive scale cultivation and its effects on food security because of food-based feedstocks to generate ethanol and biodiesel have resulted in multiple public policies, i.e., the Energy Independence and Security Act of 2007, the energy Policy Act of 2005, and the Healthy Forests Restoration Act of 2003. Furthermore, NPFL decision making is significantly influenced by policy variables. More than 60-percent of those surveyed stated that all of the policy alternatives presented were important to promote wood-based bioenergy for the future. In general, NPFL prefer tax based policies compared to subsidy-based supports. Over 80-percent of NPFL respondents stated tax incentives for landowners to be an important policy tool; over 75-percent indicated tax supports for producer and tax treatments for biofuels at the pump were also important policies; and more than 65-percent found cost-share programs and price supports for landowners to be important policies [5]. Tax incentives are favored over cost-share programs because the latter is seen as relatively more challenging and expensive to pursue. Older landowners, however, were found to be more in favor of cost-share programs while lower income landowners preferred tax incentives. Surprisingly, NPFL with large forest acreages were less likely to support any policy tools to promote wood-based bioenergy. This observation suggests they may think large scale bioenergy production will conflict with timber production and the impact it may have on revenue from timber harvesting. Many southern states have no relevant rules and regulations limiting woody biomass. One-third of the policies in the Southern states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas) are related to tax incentives within manufacturing while the Southern Appalachian states (Kentucky, North Carolina, Tennessee, Virginia, and West Virginia) have the fewest number of cost-share programs, tax incentives or regulations within the entire 50 states [1].

Observations and Implications

A growing demand for biomass to create renewable energy generated from food-based feedstocks have led to concerns regarding food security and the negative environmental impacts that would occur from massive scale production. These concerns have prompted woody biomass markets to increase because of multiple advantages, such as healthier forests and rural economic development. However, 40-percent of the United States' timberlands are in the Southern states and 71-percent of these lands are owned by nonindustrial private forest landowners (NPFL), it is important to address the various factors that would influence marketing traditional timberland products as biomass and bioenergy feedstocks.

Overall, the NPFL have an eagerness and willingness to consider wood energy as an alternative market to pulp and paper. Ultimately, economics play a primary role for the determination of bioenergy supply or the conventional forestry product markets, and is the price right? When targeting NPFL for wood supply toward bioenergy mills and markets, younger landowners with large acreage tracts are the most willing to consider the conversion. Before changing rotation strategies, the local market infrastructure and state policies need to be reviewed. Many of the currently operational, or soon to be operational, bioenergy mills provide a sustainable alternative to pulp and paper markets during traditional forestry operations such as pulp from thinning as well as pulp from final harvests.

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Initial Assessment of Student Models to Memos

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Abstract

A critical component of business education promotes learning outcomes related to problem solving and producing associated business communications. In this paper we provide a memo homework problem that requires students to evaluate a two-decision business scenario mathematically and to write their recommendation in a memo. We assess both the quality of student analyses and memo writing. We identify a gap in student communication skills.

Introduction

A critical component of business education addresses student skills in problem solving and creating associated business communications (Aiken, Martin, & Paolillo, Joseph, 1994; Boatwright & Stamps, 1988; Kimball, 1998). Multiple authors point out that business textbooks and curriculum lack adequate instruction and assessment of problem solving and communication skills (Grinde & Kammermeyer, 2003; Grossman, Norback, Hardin, & Forehand, 2008; Williams & Reid, 2010).

For example, in an undergraduate management science course, students traditionally practice problem solving by learning how to correctly formulate a mathematical model from a word problem, as illustrated in Figure 1a. In a traditional learning activity, students read a word problem and identify the decisions required, an objective, and multiple constraints. Then they write a legend for the decisions and formulate an objective function and constraints to develop a mathematical model for the problem. Next students use software to generate output from their mathematical programming formulation and identify the optimal solution. Several authors propose adding a memo as a component for business assignments (Carrithers & Bean, 2008; Williams & Reid, 2010). In a management science course, the memo assignment requires students not only to formulate a model and solve it using software, but also to write a memo in which they describe the problem and present the optimal solution in a business context (Williams & Reid, 2010). The memo based learning assignment is described and contrasted to traditional assignments in Figure 1b.

Figure 1a. Traditional homework assignment

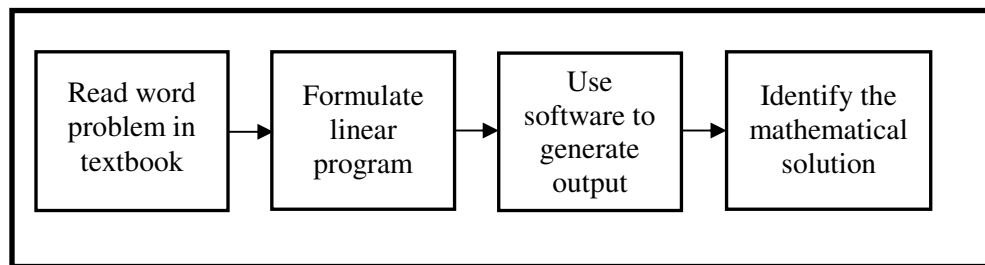
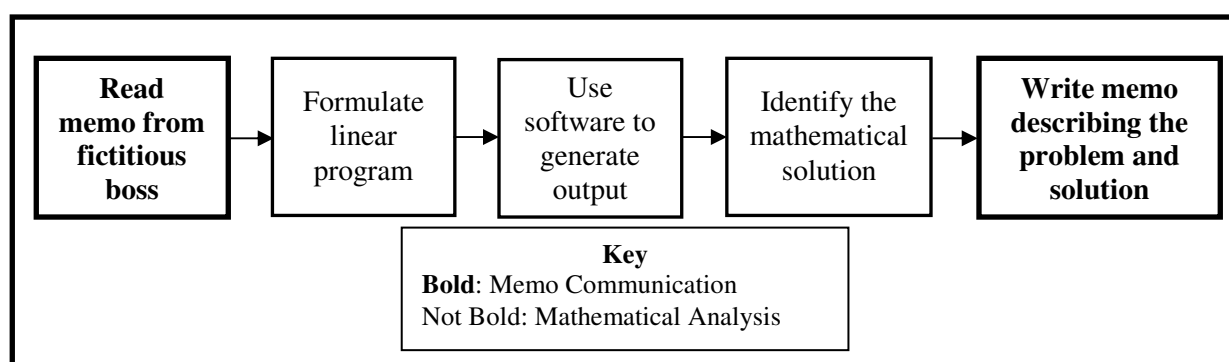


Figure 1b. Memo-based homework assignment



Student performance data were collected for three years on the first memo homework assignment in terms of problem formulation skills and qualities of business communication demonstrated in the memo. *Homework 1 problem 1* requires students to identify two decisions, a single objective, and several constraints such as material supplies, labor available, contract requirements, and/or marketing forecasts. Interestingly, average student performance was always higher on the formulation component of the homework than the communication elements associated with writing the memo (Williams, Stanny, Reid, Martin, & Hill, 2014). As a result, the researchers collected additional data to determine which part(s) of memo writing posed the greatest challenge to students. The remainder of this paper focuses on initial assessment of student performance on the first problem of the first memo assignment. Our analysis includes assessment of student skills demonstrated in the mathematical formulation component of the homework and the quality of student writing about the formulation.

Test Instrument

The test instrument was the *homework 1 problem 1* memo assignment, presented in Figure 2. The memo assignment required that students first identify the two decisions to determine how many **model a** and **model i** smartphone covers a manufacturer should produce

and sell. Students must then calculate the net revenue in terms of revenue and costs of photography, custom design, printing labor, and plastic and ink materials and formulate an objective to maximize profit. The students then had to recognize that photography, custom design, and printing labor were limited while marketing forecasts provided minimum production requirements to meet.

Figure 2. Fall 2013 Undergraduate Management Science *Homework 1 Problem 1* Assignment

MEMO DATE: August 27, 2013
 TO: MAN 3550 Management Scientist
 FROM: Bree Green, Manager; GB Zoo
 CC: Cedric Count, Controller; Sam Spender, Procurement Manager; Gerry Grow, Marketing Manager
 RE: Smartphone Cover Product Mix for GB Zoo (Assignment 1, Problem 1, due September 10)

The GB Zoo plans to expand its marketing program by selling custom smartphone covers featuring visitors enjoying their zoo experience. How many of each of two sizes of smartphone covers should GB Zoo produce in order to maximize total profit? The following departments have provided helpful information. Please submit your recommendation at the start of class on September 10.

Production
 There are two sizes (a vs. i) of smartphone covers which require the labor time and materials per cover as shown in the table below.

<u>Labor & Materials per Cover</u>		\$/unit	aCover	iCover	Resources Available
Labor	Photography	\$20/hour	3 minutes/cover	3 minutes/cover	35 hours
	Custom Design	\$20/hour	4 minutes/cover	4 minutes/cover	40 hours
	Printing	\$8/hour	6 minute/cover	8 minutes/cover	80 hours
Material	Plastic		\$2/cover	\$3/cover	Unlimited
	Ink		\$1/cover	\$1.5/cover	Unlimited

Human Resources
 The cost for each type of specialist in \$/hour is given in the table above. The hours available for each specialist are also given in the table above.

Marketing
 At least 100 of the aCovers and at least 50 of the iCovers must be produced. Each aCover sells for \$20 and each iCover sells for \$22.

Once students formulate and solve the model, they must identify the optimal solution to produce and sell 100 **model a** covers and 500 **model i** covers to generate a total profit of \$8437. The corresponding *homework 1 problem 1* memo describing the problem solution is presented in

Figure 3. The software output for the solution was generated by using *The Management Scientist 6.0* software (Anderson, Sweeney, & Williams, 2003) that accompanies the course textbook (Anderson, Sweeney, Williams, & Martin, 2010). The memo solution contains a restatement of the problem and a recommendation for the number of each model of smartphone cover the manufacturer should produce and sell to generate a maximum profit.

Figure 3. Fall 2013 Undergraduate Management Science *Homework 1 Problem 1 Key*

MEMO	
DATE: September 10, 2013	
TO: Bree Green, Manager; GB Zoo, Inc.	
FROM: MAN 3550 Management Scientist	
CC: Cedric Count, Controller	
Sam Spender, Procurement Manager	
Gerry Grow, Marketing Manager	
RE: Product Mix for GB Zoo, Inc. (Assignment 1, Problem 1)	
<p>In response to your query to determine the number of each size smartphone cover to produce to maximize profit, I investigated the resources available and their costs in terms of specialist labor including photography, custom design, and printing as well as plastic and ink. I also considered the marketing requirements to produce at least 100 of the aCovers and at least 50 of the iCovers as well as the selling price of \$20/aCover and \$22/iCover. I developed a linear programming model that is detailed in the attached appendix 1. Also included in appendix 1 is the Management Scientist software output for my model.</p>	
<p>Based on my model with an objective to maximize profit, I recommend the following product mix: Produce and sell 100 aCovers Produce and sell 500 iCovers The total profit from producing and selling this combination of smartphone covers is \$8,437.</p>	
APPENIDIX 1: Solution Approach for GB Zoo Smartphone Cover Product Mix	
<p><u>Legend</u> X1 = # of aCovers produced and sold X2 = # of iCovers produced and sold</p>	
Linear Programming Formulation	
<u>Objective Function:</u> MAX $13.87X1+14.1X2$ Maximize profit	
<u>Constraints:</u>	
1) $3X1+3X2\leq 2100$	Photography labor available (minutes)
2) $4X1+4X2\leq 2400$	Custom design labor available (minutes)
3) $6X1+8X2\leq 4800$	Printing labor available (minutes)
4) $1X1\geq 100$	Marketing requirement (aCovers)
5) $1X2\geq 50$	Marketing requirement (iCovers)
6) $X1, X2 \geq 0$	Non-negativity requirement

Figure 3. Fall 2013 Undergraduate Management Science *Homework 1 Problem 1 Key* (continued)

Optimal Solution using <i>The Management Scientist 6.0</i> (Anderson, Sweeney, & Williams, 2003):			
Objective Function Value =		8437.000	
Variable	Value	Reduced Costs	
-----	-----	-----	
X1	100.000	0.000	
X2	500.000	0.000	
Constraint	Slack/Surplus	Dual Prices	
-----	-----	-----	
1	300.000	0.000	
2	0.000	3.525	
3	200.000	0.000	
4	0.000	-0.230	
5	450.000	0.000	
OBJECTIVE COEFFICIENT RANGES			
Variable	Lower Limit	Current Value	Upper Limit
-----	-----	-----	-----
X1	No Lower Limit	13.870	14.100
X2	13.870	14.100	No Upper Limit
RIGHT HAND SIDE RANGES			
Constraint	Lower Limit	Current Value	Upper Limit
-----	-----	-----	-----
1	1800.000	2100.000	No Upper Limit
2	600.000	2400.000	2500.000
3	4600.000	4800.000	No Upper Limit
4	0.000	100.000	550.000
5	No Lower Limit	50.000	500.000

Because the memo assignment required students to write about the problem in terms of the decisions, objective, constraints, and optimal solution, we assessed each of these components. We developed a memo rubric that contains the following components: identification of the decisions, statement of the objective, description of the constraints, and statement of the recommended solution in managerial terms. We also assessed the accuracy of the student formulations with a formulation rubric, which contains the following components: variable definitions, objective function, mathematical constraints, and computer output.

Students were invited to participate with a letter of invitation in the fall 2013 undergraduate management science course at our university. Thirteen out of 15 students consented to participate in this IRB approved business education research. The demographic characteristics of the students are summarized in Table 1. Next we discuss the results.

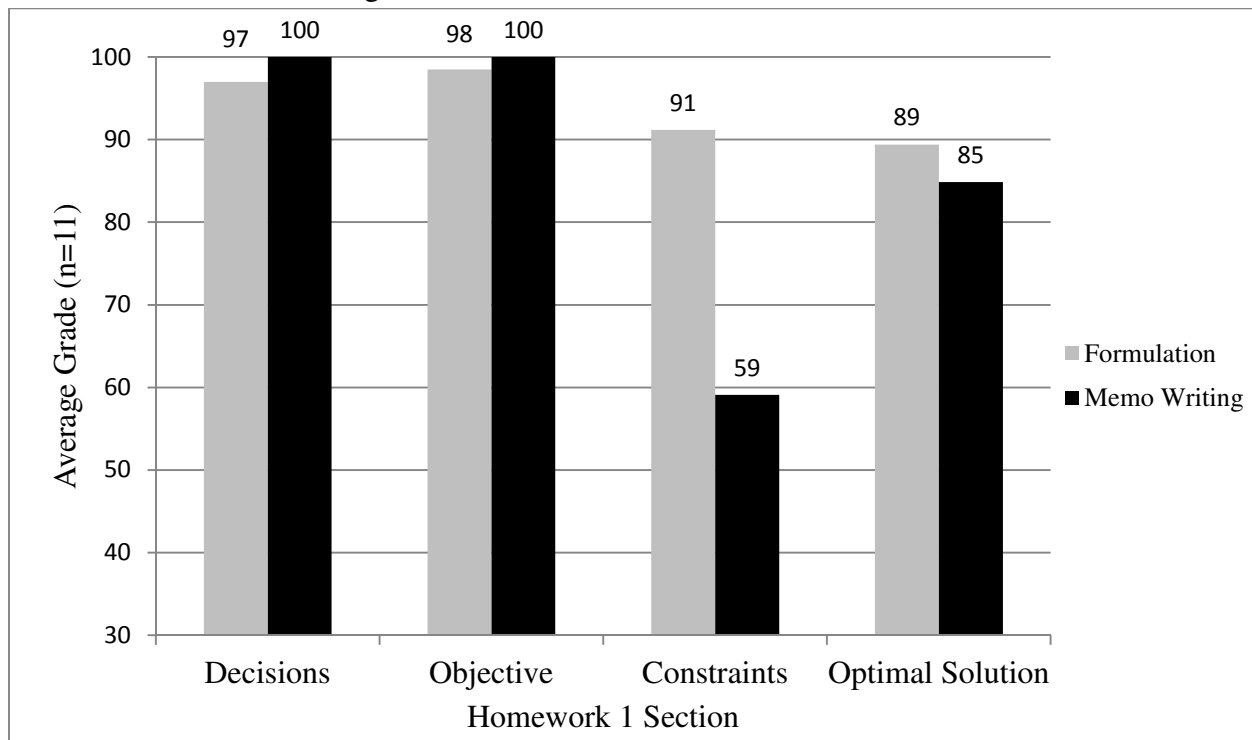
Table 1. Fall 2013 Undergraduate Management Science Course Demographics

	Enrollment (%)	Subjects (%)
Number of seniors	15 (100)	13 (100)
Number of Management majors	11 (73)	10 (77)
Number of Other majors	4 (27)	3 (23)
Total	15	13

Discussion of Results

We assessed the students' ability to complete correct mathematical analysis of the problem and write about the decisions, objective, constraints, and optimal solution recommended. Because two students did not turn in *homework 1 problem 1*, the results are based on data from students ($n = 11$) who turned in the homework for evaluation. Figure 4 presents the data for average scores obtained on submitted *homework 1 problem 1* for the memo rubric and the formulation rubric. Each rubric included the following four components: decisions, objective, constraints, and optimal solution.

Figure 4. *Homework 1 Problem 1 Assessment*



As illustrated in Figure 4, students were successful in identifying the business scenario decisions and objective mathematically in their formulation. They also were successful in

communicating the business scenario decisions and objective in their memos. Most students could formulate business constraints and identify an optimal solution in their software output. However, students were less skilled when they wrote about the business constraints and recommended solution in a business context. Our research identifies a weakness in student skills in business communication that presents an opportunity for further business education research. This research will focus on how we might improve the assessment of business communication and create learning activities that improve student written communication about business constraints and their recommendations to solve business problems.

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An Experiment with Locating Facilities

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Abstract

This paper describes the development of an experiment for understanding facilities location problems. The purpose of this tool is two fold: one is to provide the students with a better understanding of various issues involved in location decisions and second, to expose them to a real location problem in the service sector, specifically of an insurance company. To achieve this goal we conducted an experiment with students enrolled in an introductory operations management course. This paper discusses this experiment and its results. We expect that the tool developed as a consequence of this experiment will help students in enhancing their knowledge about location decisions. Furthermore, the results from this experiment indicate that other areas in operations management might benefit from an educational tool such as this one, in teaching the different subjects areas.

INTRODUCTION

During the last two decades, major changes in business operations have raised important questions that are related to location of facilities or offices in a company's distribution and supply chain system. The proliferation of products and services, increases in production costs, and greater competition in both national and international markets have caused businesses to search for potential areas of savings while offering improved products and better customer service. The distribution of products or services is an important area that offers a high potential for such savings. It includes determining the location of new facilities, which is an important managerial issue due to increases in transportation costs, and changes in demand patterns. The term "facilities" can include the following: distribution centers, manufacturing plants, offices,

medical clinics, fire stations, post offices, libraries, refineries, schools, hotels. Facilities location problems typically involve the following parameters [1,2]: cost of distribution to and from the facility, volume of distribution, fixed and variable facility costs, service performance of the facility and potential increases in demand. An open facility incurs a fixed cost and a variable operating cost which is a function of its throughput. In addition to these costs, transportation costs to and from the facilities are involved. The problem is then to select the optimal locations where facilities should be opened. These selected locations must supply the demand coming from the customers without exceeding the capacity constraints of open facilities and minimize the sum of the fixed, variable and transportation costs. If the variable and transportation costs are assumed to be linear, the facility location problem can be formulated as a zero-one mixed integer linear programming problem. In the case where these costs are not linear, zero-one non-linear programming techniques can be used. The general mathematical formulation of the facility location problem (FLP) is given as follows [9]:

$$\sum \sum C \quad \sum F$$

Subject to

$$\Sigma \tag{2}$$

$$\Sigma \tag{3}$$

$$\tag{4}$$

$$\{ \tag{5}$$

Notations used in the formulation

N = Number of potential facilities (*i*).

M = Number of customers (*j*).

F_i = The fixed cost associated with facility *i*.

C_{ij} = The variable cost of shipment from facility *i* to customer *j*.

X_{ij} = The quantity shipped from facility *i* to customer *j*.

D_j = Demand from customer *j*.

S_i = Capacity of facility *i*.

Fixed cost (F_i): This cost is associated with facility i . Fixed costs at the potential facilities are composed of training costs, personnel costs, and other administrative costs.

Variable Costs (C_{ij}): The variable costs include labor costs, material costs, utilities cost, and other per unit costs.

Demand (D_j): This denotes demand in market j .

Capacity (S_i): This denotes capacity of facility i .

The objective function is the minimization of the total cost formed by the sum of transportation, facility operating and total fixed costs. Constraint set 2 requires that each customer's demand be satisfied and constraint set 3 restricts the total shipments from site i to its capacity, S_i , only if the facility is open ($Y_i = 1$). No shipments are permitted when it is closed ($Y_i = 0$). These selected facilities must supply all demand at a predetermined set of customer territories, and should minimize the sum of the fixed, variable and transportation costs. In the case where each facility has a limit on its capacity the FLP is termed as the capacitated FLP [1]. On the other hand, when each facility has the capacity to satisfy all the customers' demand, the problem is called uncapacitated FLP [2].

Most of the text-books in operations management [3,4] cover basically three major methods for solving facilities location problems. The first method is the factor rating method. The second method is the center of gravity method, and third one is the transportation approach. These three methods provide some of the basic issues in locating facilities but for most of the students they are merely number crunching without requiring them to think any further. One of the tasks faced in teaching the topics within operations management is the illustration of the applicability and relevance of the techniques/models to real life problems. The importance of operations management can be conveyed to students by providing them with real life problems and the application of appropriate techniques to solve these problems. Brandeau and Chiu [5] and Thizzy et. al., [6] provide a survey of the literature on this subject. On the other hand, in an

application paper Gelb and Khumawala [7] applied pertinent solution methods to determine the office reconfiguration of the Variable Annuity Life Insurance Company (VALIC), a Houston marketer to employees of non-profit and government at all levels. VALIC markets life insurance to all levels of government and non-profit organizations employees. The purpose of their project was to divide the United States into sales territories which would be serviceable at the optimal cost level under certain constraints. VALIC's problem was to organize their sales force so as to obtain an optimal cost subject to certain constraints. The firm had a sales force of 336 personnel. As stated in the Gelb and Khumawala paper [7] VALIC was interested in organizing its sales force of 336 individuals in order to serve 57 geographic segments - states or portions of states - and to reduce its total costs. They assumed that the largest cities in these 57 geographic segments were the potential locations where offices might be established. Thus, the problem consisted of 57 potential locations and 57 customers (geographic segments). The factors that VALIC wanted to determine were: the costs associated with their existing 16 territories the optimal number and locations of territories to serve their markets and the amount of savings in a new territorial configuration. The organizational problem cited by VALIC indicated that a trade-off would be necessary between fixed and variable costs that are usually related to combinatorial problems. Such problems are amenable to solution by using implicit enumeration techniques like branch and bound algorithms and specifically designed heuristic algorithms.

We capitalized on the VALIC study to develop an educational tool to illustrate the importance of FLP and to provide the students with a better understanding of FLP. In the next section, we provide some background on the actual location problem faced by VALIC and the experiment conducted in this study.

DESIGN OF THE EXPERIMENT

The experiment is based on a project undertaken by Gelb and Khumawala [7] for the

Variable Annuity Life Insurance Company (VALIC) a Houston based insurance marketing firm. VALIC markets life insurance to all levels of government and non-profit organizations employees. The purpose of their project was to divide the United States into sales territories which would be serviceable at the optimal cost level under certain constraints. The study showed that some smaller territories had fixed costs that were unnecessarily high and that some larger territories had salespeople who were spending excessive amounts of travel time, which could otherwise be spent in sales efforts. VALIC's problem was to organize their sales force so as to obtain an optimal cost subject to certain constraints. The firm had a sales force of 336 personnel. At the time of this study VALIC had 16 territories which had evolved as combinations of 57 segments. The factors that VALIC wanted to determine were: the costs associated with their existing 16 territories the optimal number and locations of territories to serve their markets and the amount of savings in a new territorial configuration. In order that the total number of sales persons in any given territory would not change, it was assumed that the VALIC sales force would be assigned to a given region in a proportion equal to the portion of US market potential in that region. The organizational problem cited by VALIC indicated that a trade-off would be necessary between fixed and variable costs that are usually related to combinatorial problems. Such problems are amenable to solution by using implicit enumeration techniques like branch and bound algorithms and specifically designed heuristic algorithms. The solution technique used for solving VALIC's problem was modified version of the branch and bound algorithm developed by Khumawala [9]. It was employed in this project to determine the number of locations that would be optimal for VALIC, where the territories should have their offices, and which geographic market segments should be served from each office. VALIC did not want to limit any region to a specific size, as long as the ratio of largest and smallest market was within a reasonable limit. Thus, the capacity constraints were eliminated from the model and the resulting problem was solved as an uncapacitated facility location problem. Costs, under the assumptions

mentioned above and also on the assumption that VALIC would continue to employ 336 salespersons nationwide, fell from \$18,825,967 to \$9,993,622 (almost 50%) for the recommended configuration plus a one time cost for new offices. A subset of the VALIC problem presented to Gelb and Khumawala [7] was chosen as the FLP for this experiment. In this project, we selected 23 of the original 57 geographic segments (customers) located in the Northeast corner of the United States and 18 of the largest cities (potential locations) in these 23 geographic segments. By selecting 23 geographic segments and 18 largest cities we attempted to make the problem somewhat “challenging” for the students and at the same time not to have them get bogged down in mere number crunching.

The students included in this study were enrolled in three sections of an undergraduate operations management course. At the time the experiment took place the students had no prior exposure to the FLP. The students in this study were provided with

1. A map of Northeastern United States showing the 23 geographic segments and 18 largest cities; the geographic segments were numbered 1 through 23 and the largest cities were represented by letters *a* through *r* (Exhibit I),
2. A separate form presenting the names of the geographic segments and the largest cities, (Exhibit II), and
3. The cost matrix presenting the cost of satisfying the demand in the geographic segments from the largest cities to these geographic segments and the fixed costs for each potential location (Exhibit III).

In order to simplify calculations the costs were given in thousands. In addition, the students were also provided with one page of instructions, explaining that they were assigned the task of selecting the location of the offices to serve the customers in the 23 geographic segments and determine which geographic segments should be served from the selected offices. The students were also told that the total cost such that the demand from all of the customers should

be satisfied and that each customer should be served only from one office. We obtained the optimal solution to this reduced problem by formulating the problem as a mixed integer programming problem and then solving it with LINDO. The value of the objective function for the optimum solution to the problem, without the configuration of the offices, was given to the students in the beginning so that they would be able to compare their solutions to the optimal solution and not just “shoot” in the dark. As a pilot study, 12 students taking an elective course in operations management were selected to solve the problem manually. These students had already been exposed to FLP in their prior introductory operations management course. The purpose of the pilot study was to get feedback about the experiment before applying it in other classes. These students were asked to form groups of two, thus resulting in 6 groups. The results of the pilot study were helpful in several ways; for instance having the costs in the cost matrix clustered around the diagonal made it easier for them to solve the problem. Thus, this feedback was incorporated and the structure of the cost matrix was modified. It also helped in determining the average time required to solve this problem. With this modification and the helpful feedback and hints on timing, etc. we employed the experiment in the other three classes. In the beginning of each class, we spent approximately 25 minutes explaining the experiment to the students and answering an of their questions. Some of the questions asked by the students were;

Who were the customers?

How were the customers selected?

Could the clients be served from more than one office?

Why were the fixed costs of all these offices assumed to be equal?

How were the costs determined?

What was the planning horizon for these location decisions?

Was minimization of total costs the only criterion in determining the locations?

Clearly, these kinds of questions raised by the students, and the ensuing discussion among them was most helpful in their understanding of the various issues involved in determining the “best” locations for facilities. Also, we ensured that they understood the assumptions VALIC had made, as we presented them the reduced problem and data. The students were asked to form groups of two and were given a maximum of 35 minutes to provide their best solution. In total, 104 students were involved. They were also told that they would have two chances to improve the first solution they obtained within the given time frame. They were assisted in calculating the total costs for their configurations. An Excel spreadsheet for calculating the total costs was developed and used to

1. Verify all of the total costs provided by the students,
2. Make sure that no geographic segment was supplied from more than one office, and
3. Check that demand from all of the geographic segments was satisfied.

RESULTS and CONCLUSIONS

The total cost of the optimum solution to this problem was 4,137(000). Table I presents the results of the solutions obtained by the students, within the specified 35 minutes. Some groups calculated the total cost without any assistance. Fifteen of the 34 groups with the solution of 4,137 reported that they obtained this solution in their second attempt. All of the groups with a solution of maximum 7.64% higher than optimum solution stated that they were “satisfied” with their solution and did not want to attempt to improve their solution even when they had time. The groups whose solutions were at least 19.36% higher than the optimum solution either did not have the time to improve their solution or did not want to do so.

The following points are noteworthy: The results obtained by the students indicate that all of the solutions were feasible in terms of satisfying the constraints and following the instructions given to the students. The FLP problem in this experiment has multiple optimal solutions and this may substantiate why such a large percentage (65.4%) of the groups got the optimum

solution. If we had selected a problem with a unique optimal solution, the results perhaps might not have been the same. We, of course, had taken the cost data as they were in the VALIC study of Gelb and Khumawala [7]. In order to have only one optimum solution to the problem we would have had to modify it. As stated earlier, our objective here was to develop a “tool” for better education and not to compare how humans would solve FLP versus the computer’s optimum solution. A possible by-product or a motivation from this experiment would be to do research in this line. The aforementioned questions asked by the students and the resulting discussion would probably not have been achieved if they were not given the opportunity of using this educational tool. Of course we dealt with these questions in subsequent classes. It would be of interest to inquire from the students who participated in developing this tool as to how this tool helped them in understanding the FLP, vis-a-vis the normal lecture/textbook/hypothetical small example format. The results would help us determine if such tools would be beneficial to other areas of operations management as well. The educational tool developed in this paper will be helpful in demonstrating the importance and relevance of the techniques developed for solving the FLP.

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EXHIBIT II

	Territories	Largest City	Will serve territory #
1	Maine		
2	Vermont		
3	N. Hampshire	a - Manchester	
4	Connecticut	b - Bridgeport	
5	Rhode Island		
6	Massachusetts	k - Boston	
7	S.E. New York	l - New York City	
8	N. New York	m - Buffalo	
9	New Jersey	f - Newark	
10	Pennsylvania	g - Philadelphia	
11	Wisconsin	h - Milwaukee	
12	Illinois	i - Chicago	
13	Indiana	e - Indianapolis	
14	N.W. Ohio	j - Toledo	
15	S.E. Ohio	c - Cleveland	
16	Kentucky	d - Louisville	
17	Tennessee		
18	W. Virginia	n - Huntington	
19	Virginia	o - Norfolk	
20	Maryland		
21	Washington, D.C.	p - Washington, D.C.	
22	Delaware	q - Wilmington	
23	Michigan	r - Detroit	

Exhibit III

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Fixed Cost
a	14	91	12	494	14	90																		152
b	175	91	155	40	14	1128	148		1199	1918														152
c										1918			762	70	127	506		274	996				1380	152
d													61	70	1583	40	742	274					1380	152
e												705	1811	61	70	1583	506	742	274				1380	152
f				40			1851		96	1918												8		152
g				494				1657	1199	153					1583			274	996	904	663	103		152
h											56	145	762											152
i											56	145	762	70									1380	152
j												1811	762	6	1583	506		274					110	152
k	14	91	12	494	14	90		1657																152
l				40			148		1199															152
m		91				1128		133		1918													103	152
n										1918				70	1583	506	742	22	996	904				152
o										1918					1583			274	80	904	663	103		152
p										1918									996	72	53	8		152
q								1657	1199	1918								274		72	53	8		152
r										1918		1811	762	6	1583	506							110	152

IMPACTS OF PANAMA CANAL EXPANSION ON THE SOUTHEASTERN COTTON INDUSTRY

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ABSTRACT

Constraints and improvements in US transportation will ultimately influence cotton mill use, cotton exports, shipping patterns, and world trade through the US Gulf and Atlantic ports as the Panama Canal expansion accommodates larger container ships. The completion of the Panama Canal expansion has major implications for altered shipping patterns throughout the US, including: total cotton exports are expected to increase about two-percent; important regional shifts in trade and market share are anticipated to occur; and prices and producer revenues will experience regional shifts, favoring cotton producers in the Southeastern states at the expense of the West Coast.

INTRODUCTION

The United States is the world's third largest cotton producer (behind #1 China and #2 India) and the world's largest cotton exporter, supplying 11-percent of the global cotton production in 2013 and accounting for 38-percent of the world export market [1]. United States cotton production is concentrated in the Southern Plains, the Southeast, the Delta, and the Western regions of the US, with Texas producing 32-percent of all US cotton, followed by Georgia supplying 19-percent of US cotton production in 2013. Of the upland cotton produced in the US, 37-percent is in the Southeast (Alabama, Florida, Georgia, North Carolina, South Carolina, and Virginia), 36-percent in the Southwest (Kansas, Oklahoma, and Texas), 20-percent in the Delta (Arkansas, Louisiana, Mississippi, Missouri, and Tennessee), and seven-percent in the West (Arizona, California, and New Mexico). The top four cotton spinning countries are China, India, Pakistan, and Turkey; however, the five principal export markets for the 2012/2013 US cotton are Honduras, Mexico, Dominican Republic, Canada, and China, respectively.

In the last two decades, the US cotton sector has faced a number of challenges as the domestic mill demand has declined and US exports have increased. During the 1990s, domestic mill demand accounted for about 50-percent of available cotton supplies. Due to the decrease in domestic textile production caused by competition from imported textile and apparel products, US mill use dropped to 30-percent for 2000-2005, and has averaged less than 20-percent annually since then. The resulting cotton surplus forced the domestic industry to look for alternative markets. Significant changes in the global market for cotton and cotton-based products, particularly an increase in the global export demand, have provided overseas markets for US cotton. The emergence of China as the world's largest cotton importer has resulted in a strong, yet somewhat variable market for US cotton, especially as China has emerged as the world's largest cotton producer as well.. Currently, about one-third of all global cotton exports go to China [1].

The latest USDA estimates for 2013/2014 cotton project world cotton consumption at 109.5 million bales. With the adjustments made in September 2013, the 2013/2014 global cotton consumption is now expected to increase two percent following the four percent growth experienced a year earlier. Despite the projected rebound in 2013/2014, the consumption forecast remains one of the lowest in the past decade, as competition with manmade fibers keeps cotton mill use from growing faster as the global economy expands.

Because the US cotton industry is highly dependent on foreign markets, it is important for the industry to keep US cotton competitive with other foreign suppliers, such as India and Pakistan. Transportation is one of the major factors that affect the competitive position of US cotton, allowing for the delivery of cotton to international markets in a timely and cost effective manner. The increase in US cotton exports has clearly resulted in a shift in trade patterns and logistical requirements. In particular, increasing cotton demand in China and other Asian countries has increased cotton shipments to already congested US west coast ports. This problem was exacerbated during 2009 as Atlantic and Gulf ports became increasingly inaccessible for containerized cotton exports. Outgoing grain and oilseed exports required a greater number of containers and berths at ports. Delta and Southeast cotton shipments to China were increasingly shipped via the West Coast instead of Savannah, which resulted for the first time in a declining futures market basis for Delta/Southeast cotton relative to Texas cotton. While port congestion has eased since that time due to the global economic downturn, adequate transportation infrastructure that guarantees cotton shipments in a timely, efficient manner will provide a greater level of competitiveness for US cotton exports in the future.

Objectives And Methodology

The US export transportation infrastructure serving the cotton industry will be evaluated to assess the impacts on cotton shipping patterns in the US (and globally) resulting from the improvements and expansion of the Panama Canal. Many of the logistical and infrastructure issues affecting the cotton industry in recent years have related to major cotton producing states, especially in regard to accumulating cotton for shipment to the Texas-Mexico border, the Gulf ports, the Atlantic Coast ports, and the Western US ports. Inefficiencies with this process reflect major importance to the overall competitiveness of the US cotton industry [2].

The analysis uses the results of a cost minimizing spatial mathematical programming model, which sources cotton from actual gin points, and then routes flows to nearby warehouses for storing or shipping to intermediate(intermodal facilities) or domestic destinations (US ports of exit) for container vessel shipping. The international portion of the model connects excess supply regions with excess demand regions and ports via truck and rail and ship.

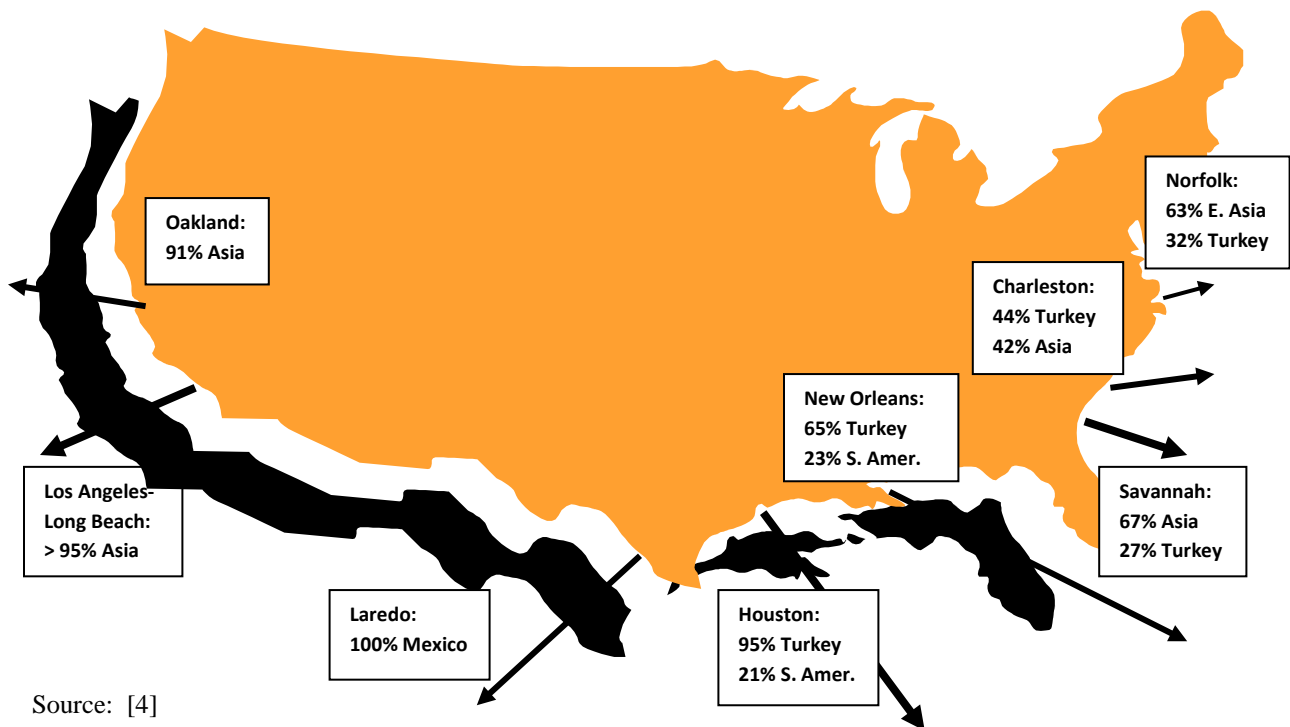
Background Information

Global container fleet capacity is forecast to increase to 17 million twenty-foot equivalent units (TEU) in 2013, placing additional demand on US ports and the transportation system infrastructure [3]. The demand for containers for the export of agricultural commodities more than doubled from 2003 to 804,000 TEU in 2008. While this represents a relatively small share of total containers available for US cargo, much of the increased demand occurred at the ports of Savannah and Norfolk. Part of the reason for this was the significant increase in freight rates for bulk cargo during this time period. The situation resulted in a shortage of containers on the East

Coast and led to the increased shipments of cotton to the West Coast by rail or truck for export. Although congestion and container shortages were mitigated somewhat by the recent economic recession, global cargo shipments have recovered and are expected to again strain the US port system. As a result, several states are funding dredging or deepening/widening of the docks, rivers and intercoastal waterways to gain access for the bigger container ships that will traverse the improved and expanded Panama Canal. Warehouse expansion is also occurring in Savannah (Georgia), Brunswick (Georgia), Charleston (South Carolina), Norfolk (Virginia), and Jacksonville (Florida).

Trends in US cotton exports, especially among the Gulf and Atlantic ports, have experienced changes in destinations during the past decade. A more pronounced view appears when examining concentration by market regions. The top three market regions for cotton exports through Houston were Turkey, South America, and Pakistan/India, and these regions accounted for about 90-percent of cotton exports through Houston during 2009/2010. For New Orleans, this concentration increased to 87-percent in 2009/2010, up about 35-percent from 2003/2004. Only Savannah has maintained a relatively stable concentration for top market regions at 81-percent for the time period 2003/2004 to 2009/2010 (Figure 1).

FIGURE 1.



In looking at the export markets by US ports, Savannah has enjoyed prominence as a point of departure for Southeastern US cotton bound for China. Other major ports accounting for cotton exports to China include Los Angeles-Long Beach, Oakland, and Houston. Houston has been and remains the leading port for exporting cotton to Turkey, followed by Savannah and New Orleans.

The large majority of cotton exports to Mexico cross at land ports of entry on the Texas-Mexico border – Laredo, Hidalgo, and Brownsville. Whether cotton is produced in Mexico in the leading producing states of Chihuahua, Baja California, and Coahuila or imported from the US, the destinations in Mexico are the mills in the states of Mexico, Hidalgo, and Morelos, all near Mexico City. Bottlenecks both politically and logistically occur at the inland borders, regardless if shipped by rail or truck, in part due to a fully implemented North America Free Trade Agreement (NAFTA). A possible solution would be to skip the land borders and ship to the port of Veracruz, Mexico from the Gulf and Atlantic Coast ports.

Other major markets include the Southeast Asian countries of Indonesia, Vietnam, and Thailand. Los Angeles-Long Beach is the largest port involved in shipping cotton to the Southeast Asian region, while Savannah is second. US cotton exports to Pakistan are also important, but somewhat erratic. Los Angeles-Long Beach is the main port involved in exporting to Pakistan, with the Savannah, Charleston, Houston, and Oakland ports sharing the second spot at least once in the last five years.

Of particular interest to ports in the Southeast are the Latin American markets (other than Mexico, discussed previously), which includes all countries in Central America, South America, and the Caribbean, especially after the implementation of CAFTA (the Central America Free Trade Agreement). Houston and Freeport are the leading cotton export sites to Latin America, followed by Savannah and New Orleans.

Results: The Baseline And The Panama Canal Expansion

A baseline model indicates the West Coast port complex of Los Angeles/Long Beach is the dominant port for cotton bale exports. Savannah is the second most important port, followed by Houston and Laredo. New Orleans was the fifth most important port, with the remaining ports of Norfolk and Mobile handling only minor export shipments of cotton.

In drawing comparisons of the baseline model results with results for the Panama Canal expansion, two scenarios were analyzed. The first is a reduction by ten-percent in ocean freight rates a result of the Panama Canal expansion for vessels originating from the US Gulf and South Atlantic ports to Asian and Pacific Rim countries. The second scenario analyzes a 25-percent reduction in ocean freight rates for the same origins and destinations.

Decreasing the ocean freight rate from US Gulf and Atlantic ports (Savannah, Norfolk, New Orleans, Houston, Charleston, Gulfport, and Mobile) to Asian and Pacific importing countries (China, Indonesia, Thailand, Bangladesh, Pakistan, Hong Kong, Japan, South Korea, and Taiwan) due to the Panama Canal expansion is expected to increase cotton exports (total volume and market share) via the Panama Canal, while the Pacific Coast ports are expected to experience a reduction in exports. A ten-percent reduction in ocean freight rates for the routes that travel via the Panama Canal is estimated to increase US cotton exports via the Gulf and Atlantic ports, except Gulfport and Mobile. The absolute change in exports is the largest for the port of Savannah, followed by the port of Houston. Furthermore, the share of US cotton exports through the Panama Canal increases by 20-percent after the expansion.

As expected, cotton flow patterns resulting from the analysis of a 25-percent ocean freight rate reduction are similar to the ten-percent reduction scenario in direction, but larger in magnitude.

The ports of Savannah and Houston increased exports by nearly 100-percent and 65-percent, respectively, over the baseline model results. Houston becomes the nation's second largest cotton exporter, and the ports of New Orleans, Charleston, and Norfolk more than double their exports. Such increases in exports via the Gulf and Atlantic ports indicate that the Panama Canal expansion would increase the canal's share in total US cotton exports, more than doubling the baseline model share.

Although cotton flows are altered with lower ocean freight rates for the Atlantic and Gulf ports, total US cotton exports are only modestly impacted. For the 10-percent freight rate reduction scenario, total US cotton exports rose less than one-percent. The 25-percent reduction in ocean freight rates also increases total US cotton exports, albeit still a modest increase of about two-percent.

As the Panama Canal expansion occurs, there would be the anticipated reduction in ocean freight rates which corresponds to a decrease in transportation costs linking the US producers (at the warehouse level) to importers. The 10-percent freight rate reduction increases price and production in most of the US regions that ship via the Panama Canal, except Oklahoma and California and Arizona. Prices decrease modestly for these states since exports are diverted to Asian and Pacific importing countries via the West Coast ports. Recalling that revenues equal price multiplied by quantity, some states like Texas realize the largest gain in revenues, but not due to price increases but rather due to expansion of cotton production. Georgia has significant gains in producer revenues as well. The gain in Georgia is relevant since the port of Savannah is in Georgia and local cotton producers are the beneficiaries of both the ports of Savannah and Brunswick expansion and the Panama Canal expansion.

The 25-percent reduction in ocean freight rates from Gulf and Atlantic ports to Asian and Pacific markets is estimated to increase annual producer revenues for all cotton producing states, except California and Arizona. With respect to prices, cotton producers in South Carolina and Virginia are the greatest beneficiaries of higher prices attributed to the Panama Canal expansion, but because production in these two states is relatively small compared to the other cotton exporting states, producer revenues were less than when compared to Texas and Georgia, for instance.

Summary and Implications

The transportation system in the United States is of crucial importance to the efficiency and competitiveness of the US cotton industry. As global cotton mill use expands, greater demands will be placed on this system, especially as the Panama Canal expansion is completed and opens to larger container ships. Constraints and improvements in US transportation will ultimately influence cotton exports, shipping patterns, and world trade through the US Gulf and Atlantic ports.

Under most normal cotton shipping scenarios, the port of Los Angeles-Long Beach is dominant for exports to Asia, with Oakland continuing as an important port for Asian markets. Savannah and Houston also continue as major cotton export ports around the world. New Orleans, Charleston, and Norfolk remain key suppliers of cotton to Europe and the Middle East.

The completion of the Panama Canal expansion in 2014 has major implications for altered shipping patterns throughout the US. Total cotton exports are expected to increase about two-

percent; important regional shifts in trade and market share are anticipated to occur; and prices and producer revenues will experience regional shifts, favoring cotton producers in the Southeastern states at the expense of the West Coast.

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The Time is Right for Teaching Business Intelligence

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Abstract

This paper discusses lessons learned while establishing a business intelligence course. After a brief discussion of the cost and power of tools available for business analysis, we focus on the emergence of business analytics tools that combine sophisticated analysis and ease-of-use. These tools provide an opportunity to teach business analytics to students that have little or no background in statistics or computer programming. The remainder of the paper discusses how such a tool was used in the first offering of a business intelligence course and concludes with suggestions for future offerings.

Introduction

Until recently, teaching a course that involved data analysis was a lot like feeding your kids broccoli. Worse yet, to give the students exposure to analysis projects worthy in size and complexity, we had to buy some expensive gourmet broccoli that left the intended audience (students) even more bitter. However, something different is happening in the field of data analysis. For years, there have been calls to incorporate data analysis and specifically business intelligence into the business curriculum. [6] Over the last 3-5 years, both the tools and the data became much more accessible to the non-expert. These trends are affecting almost every discipline (especially business the sciences) and they are manifesting themselves as highly marketable skill sets (business analytics and computational science) within these disciplines. This paper provides a glimpse into my experiments with creating a Business Intelligence course from scratch. What I hope to demonstrate is the surprising opportunity we have to introduce data analysis to business students with little or no background in the field.

Finding the Right Tool

In those earliest days of my preparation for a Business Intelligence course, I found myself a bit overwhelmed. The business analyst has a diverse arsenal of tools. A year or two before, I had traveled down a similar road for a Bioinformatics course (think of it as biology analytics) and found the tools only slightly better than outright computer programming, but definitely trending to something better. To make some sense of the business analytics landscape, I tried categorizing the tools. I was filtering my findings with the understanding that my course would not have very many prerequisites. What can I realistically expect students to do with little or no background in statistics or computer programming? To further constrain the search, I did not have much of a budget. In the end, I fully expected most of the class to center around techniques with spreadsheets. Granted spreadsheet *can* be useful in teaching business analytics [5], but I was interested in finding tools with more built-in functionality. In my search for tools, I expected to find the usual dividing line between tools that we can acquire and learn easily (e.g. charting and reporting tools) and the real tools a business analyst would use. Consider how Figure 1 describes the relationship between tools and problems. In a world

of haves and have-nots, we would expect that expensive tools (right side of figure) are equipped to handle any kind of problem (both quadrants on the right). The cheaper tools help you with the lower left quadrant (the “you get what you pay for” quadrant), but that upper left quadrant is normally wishful thinking.

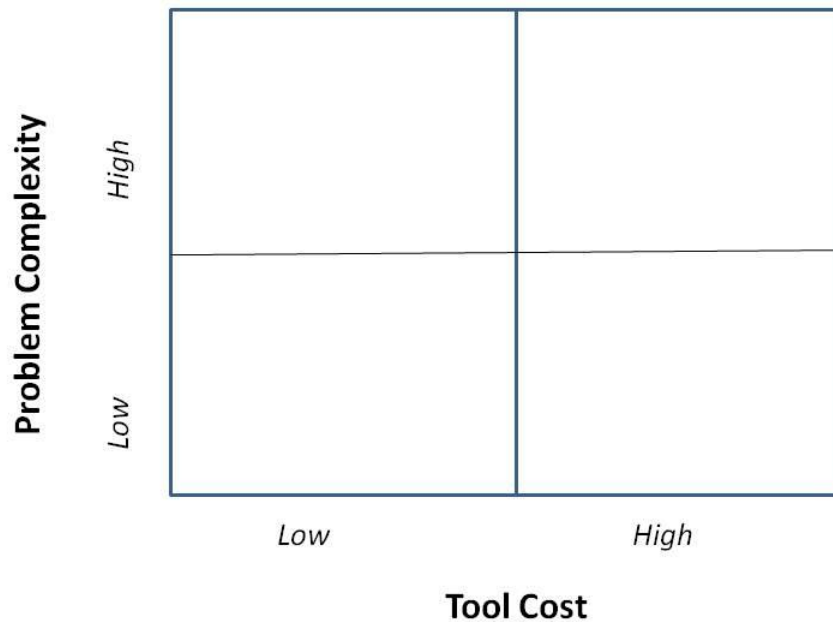


Figure 1. Matching Tools to Problems

To my surprise, I found that there are options for that upper left quadrant. In between the common tools we all know (e.g. spreadsheets) and the sophisticated technologies and theories (e.g. computer programming, statistics) of the seasoned practitioner, there is a relatively new breed of cheap, but powerful, products for data analysis. It appears that the tool makers recognized there are some well-worn paths for data analysis that can be packaged for a larger, less trained user base. How can someone without a background in computer programming apply an artificial intelligence technique like neural networks? If the user had a black box with just the right amount of controls on the outside, then that user can wield the complicated tool within a limited range of contexts. The trick is finding the right balance between hiding complexity and providing flexibility. To illustrate this, consider a bike with training wheels. The training wheels hide the complexity of maintaining balance, but reduce flexibility in turning and terrain. Whether these tool makers have found the right balance or not is an open question, but my experience with one of them in particular proved to be quite valuable for an introductory business intelligence course. Later sections discuss two tools in more detail.

Right Tools + Right Data

As I surveyed this tool landscape, I also became aware of another growing trend: free data sets. There is a surprisingly large number of data sets available on the internet. For starters, census data is available (when the government isn't shut down!) at census.gov. Many other government (including state and local) organizations have data available for download. Almost all of the major brands on the internet (e.g. amazon, facebook, google, wikipedia) can serve up their data in a usable form for analysis tools. However many of these data sets require a certain amount of “pre-analysis” to determine their suitability for student projects. The instructor must often choose between the effort of assessing an existing data set and fabricating one from scratch. In the end, I often settled for creating my own simpler and smaller data sets with the features I needed. This was certainly the case for small homework assignments designed to address a specific issue of data analysis such as data integration. For larger projects, I often gave the students a choice among a small collection of data sets some of which were available from the internet. However the students typically gravitated towards data sets that I knew the most about. The moral of the story is I needed to become more familiar with these external options.

My main goal was to discover practical ways to introduce data analysis to students with little background. I found resources that are both free and useful. Students can easily acquire data sets and use open source tools to accomplish some pretty sophisticated analysis. Combining the options for data and tool resources, I envisioned an early version of Figure 2. I used this to give the students a context for what we hoped to accomplish in the course. I categorized the tools the students would use as Medium and discussed the same trends discussed earlier in this paper. I wanted the students to see why they arrived at this course an opportune time.

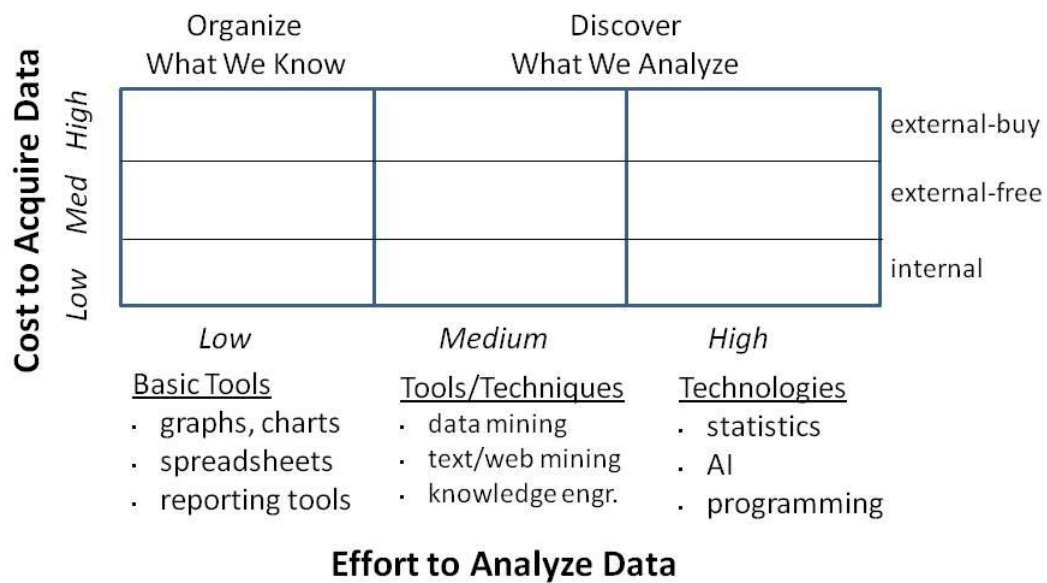


Figure 2. Charting Cost of Data and Analysis

While discussing this figure with the students, it was helpful for them to understand that this course is designed to introduce them to that medium category of analysis. If I tried to discuss the technologies (“High” effort in the figure), the students would certainly run for the hills. If we settled for basic tools, we would probably cover much of the same ground as our spreadsheets course (required for the business major but not an absolute prerequisite for this course). The students do need to be aware of high-end technologies such as statistics (another required course for business majors), and programming languages/environments such as R, Python, and Matlab. We also described some high-end tools such as SAS, SPSS, Cognos, Business Objects and Hyperion. However, the tool that we used for the course was an open source tool called Rapid Miner.

Better Tools = New Players

A tool like Rapid Miner allows a relative newcomer to data analysis to accomplish some interesting analysis tasks. Granted these beginners should not tackle a major analysis project, but the tools allow them to analyze data sets in ways they never could with their “usual” tools. Rapid Miner accomplishes this by establishing a visual way to specify a sequence of steps. Instead of requiring the user to follow detailed syntax and grammar rules for a language, Rapid Miner provides a graphical tool for building a workflow diagram and viewing the results (Figures 3 and 4). As the user adds and connects pieces to the diagram, the tool provides feedback on what isn't working and what needs to be done. The combination becomes a useful guide to building a working analysis project while avoiding some of the difficult details.

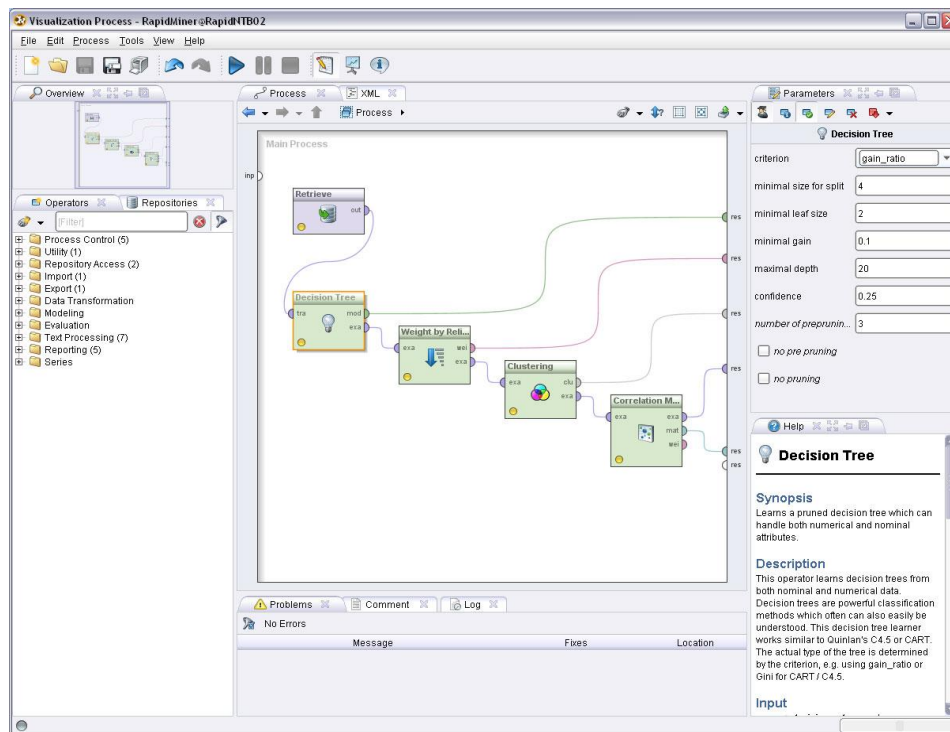


Figure 3. Rapid Miner Process Builder Screen

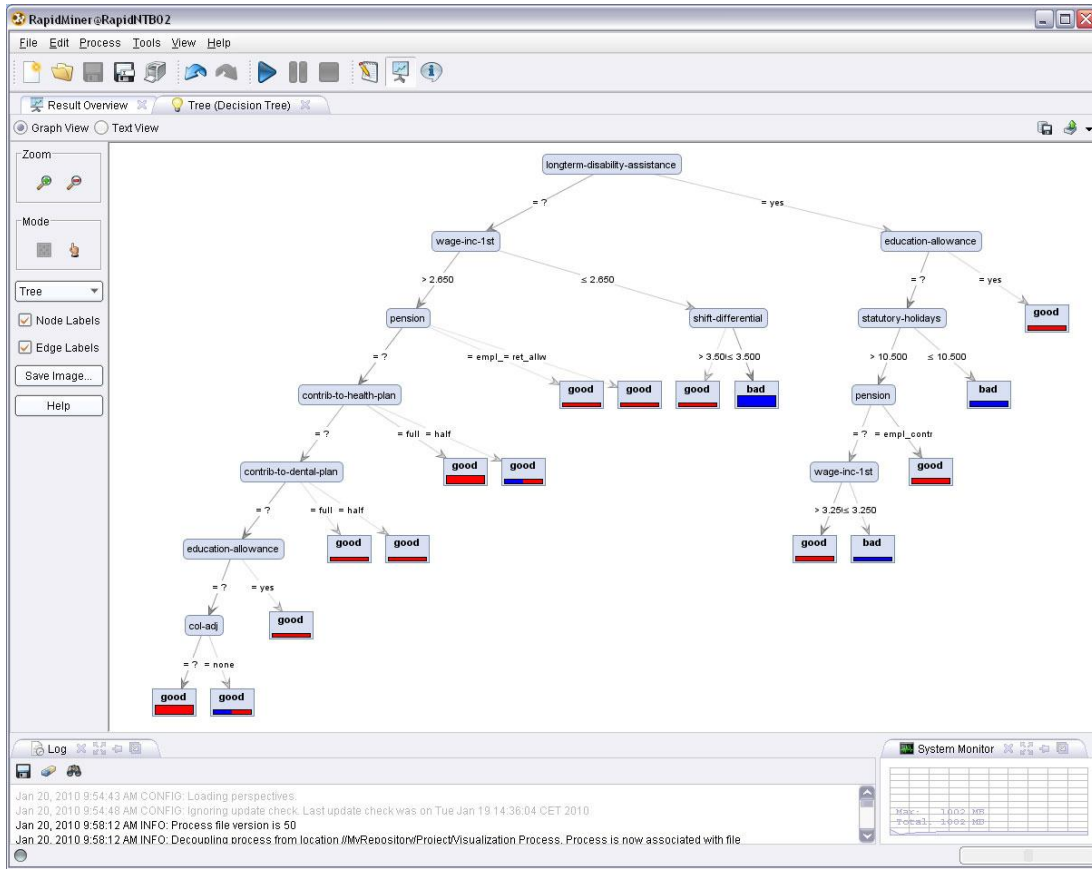


Figure 4. Rapid Miner Results Screen

Rapid Miner is available as a free download or as a free web-based product (rapid-i.com). They also sell a version that has more features and a higher level of customer support. Other vendors have begun following this same pattern and the free version often has a surprising amount of functionality. One example is Talend Open Studio (talend.com) whose specialty is data quality and integration. For data visualization, there is Tableau Software's Tableau Desktop (tableausoftware.com).

In the classroom, these tools allow students to tackle more complicated projects. For example, with a little database background, students can attempt some interesting data mining [1] and data warehouse [2] tasks. Having these tools available remotely (in the cloud) is an opportunity to use more complicated systems and tools. [4] [7]

Tools like Rapid Miner and these others don't just assist the data analyst; they open the playing field to less trained players. Businesses are trying to capitalize on this with trends like self-service BI that invite all employees to engage in more analytic tasks. [3] Just as Moore's Law describes the increasing "bang for the buck" with computer processors, these tools keep enlarging the return on a student's learning effort.

Right Tools + Right Goals

Of course, it isn't really about the tool. The real story is what users can accomplish with

it. For the educator, the goal is to cultivate discipline-specific skills, ways of thinking and sometimes passion for the subject. Many tools can assist the instructor to develop skills and ways of thinking, but each tool also comes with a learning curve of its own. The steeper the curve, the more it can distract from the real goal of the instruction. Rapid Miner enables the user to tackle a reasonably complex project without having to invest a huge amount of time just learning the tool.

However, finding a good tool for my students was only part of the equation. I still needed to establish a reasonable collection of assignments and projects. The students should learn the right skills and patterns of thinking associated with business intelligence. There is a bit of irony at this point because Rapid Miner automated some tasks so as to hide some details about the underlying techniques, but I wanted the students to understand some details conceptually. It's a bit like giving your students a fancy calculator and then searching for an assignment that requires them to apply their mental calculating skills. The compromise was to use spreadsheets at first and require them to manually work through certain analytical steps. Later, we introduce Rapid Miner to get them thinking about the next steps or the bigger picture for analysis.

For each of the student assignments, I emphasized one key concept and technique in data analysis such as repairing data or combining data from multiple sources. Table 1 summarizes the analysis tasks assigned to students for this first course in business intelligence. The course was designed to engage the student with different tools (spreadsheets and Rapid Miner) as well as different kinds of data sets. For their second project, the students chose from a menu of ten options each of which included a general link to a data set or outlined how to acquire the associated data set.

Task	Data Set	Tool	Grade Type
Cleaning/fixing data	Medical office appointment history	Spreadsheet	In-class practice
Combining/integrating data	City maintenance complaints, schedules	Multiple spreadsheets	Homework#1
Translating / evaluating data	Credit/loan applications	Spreadsheet, some pre-written formulas	Project#1
Creating and comparing models	Credit/loan applications	Rapid Miner	Homework#2
Proposing and justifying analysis project	Choose from list of options; can propose new option	None	Homework#3 (first step of Project#2)
Complete analysis project	Student option	Student option	Project#2

Table 1. Analysis Tasks Assigned to Students

These items proved to be a reasonable introduction to the discipline of data analysis for

business. However there is always room for improvement. First of all, I separated the tasks too neatly. In hindsight, some repetition would reinforce the learning. So, for example, almost every assignment or project could have included some data cleaning/scrubbing instead of sanitizing many of the projects to avoid this. Another change is introducing Rapid Miner earlier in the class allow a greater exposure to the breadth of features. For this first time teaching the course, I found my lectures were not as efficient and concise as they could be. This led to more class time devoted to my lectures and less time for hands-on tasks. Next time around, I intend to talk less and have them do more. Another consideration is whether or not a second, advanced course might be a better place for the students to practice data analysis skills. Lastly, other tools are worth considering for this course such as those from Talend and Tableau.

Conclusion

In conclusion, the experience with this first attempt at teaching business intelligence reveals that the tools for data analysis in business have progressed to the point that students with little background in analysis can still accomplish some significant analysis tasks. Though the class began using spreadsheets, students transitioned to Rapid Miner and faced a reasonable learning curve combined with a surprising collection of features. My experience has shown that the more students do the more the majority internalizes. To that end, a tool like Rapid Miner is a great complement to the introduction of data analysis concepts.

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**CRIMES AND PUNISHMENT AT THE GALLEON GROUP:
THE CONSEQUENCES OF ILLEGAL INSIDER TRADING**

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ABSTRACT

“Why is that defendants remember how much they love their family after they commit a crime that puts the whole relationship in jeopardy?” (U. S. District Judge Jed Rakoff at the 6/26/2012 sentencing of Galleon Group insider Adam Smith)

This paper defines and discusses insider trading and also describes the forms of insider trading that are illegal in the USA. The most prominent of recent insider trading cases has been that of Mr. Rajaratnam, founder and principle of the Galleon Group, a hedge trading fund managing seven billion dollars in investor’s assets prior to Mr. Rajaratnam and some his colleagues/subordinates being charged with insider trading-related crimes. The paper explores various reasons why Mr. Rajaratnam and his co-conspirators cultivated relationships with insiders and the benefits that they hoped to realize from these questionable relationships. Finally, the paper discusses some of the primary perpetrators and the punishment that they received (or avoided in some cases).

I. INTRODUCTION

There are two very good indicators regarding the direction that a firm's stock price is heading. One of those indicators is earnings per share (EPS), which predicts both appreciation in value and dividend payments for many firms. The second indicator is insider stock transactions i.e. what are the people who have access to the most information about a firm doing---are they buying or selling the firm's stock? And even if executives aren't selling their shares, is there value in knowing that top management is engaging in hedge transactions designed to protect them if the market value for the stock falls? (Sasseen 2010)

Inside information includes any information that is not available to the general investing public. Research & development successes, sales forecasts, actual sales numbers and gross profit information all precede net income and EPS results. Having access to this information or having contacts with the employees who have access can provide certain investors with enough actionable advance knowledge to engage in proactive selling or buying activities. Often, these activities are of such a magnitude as to move the price of the stock in question.

Raj Rajaratnam left the Needham & Co. investment bank in early 1997. He had raised 250 million dollars in start-up capital for his new hedge fund, Galleon Group. Within a year, his fund was managing nearly a billion dollars of investor's money. By February, 2007, his fund managed over seven billion dollars, and Rajaratnam's personal wealth topped a billion dollars. Federal securities regulators initiated an investigation at this time, culminating in Rajaratnam's "perp walk" 32 months later in October, 2009. (Guth & Scheck, 2009)

Followers of conventional wisdom believe that insider purchases send a positive signal and that when insiders are selling, independent investors should follow suit (McKay 2003) (DeFotis 2003). This notion is confounded by the exercise of stock options, however. Most

insiders immediately sell all or a large percentage of shares acquired upon exercise (Samuelson 2003 quoting Blasi, Kruse and Bernstein's book The Company of Owners: The Truth About Stock Options). Other insiders may even sell their options contracts (Stoll & Whaley 1993). Additionally, very large (\$50,000,000 or more) insider sales further confuse the issue. Neither of these activities has been shown to significantly influence a stock's value (Anon. #1 2003).

A secondary objective for this paper involves the definition and reporting methodology for insider trades (a discussion of both is in the following section). Are firms that employ methods to limit the number of insiders subject to Securities and Exchange Commission's (SEC) reporting rules doing so as a way of deliberately avoiding the requirements for reporting insider sales transactions? Fraud investigators and the field of psychology have identified six primary categories of liars. One of those classifications, the "psychopathic liar", "...seems to be without conscience, and shows no regret about acts of wrongdoing. This person shows no manifestation of guilt. This is the hardest type of liar to understand-a great actor who can fool most investigators." (Albrecht *et al* 1995) Here's another good description: "Senior level management fraudsters tend to be overly ambitious people, obsessed with enhancing power and control, narcissistic personality, with an over-inflated sense of superiority. They are surrounded by 'yes employees', and believe that they are above the rules." (Crumbley *et al* 2003). These descriptions seem to fit many of the corporate executives who were involved in inside stock transactions. They were "fooling" investors even more than they were deceiving investigators. Financial deception, in many forms, was their calling card. Insider trading and stock-option accounting are two methods that they favored most (Buffet 2002). Furthermore, problems were more likely to occur if the Board of Directors contained a disproportionate number of officers and other insiders (Beasley 1996).

II. ANALYSIS AND BACKGROUND

The term “insider trading” certainly possesses a distasteful connotation in 2013. However, insider trading can be perfectly legal. On its website, the SEC defines “insiders” (for insider trading reporting purposes) as the following: Directors, executive officers, and anyone owning 10% or more of any class of the firm’s equity securities. The definition can be expanded for investigation/prosecution purposes. A broader definition of “direct insiders” also includes managers and staff. In addition, an entity’s investment bankers, accountants and auditors, business consultants and lawyers can be defined as “temporary insiders”. Finally, the relatives and friends of the various classifications of direct and temporary insiders can be deemed “tippees” (think Martha Stewart) and also can be charged with insider trading violations.

Prior to the Sarbanes-Oxley Act of 2002, many companies followed “different” rules (actually more of a self-reporting “honor system”) for determining how many individuals associated with the firm would be required to report insider transactions to the SEC. Although reporting rules have existed since the passage of the Securities Exchange Act of 1934 (Section 16), the SEC didn’t have the resources to enforce them! (Lambiras 2003) However, if the constant stream of headlines in the financial press is any indication, the SEC has certainly stepped-up its enforcement activities during the past several years. (See statistics to follow for a surprise!) As an example, the thirty companies listed on the Dow Jones Industrial Average reported anywhere from seven to thirty-nine “insiders” for Section 16 (of the SEC code) reporting purposes (Hallinan 2002). Further crippling the system, the old rules stated that the insider was responsible for assuring adequate and timely reporting, not the firm.

Section 403 of the Sarbanes-Oxley Act mandates the following changes:

- 1) The company has the responsibility for reporting all of the insider transactions. (Formerly it was the individual's responsibility to assure reporting compliance.)
- 2) The company shall file appropriate reports electronically within two business days (Same-day SEC EDGAR reporting starting on 7/30/2003) (per www.sec.gov/rules/final/34-46421.htm)

One egregious example of the failure of the honor system is Tyco's disgraced ex-CEO Dennis Kozlowski. During the same period that he claimed that "Ninety percent of my assets are in Tyco [stock], and I've been adding to my position." he was actually selling millions of shares for approximately \$280,000,000 (Bianco, et al 2002). Unfortunately, the fact remains that illegal insider trading is comparatively easy to perpetrate but difficult to prove. It is a fraudulent act---and to prove fraud the prosecution has to prove a deliberate intent to deceive.

One reason for that conundrum is that insiders are allowed to buy and sell the securities of their employer. Proving that a seller had access to material inside information AND he/she used this information when deciding to sell or buy AND acted with scienter (a deliberate intent to deceive) can be difficult, at best. Whereas it may be easy to prove what someone did, it's a lot tougher to prove what someone was thinking! The SEC's Annual Reports reveal a total of only 156 insider-trading investigative actions for the 3-year total 2000, 2001 & 2002 (SEC #3). During the last 3 fiscal years (2010-2012), there were only 168 investigations---not much of an increase but, as mentioned earlier, the investigations are receiving a lot more attention.

When insiders engage in stock transactions involving their firm's equity securities, the SEC requires that certain forms are completed and sent to the SEC. **Form 3** (Exhibit 1) reports the initial acquisition of equity securities. **Form 4** (Exhibit 2) reports, *in a timely manner*, any acquisitions and/or disposals that take place during the year. **Form 5** (Exhibit 3) is a year-end reconciliation. **Form 144** (Exhibit 4) is used to notify officials that an insider is *considering* selling certain securities (and presumes that the transaction will involve either 500 or more shares or a market value exceeding \$10,000). This form provides some *prior* information regarding insider sales transactions, but is still presenting information based upon intent, rather than upon action. SEC **Form 3** also requires that persons identified as insiders report their holdings in the company within 10 days of the "insider" designation. SEC **Form 13C** requires anyone acquiring 5% or more of the company's outstanding shares to declare the purpose of their investment within 10 days.

The Sarbanes-Oxley Act of 2002 defines "in a timely manner" as electronic filing (the electronic filing method was mandated for universal adoption no later than July 30, 2003) within two business days of the transaction. This post-transaction information reports what actually occurred, rather than just signaling an insider's potential activities. This report is an improvement over the old time limit of ten days after the end of the month that the transaction occurred in. Actually, depending upon the type and timing of the transaction, an insider could have as much as 410 (!) days to report a sale that he/she made back to his/her own company. These rules allowed Ken Lay of Enron to encourage (and then require!) his employees to hold on to Enron's stock even while he was furtively unloading millions of shares prior to the free-fall in Enron's stock value. (Sloan 2002) When filings

are made, they can be accessed at the SEC's website. Thompson Financial Services also publishes the filings every week in *Barron's*. The InsiderInsights website also presents timely and useful information regarding insider stock transactions, and presents them in a much more user-friendly format than the SEC does.

Unfortunately, some insiders still have at least one method that allows them to conceal trades. Executives with large holdings of their employer's stock may transfer their shares, tax-free, to an exchange fund. Their shares are pooled, similar to a mutual fund arrangement, with other company's shares. The SEC suspects that many of these pseudo-sale transactions took place without being reported as such. These activities allowed panicked executives to dump their shares without reporting the trade to the SEC, thereby avoiding alerting their company's stockholders! (Smith 2004)

Presuming that the new filing deadlines are followed, what, then, would be the problem? *"The basic argument against [illegal] insider trading is that insiders should not be permitted to earn profits based on an informational advantage not held by the investing public."* (Lambiras 2003) The SEC defines illegal insider as *"... when a person trades a security while in possession of material nonpublic information in violation of a duty to withhold the information or refrain from trading."* (SEC #1 2003) The SEC's website dealing with complaints about violators further states that the trade *"...is breach of a fiduciary duty or other relationship of trust and confidence..."* (SEC #2 2003)

An inside trade becomes illegal when information that the trader possesses is material (Fried 1998). Material information is information that a potential buyer or seller would attach importance to in trying to determine whether or not to purchase/sell the shares. The SEC and other bodies believe that illegal insider trading would undermine investor

confidence. This would initiate a chain reaction of sorts. Investors without confidence that the trading system would protect them from others earning unreasonable profits at their expense would be less likely to invest in the market. Fewer investors participating in the equity markets would reduce demand for stocks, thereby driving overall prices and aggregate market value down.

Maintaining investor confidence is a concern for the listing exchanges. The NYSE, AMEX and NASDAQ all have developed and maintain systems that are designed to identify and report suspicious activity. The NYSE, for example, has a third of its staff (approximately 560 people) working in the “Regulation Division”, which just so happens to include the “Stock Watch Unit”. (Kalt 2004) After receiving notice of material information or announcements that a firm publishes, the software can “backtrack” and search for unusual trading activity in the firm’s shares. Some firms have a policy of preventing their insiders from executing trades on and/or near announcement dates. This safeguard, although useful, certainly isn’t foolproof re: restraining illegal trades.

Harvey Pitt, former SEC Chairman, advocated timely publication of new corporate information online (Pitt 2001). He offered support and cooperation to U. S. Senator Carnahan’s bill titled “Fully-informed Investor Act of 2002”. This new reporting timeliness requirement would possess the dual advantages of A) quickly disseminating information and B) this method would also be much less expensive for firms (Leahy 2000). Additionally, adhering to the Regulation Fair Disclosure Act (which states that all analysts and investors should receive information at the same time) would be easier to achieve (DiPiazza & Eccles 2002). The economist Eugene Fama won the Nobel Prize in Economics for his work related to the “Efficient Market Hypothesis” His research centered

on the theory that all persons active in a market have simultaneous access to relevant information and therefore can essentially presume a “level playing field” when making investing decisions. Insider trading activity tilts the field to the advantage of some investors and to the disadvantage of others. Unfortunately, a lack of adequate enforcement for the regulation Fair Disclosure Act still exists. The result is that investors who receive information last are sometimes harmed. (Dugan 2004)

Foster (1986) and others believed that financial stress indicators fell into one of four major categories that could be analyzed. Those four broad areas are: 1) cash flow analysis, 2) corporate strategy analysis, 3) either a univariate or multivariate comparison of a firm’s financial statements with other firms in the same industry and 4) evaluating external variable(s). Mr. Rajaratnam and his co-conspirators realized that having access to the people in an entity having access to these types of information would be very valuable for him and his hedge fund.

During the early and mid-1980’s, nearly every researcher employed or developed multivariate models for his or her research regarding bankruptcy prediction models. Some of the overviews for this research are contained in the works of Ball and Foster (1982), Scott (1981) and Zavgren (1983). These more sophisticated models normally resulted in better prediction results. Mr. Rajaratnam was interested in both being able to predict bankruptcies (and the stocks to sell) and also anticipating “good” announcements (the stocks to buy!).

Some researchers employed a different emphasis. They showed that a bankrupt firm’s stock return went into a nosedive long before the actual bankruptcy declaration (Aharony, *et al* 1980), (Mensah 1983) and (Clark and Weinstein 1983). This information provides further evidence that insiders would have plenty of “advance notice” that the firm that they are working for is in

trouble. Mr. Rajaratnam and his employees at Galleon, realizing this, invested a lot of effort in cultivating relationships with insiders.

However, not everyone thinks that having and using inside information is a problem. Henry Manne (2003) states that "...insider trading does little or no direct harm to any individual trading in the market, even when an insider is on the other side of the trades." He feels that insider trading helps to move a stock to its "correct" price. He possessed a similar opinion 44 years ago (Manne 1966). John Paulos (2003), expounding upon the three relative "strengths" of the "Efficient Market Hypothesis" (EMH), explains that since the strongest version presumes that all knowledge pertinent to a firm's stock price is reflected in the price, therefore inside information is essentially useless. Most investors don't believe this—and will therefore grasp at and hold dear any information that they feel will give them an advantage. They adjust their portfolio accordingly. The paradox is that their efforts influence the stock's price—thereby lending credence to the very theory that they distrust! This is an interesting twist on Heisenberg's "Uncertainty Principle" whereby merely the observation of a phenomenon is enough to cause changes in it. Furthermore, Watts and Zimmerman (1986) state that evidence that contradicts the "strongest" EMH theory is "...surprisingly scarce."

After maintaining an intellectual position as the champion and most influential proponent of EMH for over forty years (Fama 1970), Eugene Fama conceded that the behaviorist school of thought had merit, especially when poorly-informed investors led the market astray. Their errant "leadership" often results in "somewhat irrational" stock prices. (Hilsenrath 2004) On the other side of the table, Richard Thaler has long espoused a behavioral approach to analyzing the decisions that investors make. (Thaler 1992) For the purposes of this paper, Thaler's research establishes that not all investor decisions are based purely upon quantitative analysis. Qualitative

factors (such as insider trading transactions) can also influence the investing/divesting activities of investors and managers.

Jensen and Meckling (1976) evaluated changes/risks that occur in the agency relationship between management and outside owners (i.e. shareholders). Essentially, complete trust does not exist. Monitoring management exacts a cost. Not monitoring management, however, often exacts a much greater toll on the outside owners. Being able to monitor management's efforts to divest themselves of the firm's equities provides outside shareholders with information/feedback regarding management's own perceptions of the firm's future.

Stephen Ryan (2002) discusses "risk management" in his book Financial Instruments and Institutions: Accounting and Disclosure Rules. The causes for a firm's bankruptcy can be external and therefore unrelated to the firm's operations. Firms have no control over interest rates, foreign exchange rates, commodity prices and portfolio fluctuations. Yet any of these factors, if either severe enough in the short-term or less-detrimental but sustained long enough, can lead to financial distress. Inside shareholders, who often have taken significant equity positions in the company that they work for, also fear any news that the investing public would perceive as negative. The ensuing rush to sell shares drives the market value down (way down, in some cases), resulting in depressed portfolio values (Mulford and Comiskey 2002).

Therefore, the thinking goes, if something bad is going to happen (or an announcement is going to be made that investors will find disappointing or confidence-shaking), then one having knowledge of the problem would be wise to unload his/her stock immediately.

One writer who has addressed the question of how firms decide who is an insider is Joseph Hallinan (2002). He has pointed out that some companies with huge numbers of employees have only identified a few insiders subject to the SEC's Section 16 (1934 Securities Exchange Act)

reporting requirements. Furthermore, definitions vary from company to company. The SEC's own definition, updated in 1991 and reiterated recently, includes upper management, directors and 10% or greater equity owners. Section 403 of the Sarbanes-Oxley Act of 2002 employs the same definition.

III. DISCUSSION

Prior to continuing, maybe your authors should apologize for the long-winded introduction & overview...

So what happened at the Galleon Group hedge fund? What were the events leading up to federal regulators escorting a self-made billionaire on a “perp walk” in October, 2009? How did this billionaire manage to cultivate relationships over a 20-year period with executives at some of the largest technology companies (McKinsey & Co., IBM, Intel, Advanced Micro Devices and others) and then leverage those relationships to extract inside information? How were Mr. Rajaratnam *et al* able to develop and manage a stable of 21 executives who passed inside information at the risk of their own careers, reputations and freedom?

Quoting Guth and Scheck *ibid*, “Mr. Rajaratnam got his start as an analyst just as the moribund semiconductor industry started to boom. Charming and puckish, he made contacts in Silicon Valley’s Indian expatriate community, using them to meet other executives. By the early 1990’s, tech industry executives and Mr. Rajaratnam’s co-workers say he made himself the hub of dozens of sources funneling him supposedly confidential corporate information. In exchange, Mr. Rajaratnam would often pass them tips he’d heard.” He was a charismatic individual, and his ability to charm potential clients and eventually bring their business to his employer, Needham & Co. His rain-making ability allowed him to move into the president’s office in 1991, a mere 6 years after joining the firm as a low-level analyst.

But that wasn’t enough. After raising 250 million dollars, Mr. Rajaratnam formed (with co-founder Gary Rosenbach---more about him later in the paper) the Galleon Group in November, 1996. He was managing 800 million dollars one year later and an astounding 7 billion dollars in investor’s money when the firm collapsed in 2009. During this period, he continued to exhibit an

almost uncanny sense of which way stock prices for many technology companies were headed. Unfortunately, rather than relying on skill, knowledge and reliable forecasting techniques, his primary source of information was his network of unethical executives and other employees with access to information at dozens of different companies.

Despite facing a multitude of federal securities-law charges, there is no denying that Mr. Rajaratnam is a smart man. An advanced degree from the Wharton School of Business establishes his IQ credentials. His co-defendants in the crimes freely admit that he was both charming and charismatic. (How else would one convince an employee to allow herself to be Tasered (in return for \$5,000) when Taser, Inc. visited Galleon's offices?) Some of the co-defendants never personally profited from the information that they passed along. Essentially, Mr. Rajaratnam had a talent for cultivating and then exploiting personal relationships in a manner where the person being exploited either didn't realize it or didn't care. Despite hiring expensive defense attorneys, Rajaratnam was convicted and sentenced to 11 years in a federal prison.

Susan Pulliam, quoting the Manhattan U.S. attorney, states that "...there is a culture- not only at hedge funds but at large firms in the financial sector- that thinks nothing of casually exchanging material nonpublic information." (Pulliam 2009) One of Mr. Rajaratnam's more adept protégé's was Ms. Roomy Khan, a hedge fund consultant and former Intel employee. She "...used an assemblage of family and friends to bond with young people who had access to sensitive information about technology firms..." (*ibid*) This type of behavior is a page pulled directly from Mr. Rajaratnam's playbook. But in 2007, after being caught engaged in illegal behavior regarding inside information for the third time, she agreed to plead guilty (10/19/2009) AND she also agreed to turn informant in exchange for freedom and a delayed jail sentence. This set the FBI's 32-month

investigation in motion, culminating in perp walks for 21 disgraced executives. This paper will discuss a few of them later.

Of course, for most of the participants, the fraud was all about the money to be made from trading on inside information and/or selling inside information. McKinsey & Co.'s ex-partner Anil Kumar was paid over 1.75 million dollars for the tips he passed along to Galleon from 2004 through 2009. He pled guilty on 1/7/2012 (Glovin & Voreacos 2011) and testified against Rajaratnam in exchange for a lenient sentence of 2 years of probation.

Mr. Rajaratnam's web of contacts extended to some of Wall Street's biggest names. On 9/23/2008, *1 minute* after Goldman's board meeting, Rajat Gupta, head of consulting firm McKinsey & Associates and a director at Goldman Sachs, tipped off Mr. Rajaratnam about Berkshire Hathaway's impending 5 billion dollar investment in Goldman Sachs. (Akesson 2012) Federal charges allege that Mr. Rajaratnam proceeded to trade (and profit) upon this information. He returned the favor---providing inside information to Gupta that Gupta acted upon. It's unfortunate that Gupta lived an exemplary life for more than 50 years and then got caught-up in Rajaratnam's sphere of rotten influence. Gupta was a man who came from a humble background and, via the strength of his intellect, entered into first-name basis relationships with presidents and prime ministers. (Raghaven 2013).

Gupta was convicted on insider trading charges on June 12th, 2012. He was prosecuted by the SEC and he sued the SEC for "unfairly and unconstitutionally" singling him out. (Popper 2011) His case was brought before an administrative law judge, denying him access to a jury trial and certain legal protections. His lawsuit worked---sort of... Gupta got his jury trial but was still convicted and sentenced to two years in prison.

Glovin & Voreacas' (2011) also reported on several other co-conspirators and the punishments meted out to them. Intel's Raviv Goel pled guilty to conspiracy & securities fraud (c&sf), cooperated with prosecutors and received 2 years of probation. Richard Choo-Beng Lee, a co-founder of Spherix Capital LLC, pled guilty to c&sf and decided to cooperate. He has not been sentenced yet pending further cooperation with prosecutors. Coincidentally, a second "Richard Lee" was also involved in the tangled web of Galleon's insider trading activities. One of five (!) members of SAC Capital Advisors LLC to be indicted during the Galleon investigation, he was hired by SAC despite multiple warnings that he was involved with insider trading activities at his previous employer. The Department of Justice snarkily claimed that SAC's primary hiring criteria was "Must be good at insider trading." Spherix's other co-founder (and a Galleon alumnus), Ali Fair, also pled guilty and cooperated. His sentence is pending. Mark Kurland co-founded New Castle Funds and was Danielle Chiesi's boss (more about her later). He pled guilty to using inside information and has served a 27-month sentence. Steven Fortuna, *former* managing director at S2 Capital Management LP, pled guilty to c&sf. He is cooperating with prosecutors and received 2 years of probation at his sentencing in February, 2013. Ali Hariri, a VP at Atheros Communications, Inc., was sentenced to 18 months in prison for leaking inside information and also for betting that Atheros's stock price would fall. He refused to cooperate and is currently confined to the Metropolitan Correctional center in San Diego, CA. An interesting aside---our research revealed that cooperation was likely to result in probation rather than jail time. And, even if the perp did receive jail time, cooperating resulted in sentences being served at "country club" federal prisons, rather than being confined with all sorts of non-white collar criminals. Deep Shah tipped-off Roomy Khan (who informed Rajaratnam) about Blackstone Group LP's intent to buy Hilton Hotels Corporation. He was charged on 11/04/09 and promptly disappeared. Located in Mumbai, India in

2011, he is still at-large. Thomas Hardin, managing director at Lanexa Management LLC, pled guilty to insider trading charges and was fined \$19,000. He was known to investigators as “Galleon tipper ‘X’” prior to the discovery of his real identity. Michael Cardillo, a Rajaratnam subordinate, pled guilty to insider trading and is cooperating. He was the first informant to link Gupta (the Goldman Sachs director) and Rajaratnam. He received 3 years of probation. Zvi Goffer was sentenced to 10 years in prison for passing along inside information and for recruiting additional tipsters while he was at Galleon. There are more Galleon-related investigations pending---hence the delayed sentences for convicted individuals who are still cooperating with prosecutors.

There is one more prominent element that we haven’t mentioned yet. Sex played a prominent role in at least one situation and was hinted at a few other times. Libel & slander laws being what they are, sources for this paper needed to be careful.

Danielle Chiesi was a consultant at New Castle Funds, LLC. She was also named as Mr. Rajaratnam’s co-conspirator in a 17-count federal indictment handed down in December, 2009 (Bandler 2010). Ms. Chiesi is a former beauty queen and still an attractive women in her middle age. With a penchant for short skirts and low-cut tops, she attracted attention for her looks and flirtatious attitude along with admiration for her knowledge about the tech industry. She was quoted as saying “You do what you do to get information.” (*ibid*) In 2002, she asked to be introduced to an “up-and-comer” at IBM. When Robert Moffat, a former Eagle Scout and a workaholic senior VP at IBM was introduced to her by John Joyce, IBM’s CFO, he immediately fell for her charms. The two entered into a relationship, with Mr. Moffat exchanging inside information for Ms. Chiesi’s time & attentions. He didn’t receive a single dollar for the information that he provided, nor did he actually engage in any trades of IBM stock. A “classic tale of love and betrayal” (*ibid*), the two were bound by his love for her and her love for the inside information that he could (and did) provide.

The government doesn't have to prove financial gain to win a conviction for insider trading. It only has to prove that the person engaged in the behavior received some sort of benefit from it. Unfortunately for Mr. Moffat, the affection of an attractive woman qualifies as a "benefit". Moffat tearfully pleaded guilty to conspiracy and securities fraud involving insider information. The convicted felon's dalliance and illegal behavior also cost him an estimated 65 million dollars (the value of lost stock options & pension), his marriage, and 30 months of his life.

Chiesi refused to cooperate with prosecutors and was sentenced to 30 months in prison.

Currently, over 50 people have pled guilty to some or all of the charges against them. (*Ibid*) An extensive dossier of emails, tapped phone conversations, recording devices, cooperating witnesses and other communications have made the prosecutor's job fairly easy. If one were to draw a conclusion from all of this, it would be that greed (and other human weaknesses) trumps ethical and moral values. Although this illegal behavior likely will never be completely eliminated, better rules and, most importantly, enthusiastic enforcement would serve to greatly reduce illegal insider trading.

We should also mention a mystery. Rajaratnam *co*-founded Galleon Group. What to make of his co-founder, Gary Rosenbach? Rosenbach was the "...long-time No. 2 to Raj Rajaratnam (Lattman 2013). Possibly foreseeing problems, he resigned from Galleon a few months before Rajaratnam's 2009 arrest and, for all intents and purposes, essentially disappeared. He recently resurfaced---now a "gentleman farmer" with a ranch in Texas. He has never been charged (yet!) with any crimes related to his association with Galleon.

And what about Adam Smith? (1st sentence in the abstract) He testified against Rajaratnam and was sentenced to 24 months of probation because he had cooperated with the prosecution. This despite the fact that he had illegally shared information about Interstil, Intel, Nvidia, Advanced

micro Devices, Qualcomm, Morgan Stanley and others. (Pavlo 2012) The judge's leniency was all the more remarkable in that Smith faced obstruction of justice charges for destroying his notebooks and computers and the evidence that they contained. However, wearing a wire & his testimony discrediting key defense witnesses led to Rajaratnam's conviction---and he was rewarded for his cooperation.

According to "investing.businessweek.com", Galleon Management L.P. still operates out of an office on Madison Avenue, NY, NY. However, the firm lists no record of "Key Executives"...

IV. EXHIBITS AND TABLES

Exhibit 1 SEC Form 3

FORM 3

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549
Form 3

INITIAL STATEMENT OF BENEFICIAL OWNERSHIP OF SECURITIES

OMB APPROVAL
OMB Number: 3235-0104
Expires: January 31, 2005
Estimated average burden hours per response. 0.5

Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934, Section 17(a) of the Public Utility
Holding Company Act of 1935 or Section 30(h) of the Investment Company Act of 1940

(Print or Type Responses)

1. Name and Address of Reporting Person* (Last) (First) (Middle) (Street) (City) (State) (Zip)	2. Date of Event Requiring Statement (Month/Day/Year)	3. Issuer Name and Ticker or Trading Symbol 4. Relationship of Reporting Person(s) to Issuer (Check all applicable) <input type="checkbox"/> Director <input type="checkbox"/> 10% Owner <input type="checkbox"/> Officer (give title below) <input type="checkbox"/> Other (specify below)	5. If Amendment, Date Original Filed (Month/Day/Year)
6. Individual or Joint/Group Filing (Check Applicable Line) <input type="checkbox"/> Form filed by One Reporting Person <input type="checkbox"/> Form filed by More than One Reporting Person			

Table 1 — Non-Derivative Securities Beneficially Owned			
1. Title of Security (Instr. 4)	2. Amount of Securities Beneficially Owned (Instr. 4)	3. Ownership Form: Direct (D) or Indirect (I) (Instr. 5)	4. Nature of Indirect Beneficial Ownership (Instr. 5)

Reminder: Report on a separate line for each class of securities beneficially owned directly or indirectly.
* If the form is filed by more than one reporting person, see Instruction 5(b)(v).

Potential persons who are to respond to the collection of information contained in this form are not required to respond unless the form displays a currently valid OMB control number.

(Over)
SEC 1473 (6-03)

Exhibit 1 (continued)

FORM 3 (continued)

Table II — Derivative Securities Beneficially Owned (e.g., puts, calls, warrants, options, convertible securities)

1. Title of Derivative Security (Instr. 4)	2. Date Exer- cisable and Expiration Date (Month/Day/Year)		3. Title and Amount of Securities Underlying Derivative Security (Instr. 4)		4. Con- version or Exercise Price of Deri- vative Security	5. Own- ership Form of Deriv- ative Security: Direct (D) or Indirect (I) (Instr. 5)	6. Nature of Beneficial (Instr. 5)
	Date Exer- cisable	Expira- tion Date	Title	Amount or Number of Shares			

Explanation of Responses:

** Intentional misstatements or omissions of facts constitute Federal Criminal Violations.
See 18 U.S.C. 1001 and 15 U.S.C. 78ff(a).

**Signature of Reporting Person

Note: File three copies of this Form, one of which must be manually signed. If space is insufficient,
See Instruction 6 for procedure.

Potential persons who are to respond to the collection of information contained in this form are not
required to respond unless the form displays a currently valid OMB Number.

Exhibit 2 SEC Form 4

**UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

FORM 4

OMB APPROVAL
OMB Number: 3235-0287
Expires: January 31, 2005
Estimated average burden
hours per response. 0.5

Check this box if no longer subject to Section 16. Form 4 or Form 5 obligations may continue. See Instruction 1(b).

STATEMENT OF CHANGES IN BENEFICIAL OWNERSHIP
Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934, Section 17(a) of the Public Utility Holding Company Act of 1935 or Section 30(h) of the Investment Company Act of 1940

(Print or Type Responses)

1. Name and Address of Reporting Person* (Last) (First) (Middle) (Street) (City) (State) (Zip)	2. Issuer Name and Ticker or Trading Symbol 3. Date of Earliest Transaction Required to be Reported (Month/Day/Year)	4. If Amendment, Date Original Filed (Month/Day/Year) 5. Relationship of Reporting Person(s) to Issuer (Check all applicable) <input type="checkbox"/> Director <input type="checkbox"/> 10% Owner <input type="checkbox"/> Officer (give title below) <input type="checkbox"/> Other (specify below)
6. Individual or Joint/Group Filing (Check Applicable Line) <input type="checkbox"/> Form filed by One Reporting Person <input type="checkbox"/> Form filed by More than One Reporting Person		

Table I — Non-Derivative Securities Acquired, Disposed of, or Beneficially Owned

1. Title of Security (Instr. 3)	2. Transaction Date (Month/Day/Year)	2A. Deemed Execution Date, if any (Month/Day/Year)	3. Transaction Code (Instr. 8)		4. Securities Acquired (A) or Disposed of (D) (Instr. 3, 4 and 5)			5. Amount of Securities Beneficially Owned Following Reported Transaction (s) (Instr. 3 and 4)	6. Ownership Form: Direct (D) or Indirect (I) (Instr. 4)	7. Nature of Indirect Beneficial Ownership (Instr. 4)
			Code	V	Amount	(A) or (D)	Price			

Reminder: Report on a separate line for each class of securities beneficially owned directly or indirectly.
 * If the form is filed by more than one reporting person, see Instruction 4(b)(v).

Potential persons who are to respond to the collection of information contained in this form are not required to respond unless the form displays a currently valid OMB control number. (Over) SEC 1474 (06-03)

Exhibit 2 (continued)

FORM 4 (continued)

Table II — Derivative Securities Acquired, Disposed of, or Beneficially Owned
(e.g., puts, calls, warrants, options, convertible securities)

1. Title of Derivative Security (Instr. 3)	2. Conversion or Exercise Price of Derivative Security	3. Transaction Date (Month/Day/Year)	3A. Deemed Execution Date, if any (Month/Day/Year)	4. Transaction Code (Instr. 8)		5. Number of Derivative Securities Acquired (A) or Disposed of (D) (Instr. 3, 4, and 5)		6. Date Exercisable and Expiration Date (Month/Day/Year)		7. Title and Amount of Underlying Securities (Instr. 3 and 4)		8. Price of Derivative Security (Instr. 5)	9. Number of derivative Securities Beneficially Owned following Reported Transaction (s)(Instr. 4)	10. Ownership Form of Derivative Security: Direct (D) or Indirect (I) (Instr. 4)	11. Nature of Indirect Beneficial Ownership (Instr. 4)
				Code	V	(A)	(D)	Date Exercisable	Expiration Date	Title	Amount or Number of Shares				

Explanation of Responses:

** Intentional misstatements or omissions of facts constitute Federal Criminal Violations.
See 18 U.S.C. 1001 and 15 U.S.C. 78ff(a).

**Signature of Reporting Person

Date

Note: File three copies of this Form, one of which must be manually signed. If space is insufficient, see Instruction 6 for procedure.

Potential persons who are to respond to the collection of information contained in this form are not required to respond unless the form displays a currently valid OMB Number.

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Exhibit 3 SEC Form 5

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

OMB APPROVAL	
OMB Number:	3235-0362
Expires:	January 31, 2005
Estimated average burden hours per response:	1.0

FORM 5

ANNUAL STATEMENT OF CHANGES IN BENEFICIAL OWNERSHIP OF SECURITIES

- Check box if no longer subject to Section 16. Form 4 or Form 5 obligations may continue. See Instruction 1(b).
- Form 3 Holdings Reported
- Form 4 Transactions Reported

Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934, Section 17(a) of the Public Utility Holding Company Act of 1935 or Section 30(h) of the Investment Company Act of 1940

1. Name and Address of Reporting Person* (Last) (First) (Middle) (Street) (City) (State) (Zip)	2. Issuer Name and Ticker or Trading Symbol 3. Statement for Issuer's Fiscal Year Ended (Month//Day//Year) 4. If Amendment, Date Original Filed (Month//Day//Year)	5. Relationship of Reporting Person(s) to Issuer (Check all applicable) <input type="checkbox"/> Director <input type="checkbox"/> 10% Owner <input type="checkbox"/> Officer (give title below) <input type="checkbox"/> Other (specify below)
6. Individual or Joint/Group Reporting (check applicable line) <input type="checkbox"/> Form Filed by One Reporting Person <input type="checkbox"/> Form Filed by More than One Reporting Person		

Table I — Non-Derivative Securities Acquired, Disposed of, or Beneficially Owned

1. Title of Security (Instr. 3)	2. Transaction Date (Month/Day/Year)	2A. Deemed Execution Date, if any (Month/Day/Year)	3. Transaction Code (Instr. 8)	4. Securities Acquired (A) or Disposed of (D) (Instr. 3, 4 and 5)			5. Amount of Securities Beneficially Owned at end of Issuer's Fiscal Year (Instr. 3 and 4)	6. Ownership Form: Direct (D) or Indirect (I) (Instr. 4)	7. Nature of Indirect Beneficial Ownership (Instr. 4)
				Amount	(A) or (D)	Price			

Reminder: Report on a separate line for each class of securities beneficially owned directly or indirectly. (Over)
 * If the form is filed by more than one reporting person, see instruction 4(b)(v). **Potential persons who are to respond to the collection of information contained in this form are not required to respond unless the form displays a currently valid OMB control number.** SEC2270(7-03)

Exhibit 3 (continued)

FORM 5 (continued)

Table II — Derivative Securities Acquired, Disposed of, or Beneficially Owned
(e.g., puts, calls, warrants, options, convertible securities)

1. Title of Derivative Security (Instr. 3)	2. Conversion or Exercise Price of Derivative Security	3. Transaction Date (Month/Day/Year)	3A. Additions and Exemptions Date, if any (Month/Day/Year)	4. Transaction Code (Instr. 8)	5. Number of Derivative Securities Acquired (A) or Disposed of (D) (Instr. 3, 4, and 5)		6. Date Exercisable and Expiration Date (Month/Day/Year)		7. Title and Amount of Underlying Securities (Instr. 3 and 4)		8. Price of Derivative Security (Instr. 5)	9. Number of Derivative Securities Beneficially Owned at End of Issuer's Fiscal Year (Instr. 4)	10. Ownership Form of Derivative Securities: Direct (D) or Indirect (I) (Instr. 4)	11. Nature of Indirect Beneficial Ownership (Instr. 4)
					(A)	(D)	Date Exercisable	Expiration Date	Title	Amount or Number of Shares				

Explanation of Responses:

** Intentional misstatements or omissions of facts constitute Federal Criminal Violations.
See 18 U.S.C. 1001 and 15 U.S.C. 78ff(a).

** Signature of Reporting Person

Date

Note: File three copies of this Form, one of which must be manually signed.
If space provided is insufficient, see Instruction 6 for procedure.

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The Prevalence of Sustainable Values and Behaviors among College Students: An Exploratory Student Research Activity

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ABSTRACT

Students in an upper level marketing class helped to develop a survey instrument to assess the degree to which students at our college hold LOHAS (Lifestyles of Health and Sustainability) and engage in related behaviors. The survey was administered online to a random stratified sample of 500 students. The students in the marketing class received the data in Excel files and analyzed it using either Excel or SPSS. With their analyses they wrote up research reports and developed marketing and promotional plans to either help raise awareness and remind students the importance of making sustainable consumer and lifestyle decisions or introduce a sustainable product to market a college student population.

SUSTAINABILITY DEFINED

Our Common Future [13] by the World Commission on Environment and Development defined sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” Willard [12] suggests that in economic language this means living of the Earth’s interest and not its capital. In business, that’s sustaining nature’s resources while sustaining business activities. He and others [2] [7] [10] outline a more practical definition. That is that a business doesn’t have just one bottom line of financial profitability; it has three bottom lines that include 1) financial profitability, 2) environmental preservation and 3) social justice.

BACKGROUND

For several years I have been incorporating examples of sustainable businesses into my presentations to students in my marketing classes. I have made a number of assignments in which students write a “Marketing Plan for a Sustainable Business or Organization”. In my Buyer Behavior course, students have always completed at least two research projects. While Marketing Research is not a pre-requisite for the class, many students in the class have typically completed the course or are taking it concurrently. Therefore, this is a simple, basic research project designed to give all students an experience on designing research questions and doing some data analysis. Moreover students also developed a marketing and promotional plan to either raise awareness for the need for a sustainable lifestyle or to introduce a sustainable product to college students.

As consumer lifestyles, activities opinions and attitudes are common topics in the class, the description of the LOHAS segment [9] is included in the text and class discussions. LOHAS

stands for Lifestyles of the Health and Sustainability, we look at the research that has been done and acknowledge the research that shows that between thirteen and nineteen percent of adult consumers in the US are currently considered LOHAS Consumers. This market was conservatively estimated at \$290 billion [9]. Hence, it is a significantly large segment of US consumers. Estimates for consumers in Northern European countries and Australia and New Zealand are even higher.

According to *Princeton Review's Guide to 322 Green Colleges* [11] close to 70% of college bound students would value having information about a school's commitment to the environment. In my own classes students arrive already enthusiastic about living more sustainably. This is probably due to the fact that it has been a visible and popular trend for the last couple of decades. Programs in elementary, middle and high schools that promote sustainability are not uncommon. However, recent research [6] has found that younger millennials (18-24) are not as sustainable as older millennials (25-33 years old). A millennial himself, Joseph Harris-Confino, wrote in *The Guardian* [5] that many of us are assuming that all millennials value sustainability and engage in sustainable behaviors. He warns that the group is not one large monolithic group and points out that like other generations, there are some that value sustainability and live accordingly and there are others who do not.

It is interesting to see how students at our college compare. Roanoke College is not among the 322 green schools reviewed by the Princeton Review. The other liberal arts school in our valley, Hollins University is quite a bit ahead of us and it didn't make the list either. However, Roanoke College has taken a few steps in terms of renovations and new construction. Lucas Hall was renovated several years ago and now has Silver LEED certification. A new dorm was opened last year that is also LEED certified.

Our director of Institutional Research informed me that there are a variety of student organizations will be interested in our findings. These include RC Sustain, Earthbound, the Student Government Association, the Environmental Science department and the Sociology department. Research findings will be shared with these groups. Additionally, select student produced promotion plans will also be shared.

Hence this project has given students the opportunity to not only learn about survey instrument construction, sampling issues, data collection, data analysis and report writing but also has given them an opportunity to create a marketing and a promotion plan to either raise student awareness on campus and remind students about sustainable choices and behaviors or introduce a sustainable product to them.

ADMINISTERING THE SURVEY

After the students submitted the survey questions I sorted through them and selected and formatted a good group of them I then compiled the survey and submitted it to our director of Institutional Research. It also went through our IRB (Institutional Review Board) office. Unfortunately, it took longer than expected since the director of IRB's computer had crashed. The Director of Institutional Research stated that the survey would be administered to a stratified random sample of 500 students divided evenly to groups of freshmen, sophomores, juniors and

seniors. This sample size of 500 is roughly 25% of the student body. The permission to run the survey was granted for only a 14 day period. After 7 days a friendly reminder was sent out to the selected group of students to try to increase the sample size. Unfortunately, in total, only 50 students took the survey. See Appendix 1 for the breakdown of the population of the students who participated.

FINDINGS

Characteristics Of The Respondents

There was quite a bit of self selection bias. For some reason the survey must have appealed more to the female students as 78% of the respondents were female and only 22% were male. The survey also appealed to more junior and senior level class students with them represented with 30% and 43% participation respectively. Students studying in the Sciences more represented with 37% of the respondents. Business, Liberal Arts and Social Science students were represented as 23%, 19% and 18% respectively. It should be noted that these percentages by major do not match up to the percentages of students in these majors on the Roanoke College campus. Regions were also represented in different proportions. 40% of the respondents were from New England while only 30% of the students were from the Roanoke area. Another 40% were from other parts of Virginia. Less than 10% of the respondents came from other regions.

Values Held By The Respondents

Values held by the students who responded were mostly compatible with Sustainable Lifestyles as defined by LOHAS. However, it must be mentioned that the email invitation the students received defined LOHAS and stated that the survey intended to learn about the LOHAS values held by Roanoke College students and their behaviors. Therefore it is quite possible that students aware of LOHAS and/or sustainability issues were more likely to take the survey. That may also explain the overwhelming evidence in the findings that the students more likely than not, hold LOHAS values and engage in LOHAS behaviors. These were important issues for the students in the class to learn.

For the purpose of this paper which expounds upon the analysis of the values uncovered by the survey, I am using the term “agreed” to indicate those who responded using the buttons corresponding to all three levels of agreement (i.e. Strongly Agree, Agree and Somewhat Agree.) Appendix 2a contains a list of the values examined and the percentages of the respondents that indicated the strongly agreed, somewhat agreed and agreed to having those values. It is interesting to see that 100% of the students agreed that they valued their health but only 92% agreed that they ate nutritional foods. Further down on the list of values there is a Likert measure that seeks to find whether the respondent prefers veggies and dip to chips and dip. Only 58% of the respondents agreed with the statement that they prefer veggies to the chips. This is not consistent with the earlier finding on the statement about eating nutritionally. Seventy percent of the respondents agreed with the statement that they prefer organic foods while only fifty-three and fifty eight percent agree with the statements about preferences for organic personal care and household products respectively.

Organic products are valued by the LOHAS segment because they are not only healthier foods (as long as a nutritional and balanced diet is followed), but they reduce and/or eliminate harmful effects on the environment. This is important to know so consumers can make choices consistent with their values. At least 75% of the respondents (from across the academic disciplines) in this study agreed that this is true, but only 54% of the BUAD students agreed with this statement (see Appendix 3). The percentage of respondents that preferred organic personal care products and household products was much lower than those who prefer organic foods. This illustrates that not all the respondents may be aware of the impact of non-organic product production and consumption on the environment.

Behaviors In Which The Respondents Engage

While there was a great deal of agreement with most LOHAS values, there was less consistency with respect to behaviors. However, it should be noted that these respondents do engage in numerous LOHAS related behaviors. There was a comments section and while only two respondents left comments they were right on point. One of the students complained that it was difficult to live sustainably on the Roanoke College campus. This respondent also explained that it is difficult to do so on a student's budget.

Appendix 2b contains the list of LOHAS related behaviors and one can see how much the respondents can and at least state that they do actualize their values. While 63% of respondents agreed that they would prefer a hybrid car (see Appendix 2a), only 22% indicated that drive an energy efficient car. This is likely due to the fact that college students are often driving the car that someone has given them to drive or one that they can afford. Hence, it is not surprising that the cars they drive are not energy efficient. Many parents let their children take an old family car to college, while others may be motivated to buy them SUV's to be sure they are protected in case of an accident. Many of these cars are not energy efficient, nor are they the cars the students have chosen for themselves.

Impressive is the finding the 92% of the respondents always or frequently turn off the lights when leaving a room. This is behavior that has been instilled in all of us by our parents (or whoever is paying the electric bill!). Less common are the instructions from parents to turn off the water while one is brushing ones teeth. However, an impressive 80% of the respondents report that they always or frequently do that. Interestingly 25% of Business students said they only did it rarely or never.

Seventy-six percent of the respondents reported that they always or frequently recycle when possible. That is a positive finding but it would be easy enough to try to increase engagement in that behavior. 10% of Business students and 12% of Social Science students state that they recycle rarely or never.

Fewer students use a refillable water bottle, yet almost 70% engage in that behavior always or frequently. Again, that is a behavior that should be encouraged. Only 53% indicated that they always or frequently buy products that are made with recycled materials. That lower number may be due to the fact that it is many times not possible to do so, especially on and near Roanoke College's campus. Furthermore, they may actually be buying or using these products without

really knowing it. For example, many on campus are upset by all the use of paper, however, few realize that the paper used is mostly made from recycled materials. While this doesn't give us free rein to waste paper, it is at least a small contribution to living sustainably and many are doing it without even realizing it. There is a significant difference between the numbers of respondents that would buy a "Green" product if the price were equal to a conventional product and those that would buy the "Green" product if the price were slightly higher. This is a finding consistent with other research on this topic. As we emerge from the "Great Recession" we may become less price sensitive. LOHAS consumers tend to have higher incomes and educational levels and are therefore less price sensitive when it comes to "Green" products.

Differences Among the Groups

Interesting deviations from the main findings were uncovered using a cross tabulation of the data. While the percentages in Appendices 2a and 2b are for the entire group of respondents, there were some differences among the different groups of respondents (See Appendix 3).

Regional Differences

While 92% of the total group indicated that they ate nutritiously, only 50% of the respondents from Virginia (not including Roanoke) and the Northeast agreed with that statement. There has been considerable press about less nutritious eating habits of Southerners, but an increased percentage was not found for Roanoke or the Southeastern area. As for the Northeast (and Virginia for that matter) the anomaly might be explained by the fact that these respondents are young college students. Interestingly 70% of the respondents from Roanoke prefer veggies and dip to chips and dip while 50% from the Northeast preferred the chips.

Differences Among Disciplines

While 100% of all students strongly agreed, somewhat agreed and agreed that their health is valued. 20% from each academic discipline only agreed. Students in most disciplines agreed strongly or somewhat that they ate nutritiously. However, the Education and Social Science students disagreed by 33% and 25% respectively. Only 30% of Business students agreed about preferring veggies and dip to chips while the percentage for the total group was 58%.

Also interesting were the differences among students in different disciplines with respect to values about working conditions for producers of products and agreement about whether there is a water crisis. Over 76% of the respondents in the Math, Science, Liberal Arts and Social Science disciplines agreed that they were concerned about working conditions. However, only 27% of the Business respondents agreed. This is somewhat troubling as it is business that plans and implements production here in the US and abroad. This may be an area where business students need more guidance in the classroom about the way business should be conducted.

For the perspective on whether there is a water crisis, the results were paradoxical. The other disciplines agreed 66% and higher that there is one. Among the business respondents, there was just 45% agreement. Actually, science shows that water is constantly being recycled through evaporation and condensation. So, it is interesting that the science students were more in

agreement on that question than the business students. At Roanoke College, business students are not very big on science. Most of our students take only one lab science course due to the fact they have to take two Math courses to get into courses in our major. Yet their responses were more in line with current scholars in Sustainability Studies.

More Liberal Arts majors in terms of percentages would prefer a hybrid car that in the other disciplines. Interestingly Business and Education students only agreed by 54% and 0% respectively. Math and Science respondents agreed more enthusiastically (100% and 70% respectively) about preferring organic foods while Business and Social Science students preferred them less (9% and 25% respectively)

Most Roanoke College students exercise regularly and it has been named as one of the most fit campuses in the country. However, 27% of both the Liberal Arts and Business respondents indicated that they only do it rarely.

Finally when it comes to buying a “Green” product if the price is slightly higher, the Math respondent agreed s/he would and only 18% of the Business students did. The percentage for the entire group of respondents was 47%.

LIMITATIONS TO THE RESEARCH

As mentioned above there are many limitations to this research. Recognizing these and sharing them with students makes for a real authentic learning opportunity. Obviously the small sample size was a huge problem, however there was at least enough data to play around with it and make some inferences. The fact that there was likely significant self selection bias also makes the data difficult to generalize. Problems related to delays and restrictions put on the project by the Institutional Research office and the IRB could not be avoided but they did limit the research significantly.

STUDENT ANALYSES AND MARKETING AND PROMOTIONAL PLANS

Students in this class may or may not have had the Marketing Research class. Therefore, I didn't expect grand analyses from them all. Some of them just looked at the numbers in the Excel file and made some inferences while others did an analysis in SPSS and found some correlations and other relationships. I told them that they could do the analyses in teams if they needed or wanted help. However, the rest of the paper had to be their own work. They turned it in using “Turnitin.com” and no problems with plagiarism occurred. This was a good exercise that allowed them to share their skills and learn more about analyzing data and of course those who already knew (i.e. the ones who had had the marketing research class) were able to get more experience analyzing data and benefitted from being able to teach their classmates.

I was impressed with some of the marketing and promotional plans they provided. There was great range and much creativity shown in about half of the projects (See the list in Appendix 4).

Here I will describe a few of the most interesting ideas (from my perspective). One student found a refillable water bottle on line that was made of the very sustainable material of bamboo.

At first I was skeptical but the information she provided convinced me that it would be sanitary and durable and also “cool”. Another student proposed having water refilling stations installed around campus. There are some already installed, but it is a great idea to have more. It was interesting how these two ideas complemented each other. Another student proposed that Roanoke College develop a program that serves colleges worldwide that entails making certain students who are motivated to make a difference to be “Sustainability Ambassadors”. This student produced a very nice video ad to promote this. Another student proposed a business that is like the ZipCar concept where students or anyone can go online and find a car locally to rent for a limited period. He described the whole procedure that would occur virtually including a code that would need to be used to unlock and start the car. That has been successful elsewhere and could reduce the number of cars that are on campus.

CONCLUSION

While the research here suffers from numerous limitations, it did serve as a great teaching tool. The methodology of doing survey research was not only taught but it was also experienced by the students. They learned about and engaged in question formation and survey construction. Then they indirectly experienced the ups and downs of dealing with Academic Administration and IRB challenges. They got hands on experience with data analysis and were able to either do it for the first time or get additional experience with it. This helps the students more deeply integrate these skills into their marketing repertoire. Students acknowledged and articulated the limitations of the research and grappled with associated issues. Finally students were invited to think creatively about how marketers can benefit from examining consumer data and come up with appropriate plans using the knowledge they gain from the research. The generation of marketing and promotional plans gave them additional experience not terribly unlike what would be done in the real world.

APPENDIX 1

Gender

Female	Male
78%	22%

Class

Freshmen	Sophomore	Junior	Senior
12%	14%	30%	43%

Major

Science	Business	Liberal Arts	Social Sci	Education	Math
37%	23%	19%	18%	10%	2%

Hometowns

Roanoke	VA	NE	SE	Other
20%	33%	40%	6%	2%

APPENDIX 2A

Values

Value	Percentage Strongly Agreed, Agreed and Somewhat Agreed
Health	100%
Eating Nutritional Foods	92%
Enjoy Outdoors	98%
Prefer Organic Foods	70%
Prefer Org Personal Care Products	53%
Prefer Org Household Products	58%
Prefer Veggies to Chips	58%
Prefer a Hybrid	63%
Org Prods are Better for Envirnmt	88%
Care about Working Conditions	84%
There is a water crisis	80%

APPENDIX 2B

Behaviors

Behavior	Percentage Responding Always or Frequently
Drive Energy Efficient Car	22%
Turn Off Lights w/leaving room	92%
Turn Off H2O w/brushing teeth	80%
Recycle when possible	76%
Use Refillable H2O Bottle	69%
Buy Products made w/Recycled	53%
Buy Green if Price is Equal	86%
Buy Green if Price is a little more	47%
Exercise	58%

APPENDIX 3

The percentages are for those that agreed, somewhat agreed or strongly agreed.

Region/Value	Eat Nutritiously	Pref Veg to Chips	Pref Org Foods	Pref Org PC Prods
Roanoke	80%	70%	70%	40%
VA (not Roa)	56%	25%	69%	19%
NE	69%	50%	58%	32%
SE	100%	0%	67%	33%
Other	33%	33%	100%	100%

Region/Behavior	Drive Energy Efficient Cars
Roanoke	90%
VA (not Roa)	31%
NE	58%
SE	58%
	33%

Discipline/Value	Health	Eat Nutritiously	Pref Veg to Chips
Math	20% Only agreed	100%	100%
Science	20% Only agreed	100%	53%
Liberal Arts	20% Only agreed	100%	55%
Education	20% Only agreed	66%	0%
Business	20% Only agreed	54%	30%
Social Science	20% Only agreed	75%	25%

Discipline/Value	Working Conditions	Org Better for Envi	Water Crisis
Math	100%	100%	100%
Science	76%	76%	88%
Liberal Arts	81%	72%	66%
Education	100%	67%	66%
Business	27%	54%	45%
Social Science	86%	75%	88%

Discipline/Value	Prefer a Hybrid Car	Pref Organic Foods
Math	100%	100% agreed
Science	66%	70% agreed
Liberal Arts	81%	73%
Education	0%	33%
Business	54%	9% agreed
Social Science	62% agreed	25% agreed

The percentages in the following two tables on this page are for behaviors that are sometimes , frequently or always engaged in.

Discipline/Behavior	Drive Energy Eff. Car	Turn off Water –tb	Recycle w/ possible
Math	100%	100%	100%
Science	35%	94%	100%
Liberal Arts	54%	100%	100%
Education	0%	67%	100%
Business	27%	75%	90%
Social Science	50%	100%	82%

Discipline/Behavior	Exercise	Buy Green if P=	Buy Green if P>
Math	0%	100%	100%
Science	100%	94%	82%
Liberal Arts	73%	100%	63%
Education	100%	66%	67%
Business	73%	72%	73%
Social Science	88%	100%	100%

The percentages for these two Gender tables are for those who strongly agree, somewhat agree or agree with the values or those who always, frequently or sometimes engage in the behaviors.

Gender/Issue	Buy Green if P>	Prefer a hybrid	Energy Efficient Car
Male	73%	45%	54%
Female	80%	66%	54%

Gender/Issue	Care re: Working Cond	Prefer veggies
Male	82%	31%
Female	69%	46%

APPENDIX 4

Marketing Plan Products

1. LOHAS Ambassador Program
2. Whip Car – Peer to Peer Sharing
3. RC Ecobags – Cute idea about event where people come and customize their own
4. Bamboo Refillable Bottle
5. A Water Refilling Station
6. Toyota Prius Derby Days – To create more excitement about sustainability
7. Organic Food Tasting Program for RC students
8. Organic Vitamin Gummies
9. The Bobble Bottle
10. All Natural Fruit Bar available in vending machines all over campus
11. Line of Organic Spices and Foods, Personal Care Products and Kitchen Accessories
12. Computer made from Recycled Materials and that uses less energy
13. Subaru Forester
14. Seven Year Pen
15. Affordable Product Recycling Bins that are customized
16. PX90 Workout DVD
17. Tom's Shoes Made from Recycled materials

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Selecting a career in Marketing: The Perception of Millennial college students

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Abstract

The accelerated growth of particular Marketing sectors, the increasing rate of Baby Boomer retirement, the expansion of globalization all compounded by the acceleration of technology are escalating the demand for a broader range of talent in Marketing fields. An important source of talent to meet these opportunities in the field of Marketing exists in recent college graduates.

In order to effectively recruit college students for marketing positions, organizations need to understand the perceptions and career expectations that these particular students have. The researchers have undertaken this study on student career choice to help Marketing professions develop better recruitment practices for attracting talent and to assist business schools in understanding the career expectations of millennial students enrolled in a business major. The objectives of the study were to understand what expectations students have for their careers, how students perceive different career opportunities specific to the field of Marketing, how students assign importance among factors such as starting salary, work-life balance, benefits, training for development and how their perceptions may influence their career choice decision.

Introduction

The Millennial Generation, comprising of individuals born in the early 1990s (Smola and Sutton, 2002), has increasingly received scholarly attention in its ongoing entry into the workforce. Millennials have also been branded as Generation Y, Nexters, and the Nexus Generation (Burke & Ng, 2006; Zemke, Raines, & Filipeczak, 2000). The term “Millennials” is used in this study in an effort to maintain consistency with literature and mainstream media. There has been a significant amount of speculation and concern regarding Millennials despite their popularity in media and literature. The argument has been made, for example, that Millennials are disloyal, self-important, and impatient (Howe & Stauss, 2007; Ng, Schweitzer & Lyons, 2010). On the other hand, it has also been suggested that they are ambitious, that they value organizational training and development, they prefer meaningful work, and they seek personal fulfillment in their careers (Rawlins, Indvik, & Johnson, 2008).

Several studies have been conducted over the last 40 years regarding the attitudes of students and their perceptions of different careers as well as marketing (Kowske, Rasch, & Wiley, 2010). One study in particular stated that there is a negative perception among college students of marketing careers and that this perception has prevented individuals with corresponding skills and talents from pursuing marketing as a career field (Chuang, Walker & Caine-Bish, 2009). A subsequent examination of student attitudes toward marketing, as mitigated by college major and personal values, found that students had low opinions of marketing careers regardless of their major. Additional studies investigated the accuracy of role perceptions among students and confirmed that the stereotypical view of marketing as a “door-to-door activity” remained prevalent. One study in particular found that in the industrial marketplace, students

misperceived marketing careers when compared to the viewpoint of industrial sales persons (Honeycutt Jr., et.al., 1999). Students held a particular belief that a job in marketing was less likely to feature task variety and job security and were more likely to offer rapid advancement opportunities and significant leisure time.

The purpose of this study was to increase our understanding of the expectations Millennial students have for their careers, how students perceive different career opportunities specific to the field of Marketing, how students assign importance among factors such as starting salary, work-life balance, benefits, training for development and how their perceptions may influence their career choice decision. The following research questions guided our study: How do millennial students perceive choices of careers in Marketing? What expectations do Millennial students have for their careers in Marketing? What factors determine specific fields of Marketing over other careers in Marketing (i.e. sales, retail, market research)? Are there differences in career expectations and demographics among students who choose particular fields of Marketing as their destination career? How do students assign importance among factors such as starting salary, work-life balance, benefits, training for development and opportunity for advancement?

Background

Millennials in the Workplace

Millennials are the latest addition to the workforce and as such there has been increasing and varied interest and discussion about them. Kowske, Rasch and Wiley (2010) in their study of Millennials in teams, showed that they demonstrated higher levels of individualism than of collectivism. Hershatter and Epstein (2010) looked at ways in which Millennials approach work

and the concept of career and suggested that they integrate technology into their lives and expect organizations to accommodate their experiences, needs, and desires.

Kowske, Rasch, and Wiley (2010) found in their empirical study of the effect of generation on work attitudes that the millennial generation has a higher level of overall satisfaction with their jobs and job security, recognition, and career advancement than do members of Generation X and Baby Boomers. Millennial workplace expectations, communication styles, and relationships with team and organization members were discussed by Myers and Sadghiani (2010). In particular, they suggested that Millennials work well in teams, find motivation in carrying out significant tasks, have a preference for open and frequent communication, and have a solid comprehension of communication technology. Studies of Millennials by NG, Schweitzer, and Lyons (2010) found that they favor individualism and seek out career advancement and skill development while ensuring that their life away from work is meaningful and satisfying.

Career expectations

Sans consideration of market research, human resources literature has examined the career expectations of Generation Y. The argument has been made that those new to the marketing industry often enter into it accidentally rather than by way of a carefully planned career path (DeVecchio & Honeycutt Jr, 2000) and that marketing lacks a career profile among college students. Moreover, college students with an awareness of marketing as a potential career do not view it positively. In a study conducted in 2005, for example, it was found that 86% of marketing and business undergrads had the perception that marketing is dull, boring, mundane,

or tedious (Drinkwater 2005) and a Smola and Sutton (2002) study found that many respondents had similar perceptions.

Marketing was perceived as a long term career option for only 63% of respondents and 37% view the industry on the way to other more fulfilling career options. These fundamental problems are the epicenter of a generally negative perception of marketing as a career among marketing students, corporate decision makers, and others. Low awareness and poor image contribute to the problem which is indicative of the reported difficulties marketing firms have in the attraction and retention of high quality employees. Therefore recruitment and retention purposes necessitate an understanding of how the industry is perceived by potential employees.

Attitude and perception

Traditionally, marketing professionals have been typecast as aggressive, money-hungry, eager-to-sell, hardworking and ambitious individuals and statistical data drives these stereotypes. For example, a Gallup poll conducted in 2005 found that out of 26 possible careers, car marketing was the least ethical, with insurance marketing people voted 26 (as quoted in Honeycutt Jr, et. al, 1999). These types of perceptions were not exclusive to the United States as other cultures have shown evidence that selling as a profession is more of a designation of conceit or an insult. Research has shown that the negative opinion that many students maintain about marketing careers is supplemented by negative experiences that they have had with marketing people. DelVecchio and Honeycutt Jr (2000) noted that most customers see marketing people as poorly paid, uneducated, monotonous, high-pressure phone individuals who they would not want to meet again.

Finally, research has suggested that employers in their efforts to recruit new talent lack an ability to effectively communicate the demands, responsibilities, and rewards of and qualifications required for a career in marketing. As a result, the negative perceptions among students regarding marketing positions remain “untouched”. There are, therefore, two distinct repercussions of this type of phenomenon. The first is that students are hesitant to pursue jobs in marketing and the second is that those who do take marketing jobs demonstrate behavior in line with these perceived notions and thus perpetuate the negative marketing perception (Howe & Strauss, 2009). Comparisons are drawn in the second category of field studies between different sets of factors such as perceptions of male/female, business/non-business, enrolled/not-enrolled in selling courses and student/sales person.

Kowske, Rasch and Wiley (2010) conducted a series of studies that came to the conclusion that the underlying attitudes of males toward marketing was “...forceful, deceitful, holding positions with low status and prestige, with little security (Kowske, Rasch and Wiley, 2010). Conversely, Sandfort and Haworth (2006) found universal feelings of negativity among students regarding marketing careers regardless of their major field of study. Chuang, Walker and Caine-Bish (2009) compared the perception of marketing careers among students with other vocational needs and concluded that most have a positive attitude about marketing jobs. In another study, Chuang, Walker and Caine-Bish (2009) compared the perceptions of both sales people and students regarding selling and discovered that there were misconceptions among students regarding marketing jobs when compared with that of sales people.

Preferential differences were also found to exist among students in regards to seven specific marketing jobs (Chuang, Walker and Caine-Bish, 2009). A comparison of the sexes shows a conflict in the findings. While Kowske, Rasch and Wiley (2010) discovered greater

reluctance among females than males in the acceptance of marketing positions, Rawlins, Indvik and Johnson (2008) discovered that college females were more likely to have a positive opinion about personal selling than males. In other studies, African-American students were shown to hold a lower preference for marketing jobs than Caucasians but that these attitudes become more positive upon the completion of marketing-related courses (DeVecchio & Honeycutt Jr, 2000).

Methodology

For the present study, we surveyed undergraduate students at two universities' enrolled in undergraduate classes related to business. Data were collected on a voluntary basis, in the form of a survey administered during fall semester 2013. The participants surveyed were upper-division (e.g., junior, senior, and post undergraduate) students in business or marketing related courses because they would be making career decisions soon and/or would soon be in the transition stage from school to work. Students were contacted via email regarding participation in the study and directed to the digital survey.

This study utilized a variant of a questionnaire, asking a similar set of questions about college student perceptions of retail careers, previously developed by Swinyard, Langrehr, and Smith's (1991). The survey instrument included items that measured students' perceptions of various items. These included perceptions of marketing careers, career expectations, career interest, and sources influencing students' career choice decisions.

This descriptive study was designed to increase our understanding of the expectations Millennial students have for their careers. The study also investigated their perceptions of opportunities available to students, determined how students assign importance among factors

such as starting salary, work-life balance, benefits, training for development and how their perceptions may influence their career choice decision.

Population

A convenience sample of 120 students in the class of two Universities' was used in this study. The University of North Carolina-Pembroke, a four year public University and Methodist University, a four year private institution. Overall 120 students participated in the survey. Students at each university were invited to participate in a digital survey through an email request. No names or identifying data was requested on the instrument. Student's voluntary participation in the survey served as their consent. Students' responses were anonymous and all results were held confidential. The students experienced no risks or benefits from their participation in the study.

Data Analysis

The purpose of this study was to analyze data to indicate the increase our understanding of the expectations millennial students have for their careers.

The data were analyzed using SPSS 20.0 for Windows. Descriptive statistics were used to present data that projected the demographic characteristics and responses of the sample. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used, to describe how students perceive different career opportunities specific to the field of Marketing, to describe the influence of career choices, to describe how students assign

importance to different factors such as starting salary, work-life balance, benefits, training for development and how their perceptions may influence their career choice decision.

Demographic Profile

Demographic data were collected to identify the sample, to explore similarities and differences within the sample, and to determine the possibility of generalizing the results beyond the sample.

A total of 120 surveys were submitted. Eleven surveys were found to be incomplete and were not included in the data analysis. Therefore, this study was limited to 109 participants. Out of 109, forty two students (38.5%) were enrolled at Methodist University, and sixty seven students (61.5%) were enrolled at The University of North Carolina-Pembroke. There were approximately equal numbers of males (59) and females (50), the majority of them being either of white (64.2%) or African American (19.3%) ethnicity, with over 69% of the sample comprising of students aging between 18-25 years. The sample was generally young, with more than eighty two percent (82.6%) under the age of 34, and approximately seventy percent (69.7%) under the age of 25. The current grade level of participating students was Senior 58 (53.2%), Junior 36 (33.0%), Sophomore 12 (11.0%), and Freshman 2 (1.8%). About 15.6% of the respondents had a GPA between 3.6 and 4.0; 33.9% had a GPA between 3.1 and 3.5; 34.9% had a GPA between 2.6 and 3.0; 14.7 had a GPA between 2.1 and 2.5; and only one student had less than a 2.0 GPA.

Respondents of this survey had the following current employment status: 30 (27.5) were employed full-time, 33 (30.3%) were working part-time, 42 (38.5) were not working and continuing their education full time, and one (0.9%) was retired but continuing his education.

Respondents' length of employment varied from less than 1 year to more than 10 years. 26 (23.9%) respondents, reported being employed for more than 10 years. 26 (23.9%) were also employed for 6 to 10 years. Thirty respondents (27.5%) were employed for three to five years, 13 students (11.9%) were employed 1 to 2 years, and 10 of them (9.2%) reported being employed for less than one year. The majority of subjects indicated their career intent to be in Business administration (57.8%), Management (15.6%), or Marketing (11.0%).

Which University do you attend?

	Frequency	Percent	Valid Percent	Cumulative Percent
Methodist University	42	38.5	38.5	38.5
University of North Carolina-Pembroke	67	61.5	61.5	100.0
Total	109	100.0	100.0	

What is your gender?

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	50	45.9	45.9	45.9
Male	59	54.1	54.1	100.0
Total	109	100.0	100.0	

What is your current status in college?

	Frequency	Percent	Valid Percent	Cumulative Percent
Freshman	2	1.8	1.9	1.9
Sophomore	12	11.0	11.1	13.0
Junior	36	33.0	33.3	46.3
Senior	58	53.2	53.7	100.0
Total	108	99.1	100.0	
Missing System	1	.9		
Total	109	100.0		

What is your Major?

	Frequency	Percent	Valid Percent	Cumulative Percent
Accounting	5	4.6	4.7	4.7
Business Administration	63	57.8	58.9	63.6
Economics	3	2.8	2.8	66.4
Entrepreneurship	4	3.7	3.7	70.1
Management	17	15.6	15.9	86.0
Marketing	12	11.0	11.2	97.2
Sport Management	3	2.8	2.8	100.0
Total	107	98.2	100.0	

Missing System	2	1.8	
Total	109	100.0	

Which of the following best represents your racial or ethnic heritage?

	Frequency	Percent	Valid Percent	Cumulative Percent
American Indian or Alaska Native	6	5.5	5.5	5.5
Asian	3	2.8	2.8	8.3
African American	21	19.3	19.3	27.5
Native Hawaiian or Other Pacific Islander	3	2.8	2.8	30.3
White	70	64.2	64.2	94.5
Hispanic	6	5.5	5.5	100.0
Total	109	100.0	100.0	

How old are you?

	Frequency	Percent	Valid Percent	Cumulative Percent
18-25	76	69.7	69.7	69.7
26-34	14	12.8	12.8	82.6
35-54	15	13.8	13.8	96.3
65 or over	4	3.7	3.7	100.0
Total	109	100.0	100.0	

What is your current cumulative GPA?

	Frequency	Percent	Valid Percent	Cumulative Percent
Between 3.6 and 4.0	17	15.6	15.6	15.6
Between 3.1 and 3.5	37	33.9	33.9	49.5
Between 2.6 and 3.0	38	34.9	34.9	84.4
Between 2.1 and 2.5	16	14.7	14.7	99.1
Less than 2.0	1	.9	.9	100.0
Total	109	100.0	100.0	

How long have you been working?

	Frequency	Percent	Valid Percent	Cumulative Percent
More than 10 years	26	23.9	24.8	24.8
6-10 years	26	23.9	24.8	49.5
3-5 years	30	27.5	28.6	78.1
1-2 years	13	11.9	12.4	90.5
This is my first year	10	9.2	9.5	100.0
Total	105	96.3	100.0	

Missing System	4	3.7	
Total	109	100.0	

What is your current employment status?

	Frequency	Percent	Valid Percent	Cumulative Percent
Full Time	30	27.5	28.3	28.3
Part Time	33	30.3	31.1	59.4
Retired	1	.9	.9	60.4
Full time student	42	38.5	39.6	100.0
Total	106	97.2	100.0	
Missing System	3	2.8		
Total	109	100.0		

Influence of Others

Please evaluate each of the following sources regarding its influence on your choice of career

Descriptive Statistics

	N	Mean	Std. Deviation
Work experience	98	4.05	1.019
Personal experience as a customer	97	3.70	1.101
Degree-related/ Curriculum materials	97	3.65	1.146

Former or current employer	98	3.56	1.227
Teachers' advice	98	3.39	1.224
Friends working in the field	98	3.35	1.176
Internship experience	98	3.35	1.514
Exposures to careers in media (e.g., TV, magazines, newspapers)	98	3.21	1.254
Family/ relative working in the field	98	3.20	1.407
Career advisor's advice	98	3.18	1.279
Company web sites	97	3.06	1.162
Exposures to careers on campus (e.g., info sessions, guest speakers)	97	3.00	1.307

Although all students make career choice decisions, they often experience pressure from a variety of sources. Responses via a Liker type scale demonstrated the levels of influence students attributed to selected societal factors in the decision to select their careers. Student responses regarding these factors are ranked ordered by their mean. Exposure and opportunity play a part in career choices. Analysis of the data indicates that the students reported ‘work experience’, as very influential, making it the most highly rated response with a mean of 4.05 out of 5. The second most influential response was ‘personal experience as a customer’ with a mean of 3.70 out of 5 followed by ‘Degree-related/ Curriculum materials’ with a mean of 3.65. The fourth most rated influential response according to a mean of 3.56 was ‘former or current employer’. Teacher’s advice was ranked as fifth influential response with a mean of 3.39. Other notable factors that influenced student’s career choices were friend’s working in the field, Internship experience, exposures to careers in media (e.g., TV, magazines, newspapers), family/ relative working in the field, career advisor's advice, company web sites, exposures to careers on

campus (e.g., info sessions, guest speakers) with mean importance of 3.35, 3.35, 3.21, 3.20, 3.18, 3.06 and 3.00. Existing career models have indicated that family/friends/relative working in the field sometimes influence children’s career choices as children follow in their footprints. However, not the vast majority of students in this sample reported that their career choice is influenced by either friends or family member working in the same field as indicated by mean of 3.35 and 3.20 respectively. As a collective, the student sample under study rated the career advisor’s advice, company website and their exposures to careers on campus (e.g., info sessions, guest speakers) as the least influential factors of all the societal items under consideration.

The data revealed that the parents, family/friends in industry, industry representatives or advisors are not the one who influenced career choice of students in the sample but rather their own experiences guided them to make career choices.

Important Factors

Please rate the extent to which each statement is a consideration in your career decision -

Descriptive Statistics

	N	Mean	Std. Deviation
Opportunities for advancement (I.e. future career progression, future earnings potential)	99	4.38	1.037
Salary and Benefits (I.e. starting salary, potential salary, perks and benefits)	99	4.29	1.023
Work environments (I.e. flexible working hours, pleasant working conditions)	99	4.27	1.067

Security (I.e. being sure I will always have a job, being certain of keeping my job)	99	4.24	1.089
Leadership development (I.e. existing role models for projected career paths, profit/loss responsibility, training programs for professional growth)	99	4.14	1.107
Challenging work (I.e. doing exciting work, doing a variety of things, doing a challenging work)	99	4.02	1.078
Social benefits (I.e. making the world a better place, being of service to society, helping others)	99	3.95	1.110
Status (I.e. being looked up to by others, gaining respect)	98	3.80	1.139
Coworker relationship (I. e. getting to know fellow workers quite well)	99	3.75	1.128
Autonomy (I. e. doing my work in my own way, determining the way my work is done)	99	3.60	1.059
Valid N	98		

On the survey the researchers asked students to rate the importance of different factors/statements in their career choice. The ratings were classified by respondents selecting the following choices: very unimportant, unimportant, neutral, important, and very important. Findings were assessed by the researcher ranking by mean the factors that the respondents rated. According to respondents, the highest rated/most important factor was “opportunities for advancement (i.e. career progression, future earning potential)” with a mean of 4.38 out of 5 (n=99). The next highest ranked factor was the “salary and benefits (i.e. starting salary, potential salary, perks and benefits” with a mean of 4.29 out of 5.00 (n=99). The third highest ranked factor was “work environment (i.e. flexible working hours, pleasant working conditions” with a

mean of 4.27 out of 5.00 (n=99). The fourth highest ranked factor was “Security (I.e. being sure I will always have a job, being certain of keeping my job)” with a mean of 4.24 out of 5.00 (n=99). “Leadership development (I.e. existing role models for projected career paths, profit/loss responsibility, training programs for professional growth, the responsibility) was fifth in rank with a mean of 4.14 out of 5.00 (n=99). The next ranked factors that were important for student’s career choice were Challenging work, Social benefits, Status, Coworker relationship, and Autonomy with mean importance of 4.02, 3.95, 3.80, 3.75 and 3.60 respectively. These findings suggest that students want their field to be rewarding and that they offer opportunities for advancement, flexible working conditions, as well as guarantee for job security.

Fields of Marketing

Please rate the extent to which each statement describes your interest about a career in this field

Descriptive Statistics

	N	Mean	Std. Deviation
Retail Marketing	98	3.07	1.409
Brand Management - Products or Services	96	3.05	1.301
Marketing Consulting	98	3.01	1.351
Advertising	97	2.91	1.284
Sales (especially entry level undergraduate positions)	96	2.86	1.381
High-Technology Marketing	98	2.73	1.328
Market Research	98	2.69	1.179

Pharmaceutical Marketing	97	2.23	1.366
Valid N	92		

On the survey, the researchers asked students to rate different fields of marketing to describe their interest about a career in this field. Respondents were asked to select: not at all or very slightly, a little, moderately, quite a bit, and very much. The findings were assessed by the researcher ranking these fields that the respondents rated. According to respondents, the highest rated marketing field was “Retail Marketing” with a mean of 3.07 out of 5.00. The next highest ranked marketing field was the “Brand Management-Products or Services” with a mean of 3.05 out of 5.00. The third highest ranked field was “Marketing Consulting” with a mean of 3.01 out of 5.00. Advertising was fourth in rank with a mean of 2.91 out of 5.00. Other fields followed as Sales (especially entry level undergraduate positions), High-Technology Marketing, Market Research and Pharmaceutical Marketing with mean ratings of 2.86, 2.73, 2.69, and 2.23.

Perception about a Career in Marketing

Please rate the extent to which each statement describes your perception about a career in Marketing-

Descriptive Statistics

	N	Mean	Std. Deviation
Creative	100	4.48	.847
Competitive	99	4.38	.765
People oriented	100	4.27	.908
Hard work	99	4.22	.828

Rapidly changing	99	4.21	.961
Challenging tasks	100	4.16	.929
Interesting	100	4.02	1.005
Rewarding	100	3.98	1.005
Significant management responsibility	99	3.97	1.015
High growth	100	3.88	1.057
Good training for professional development	99	3.87	1.027
Good salary	98	3.55	1.056
Contributing to a community	100	3.47	1.068
Fast promotion	99	3.43	1.002
Honest	99	3.32	1.211
Stable	100	3.20	1.101
Routine	100	2.75	1.175
Long, unsocial hours	100	2.64	1.087
Limited advancement opportunities	100	2.39	1.127
Poor Salary	99	2.37	1.130
Lacking prestige	100	2.17	1.083
Boring	100	1.95	1.029

On the survey the researchers asked students to indicate their perceptions about a career in Marketing. The students were asked to rate a series of general questions to help establish their perception of the Marketing career. The ratings were classified by respondents selecting the

following choices: not at all or very slightly, a little, moderately, quite a bit, and very much.

Overall students had a very positive perception of the industry as they defined it as ‘creative’, ‘competitive’, ‘people oriented’, ‘hard work’, ‘challenging tasks’, ‘interesting’ and ‘rewarding’ with mean ratings of 4.48, 4.38, 4.27, 4.22, 4.21, 4.16, 4.02 and 3.98 respectively. Overall students appeared to have a positive view of the marketing industry and appeared to be aware of opportunities available to them within the industry.

Conclusion

The data revealed that the parents, family/friends in industry, industry representatives or advisors are not the one who influenced career choice of students in the sample but rather their own experiences guided them to make career choices. Students indicated that their career must offer them opportunity to grow and to become an integral part of the industry. Students desire their career field to be rewarding and to also offer opportunities for advancement, flexible working conditions, as well as guarantee for job security. According to the positive results reported by students in this study, they appear to have a reasonably confident outlook about their employment opportunities in the field of marketing. However, lower mean ratings of different fields of marketing suggest that students are only moderately interested in them. These findings may be related to their lack of awareness and knowledge of different fields of marketing.

These results also indicate that companies face a multitude of challenges in order to enhance the attractiveness of a marketing career to students coming out of business schools. Without exposure to a variety of marketing positions and the opportunities thereof, students remain fixed in their limited and negative perceptions of the industry. The greater the demand placed on business schools by global corporations that hire graduates of those schools, the more

changes in curriculum can be implemented. If business schools do not generate a greater awareness and understanding among students regarding the viability of marketing careers, the most talented and qualified students will be motivated toward other careers and global marketers will be limited to hiring less qualified students and hence proliferate a lower quality workforce.

Additionally, marketing management positions are not readily available to new graduates and thus students need to be made aware of more viable career choices (Myers & Sadaghiani, 2010). These business students and the negative perceptions thereof may be compounded by cultures in which marketing is seen as nothing more than retailing and door-to-door selling and changing that perception so that a culture sees the merits of and value in a marketing career could prove to be a slow and arduous process. The provision of internships for students by marketers and the arrangement of relationships with business schools that facilitate open dialogue about the needs of certain types of graduate skills are likely to enhance the overall marketing industry image and attract a greater talent pool.

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Managers and Fallacy of Composition

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Abstract

According to the over production theory and the theory of the tendency of the rate of profit to fall managers behave rationally, that is they try to maximize profits. But another problem arise at the sectoral and/or economy level as a result of their rational behavior: overproduction and the tendency of the rate of profits to fall. This is we called fallacy of composition. According to another heterodox theory, Hayman Minsky's financial instability thesis, some managers even behave irrationally. Recent developments in Managerial literature, such as stakeholder participation cannot solve these problems. They can solve only transparency, accountability and conspiracy problems. There are some new approaches for "management" in management science such as governance and stakeholder problem. This paper describes and discusses these new approaches.

Introduction

We define capitalism as waged labor as accepted by many political economy theoreticians. That is, capital, the value which can accumulate itself, can only exist when there is waged labor. If so, can we define for example 20th Century socialism experimentation as capitalism? Both yes or no. It was capitalism, because it was based on waged labor. But it collapsed because the rate of profit was no longer high enough to cover their cost of equipping themselves for international competition.¹ That is, there is no profit maximization in these countries. So capitalism is the waged labor system which economies can survive only by profit maximization.

Theoretically, it is possible a capitalist system which profit maximization is not required, that is there is no international competition. For now, it is out of sight and if we assume international competition, profit maximization is required to survive. If this context changes, we may have another variant of capital order². But if we stay in capitalism, only profit maximizing economies can survive. Therefore, in this paper we assume that firms' and

¹ Harman,C. "The Rate of Profit and the World Today", *International Socialism*, (Summer) 2012, v.115,

² For the difference between capital order in general and capitalism see Meszaros,I., *The Structural Crisis of Capital*, Barnes & Noble, 2009.

managers' goals are identical and it is profit maximization. We try to show that if heterodox theories about how capitalism works is correct, then the "rational" behaviors of managers lead to different outcomes which they cannot predict at the level of economy in general, in short there is fallacy of composition.

Main theories of Heterodox Economics on How Capitalism Works

We shortly look at seven main theories of heterodox economics (more correctly: of heterodox political economy) about how capitalism works. These are: 1. Giovanni Arrighi's "Capital Cycles Theory" (a World-System Approach) *and* "Overproduction Theory" (a Marxian approach), 2. "Tendency of the Rate of Profit to Fall Theory" (a Marxian approach), 3. "Underconsumption Theory" (a Keynesian and 'Marxian' approach), 4. "Technological Cycles Theory" of Charlotta Perez (an Evolutionary Economics approach), 5. Hayman Minsky's "Theory of Firm" (a post-Keynesian approach) and 6. "Declining Investment Opportunities" approach (for example, Harry Shut). Throughout the paper, we assume that the aim of firms and managers are identical, which is profit-maximization.

1. According to Giovanni Arrighi, we have four capital cycles in the history of capitalism: Genoese-Iberian cycle, United Provinces cycle (Dutch cycle), United Kingdom cycle (British cycle) and United States cycle. Every cycle has two phases: material expansion and financial expansion. During the beginning of material expansion there are increasing returns to capital. Profits are reinvested to material production;

"Knowingly or unknowingly, the system's main centres cooperate in sustaining one another's expansion. Over time, however, the investment of an ever-growing mass of profits in the further expansion of trade and production inevitably leads to the accumulation of capital 'on a scale beyond the normal channels for investment', as Braudel put it, or, as we would say, over and above what can be reinvested in the purchase and sale of commodities without drastically reducing profit margins. Decreasing returns set in; competitive pressures on the system's

governmental and business agencies intensify; and the stage is set for the change of phase from material to financial expansion”.³

The above is the definition of over-accumulation and/or overproduction in the words of Braudel and Arrighi. As you know, we assume that all managers behave rational. If they behave rational, how can over-accumulation/overproduction arise?

To understand this, now we turn to Simon Clarke;

“ The tendency to the over-accumulation of capital is not determined by the anarchy of the market, but by the contradictory form of capitalist accumulation, as the pressure of competition leads individual capitals to seek constantly to revolutionise and expand the forces of production without regard to the limits of the market, so that new methods of production are only generalised through the devaluation of capital, the liquidation of productive capacity, the intensification of labor and the “redundancy” of workers. This is the essential form of accumulation in all branches of production”.⁴

Some managers use new technology without regarding the limits of the market. This is rational, because due to product differentiation or lower cost of production, they think that they can sell all of the output they produce. Others begin to think that if they use the same technology, then they can succeed too. So we have overproduction.

David Harvey explains over accumulation of capital in simpler terms;

“In the absence of any limits or barriers, the need to reinvest in order to remain a capitalist propels capitalism to expand at a compound rate. This then creates a perpetual need to find new fields of activity to absorb the reinvested capital: hence ‘the capital surplus absorption problem...if growth does not resume, then the over accumulated capital is devalued

³ Arrighi,G.and G:W:Moore, “ Capitalist Development in Historical Perspective”, *Phases of Capitalist Development – Booms,Crisis and Globalizations* (eds. Albritton,R., M.Itoh, R.Westra, A.Zuege), Palgrave, 2001. pp. 56-76.

⁴ Clarke,S. “Overaccumulation, Class Struggle and the Regulation Approach”, *Capital &Class*, v.36, 1988, p. 21.

or destroyed...Devalued capital can exist in many forms: deserted and abandoned factories, empty office and retail spaces, surplus commodities that cannot be sold, money that sits idle earning no rate of return, declining asset values in stocks and shares, land, properties etc...the 50 trillion dollar or so loss in global asset values so far estimated for the current crisis is a case in point”.⁵

This is a typical example of “fallacy of composition”. That is, everybody behaves rationally, but the sum of their plans, if realized, leads to a different result, in our case, to overproduction. But overproduction cannot last forever. As we see above in the quotation from Clarke and Harvey, the result is devaluation of capitals and liquidation of productive capacity, that is, waste of scarce resources.

Let’s look at an example: According to the research company CSM, there were 34 million cars unsold in 2008. This amounts to the output of 100 car factories. And managers continue to invest in car industry.⁶ One can say that what “overproduction leads to devaluation of capitals and liquidation of productive capacity” means in fact, is that supply adjusts to demand. Yes it does. But according to mainstream theory, managers determine their output level in terms of demand. This is one of the building blocks of the mainstream theory, in fact, the basic one. Of course it is not possible that supply always equals to demand, we need an adjustment process. Here, there is no substantial amount of waste. Devaluation of capital and liquidation of productive capacity is trivial, we can even neglect it. We can call this smooth adjustment. For market is a constant matching process of supply to demand. But according to the overproduction theory, the adjustment process can lead to devaluation of capital and liquidation of productive capacity, that is, the waste is not trivial, in real world, it is huge. We can call this harsh adjustment. So, according to mainstream theory, the decisions of managers lead to smooth adjustment, and according to overproduction theory, their decisions lead to harsh adjustment.⁷

⁵ Harvey,D., *The Enigma of Capital*, , New York, Oxford University Press, 2010, p.45-46.

⁶ Foster, J.B, “*Büyük Bilmeyen Kriz*”, Monthly Review (Turkish edition), (September) 2012, pp.3-36

⁷ If all sectors of an economy expand at the same rate, there is no overproduction because they buy each others’ output. But the assumption that all sectors expand at the same rate is very unrealistic. So the theory of overproduction is a theory of uneven development at the same time.

2. Another variant of Marxian theorists emphasizes the importance of the tendency of the rate of profit to fall. In short, this theory says that labor-saving technological change leads the rate of profit to fall. But this is just a tendency since there are countertendencies, such as pressing down the wages, cheapening of capital goods, etc. The result is the interplay of these countertendencies and the labor-saving technological change. Here again, we have a “fallacy of composition”. Managers behave rational to use advanced technologies. But when all or most of them use advanced technologies, downward pressure on the rate of profit arises. This is because the source of profits is surplus value, the source of surplus value is living labor, and labor-saving technological change amounts to a falling share of living labor in the value created. So profit rates fall.

There is ongoing debate between radical economists over why profit rates fall. Some of them reject the tendency of the profit to fall due to value theory of labor.⁸ But “Historical research is unequivocal in this regard: every study of the longer term secular movement of the profit rate has confirmed that the capitalist system, in the course of its evolutionary development, passes through periods of rising and falling profitability, with each phase lasting two to three decades”⁹. There is also a debate on the longevity of profit cycles. But the fact remains that there are profit cycles. Here again, managers try to maximize their firm’s profit rate, but profit rates fluctuate continuously.

3. Some Marxian theorists claim that there is under-consumption in capitalism which is an insufficient aggregate demand to buy the current output. One of the two main reasons of under-consumption is compulsory hoarding of wealthy classes (their incomes are so large that they cannot spend all of it; in mainstream theory’s terms, saving and investment curves cannot interact by interest rate movements, as we witness today).¹⁰ The other reason is wage level. Wages are determined by productivity, the general balance of class forces, population rate, unemployment rate, etc. We think that unemployment rate plays a dominant role here. The higher the unemployment rate, the lower the real wages. We can safely assume that managers have an inherent tendency to press down the wages. When there is unemployment, they can do this. But this leads to under-consumption. So we have another fallacy of composition here.

⁸ For these debates see ; Kliman, A. “Okishio Theorem” 2001, <http://akliman.squarespace.com/writings>

⁹ Beitel, K. “The Rate of Profit and the Problem of Stagnant Investment: A Structural Analysis of Barriers to Accumulation and the Spectre of Protracted Crisis” *Historical Materialism*, 2009, v.17 i.4, pp.66-100

¹⁰ In developed economies real interest rates has fallen during recent years but there is no corresponded investment rises. The huge amount of savings especially in East Asian countries goes to USA treasury bonds.

Note: some economists use overproduction and overconsumption interchangeably. But this is misleading? Overproduction appears as overabundance of goods and services, so many people suppose that this is an under consumption and see the rise of wages as a remedy.

4. One of the leading theorists of Evolutionary Economics, Charlotta Perez, tells us a different story.¹¹ She explains the life of capitalism by technological cycles. Here we have no fallacy of composition. This time, the behavior of the profit-maximizing managers does not lead to something which they are not aware of or which is bad for the society. To sum up the technological cycles theory we have The Industrial Revolution of 1771, The Age of Steam and Railways of 1829, The Age of Steel and Heavy Engineering of 1875, The Age of Oil, Autos and Mass Production of 1908, and The ICT revolution of 1971. Every phase has its golden age and bubbles. This is an interesting theory and of course not as simple as I have presented. But our problem is managers, so this much about evolutionary economics should suffice for our purposes.¹²

5. Hayman Minsky held that;

“over a prolonged period of prosperity, investors take on more and more risk, until lending exceeds what borrowers can pay off from their incoming revenues. When over-indebted investors are forced to sell even their less-speculative positions to make good on their loans, markets spiral lower and create a severe demand for cash – an event that has come to be known as a “Minsky moment”.”¹³

We know that many economists explain 2008 Great Recession by this thesis. According to them, we were in a Minsky Moment in 2008. But if Minsky is correct, we are in trouble again. Some managers invest their money in areas that are too risky so that many of them fall bankruptcy, and this triggers a crisis. This is another fallacy of composition. Once again, a race begins which only some managers can win. But there are many losers; it is they who trigger the crisis.

¹¹ Perez, C. *Technological Revolution and Financial Capital: The Dynamics of Bubbles and Golden Ages*, , Edward Elgar, Cheltenham, 2002.

¹² For Perez, an institutional social framework must be created that proper the technological change. Every technological revolution needs its own social-institutional structure. According to Perez, if these institutional – social transformations succeed, a new golden age can begin in 2014 or 2015.

¹³ www.levyinstitute.org/about/Minsky

6. Harry Shut explains the declining productive investments of early 2000's by declining investment opportunities.¹⁴ For example, he says that we have no new sectors that have strong employment effect, which has strong backward and forward links in recent decades. We just have IT technologies, and they have no such strong effects.¹⁵ This also an interesting theory for us, but here managers seem innocent as in Peres' theory. We cannot put the blame on managers about the insufficient R&D. Steve Job, as a manager, is an exception. Isn't he?

When we consider these theories, except the Evolutionary Theory and the Declining Investment Opportunities Theory, there is a fallacy of composition problem with managers. That is, they behave rationally, but as a result of their rational decisions, a very different picture arises when we look at the sector level. One exception is Minsky's theory. Here there are some managers who we can regard as too risk inclined in their behavior. This risk-inclination leads to a Minsky moment, that is, when many other firms fall into bankruptcy due to behavior of these managers. Here it is difficult to say speculative and Ponzi firms managers behave rationally.

Conclusions

There are production cycles, profit cycles and technological cycles inherent in capitalist economies. The production and profit cycles are the result of managers profit-seeking rational behaviors as we have seen above. There are some new approaches for "management" in management science such as governance and stakeholder problem. These kind of approaches can solve the transparency problem, accountability problem and collusion problem. But when these new approaches begin to prevent managers for profit maximization, default of the relevant firms is inevitable. Because they cannot survive in the context of international competition and if there is no international competition we have another variant of capital order but it is not "capitalism" and it is out of sight for now.

One option is to change the parameters of international competition. For example Basic Income and Tobin Tax, if accepted internationally can change the parameters of the

¹⁴ We have no saving problem here. We can safely claim that investments can be realized without saving. An entrepreneur, collateral, and a good investment project are enough, as seen in real world.

¹⁵ Shutt,H. *Kapitalizmle Derdim Var (Trouble with Capitalism)*) Kitap Yayınevi, Istanbul 1988, p. 43-47.

game, that is international competition. These kind of changes may help to reduce poverty substantially. Some new parameters about environmental problems also can change the parameters of the game. But production and profit cycles survive. In other words new rules such as governance, stakeholder participation to management, Basic Income, Tobin Tax and environmental criterias will have positive effects to our problems of poverty, environmental damage, accountability, transparency plus underconsumption.. Even Minskian speculative and Ponzi firms can be prevented thanks to stakeholder participation to management. But overproduction and tendency of rate of profit to fall remains. Because these are the results of the core mechanisms of capitalism.

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www.levyinstitute.org/about/Minsky

Social Media and Project Management

The Next Generation Communication Tool to Enhance an Evolving Relationship and Improve Project Success

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Social Media and Project Management:
The Next Generation Communication Tool to Enhance an Evolving
Relationship and Improve Project Success

Abstract

The research agenda on the impact of social media in the workplace has focused on identifying ways in which the latest modes of shared communications has influenced productivity in project development, testing, and implementation. Traditionally, a written formal project management communication plan has been key in supporting the integration management that coordinates the project from beginning-to-end to not only ensure a greater level of collaboration when managing project scope, schedule, budget and quality, but to provide a greater sense of confidence in completing the project successfully. However, how beneficial are social media networks in improving the project team's dynamics which are important to successfully managing scope verification, budget adherence, and schedule compliance? How will these tools support the techniques that play a significant role in ensuring greater user involvement, senior management commitment, and user/system requirements? Whereas recognition that social media networks are playing a greater role in the work environments, the degree to which it has and perhaps may become commonplace has not been vetted sufficiently to determine what might be the best social media network(s) for achieving the greatest positive value to managing projects. The purpose for this research is to recognize what types of social media networks have been used and accepted as potential models for improving project management, and secondly, to promote a discussion to advance research paradigms for investigating the impact of implementing social media networks in project management.

Introduction and Rationale for Social Media Networking

The United States population is currently about 316 million¹, of which the total number of adults between age 21 and 65 is about 200 million and who represent 91% or about 180 million, use cell phones as reported by the Pew Research Center's Internet and American Life Project. The report asserts that '...the cell phone is the most quickly adopted consumer technology in the

history of the world--...”, and except for a demographic segment, “...people ages 65 and older; those who did not attend college; those living in households earning less than \$30,000; and those in rural areas. [and] ... women are statistically significantly less likely to own cell phones than men.”² cell phones have been accepted as an important component in establishing and sustaining social relationships. The predominant users are individuals younger than 55 years of age, both white and black, college educated, and earn more than \$50,000.³ Where you live does not make a difference.

The cell phone is the basic building block for first-order social media application—basic communications, texting, image capture, and storage; The natural extension of the telephone with the added convenience of non-tethered mobility has led to an ubiquitous technology that is pervasive on a global basis. The evolution of that building block as led to the use of smartphones, personal data assistants, tablets, iPads, etc, and with them, the adoption of more sophisticated and intelligent social media applications that enhance the ability for individuals to collaborate on many levels of information exchange. According to the Pew Research Center’s Internet and American Life Project tracking survey conducted in spring 2013, 40% of cell phone users access a social networking site via their phone.⁴ The report also found a 40% jump in use of social networking sites by 18-29 year college age old internet users. This implicit corollary is today’s and future career professionals will be equipped with the knowledge, skills, and the confidence in using an infrastructure that may provide project managers the necessary conditions for a more responsible communications management protocol.

The derived benefits of social networking imply that while individuals may maintain protective of their personal locus of control, they can use the attributes afforded by social networking to develop ‘necessary connectivity’ when required to achieve established goals/objectives/norms with positive outcomes that reflect the power of synergism. The Pew report also supports the notion that instead of workgroups that do not provide a sense of community and trust for working toward a common goal, the emulation of real teams is achieved through an evolved sense of social support and the ability to develop close relationships that encourage a community of trust and sharing.⁵ In particular, information technology (IT) projects often require that the project team operates in isolation from one another; and, quite often the case is the project encompasses a virtual team with members from diverse geographic and temporal environments. Managing projects under these conditions has become the norm, not the unique. Equipping project managers with tools and techniques that take advantage of the positive attributes of social media networking could provide a necessary step in the direction of overcoming one of project management’s greatest criticisms, ‘lack of timely and accurate communications.’

Social Media Usage

According to Jeff Bullas, the most significant social media facts and statistics in 2013 may include insight into the most likely transition scenario by the most experienced project managers

that are responsible for the billions of dollars of private and public sector project initiatives.⁶ In general, most experienced project managers are those who have been with the organization the longest and senior in age as well as position. The following observations reported by Bullas include those trends that most likely will influence the use of social media in project management:⁷

1. Usage of social networks by older users is increasing
2. LinkedIn is the most popular for older users
3. Facebook dominates social media engagement (older generation feel the need to keep in touch with the younger generation which encourages more social involvement)
4. Active usage of the major, global social platforms is growing worldwide with mobile being the key driver
5. Mobile and tablet usage is beginning to heavily impact social media usage with mobile having the biggest effect

Tom Pick, in a commentary on social media and digital marketing, echoes the trend cited by Bullas that social media has reached middle age(d) with the fastest growing segment of social media users is now adults aged 45, representing 54% of all users.⁸ Pick also notes that "...Social media users are more social than non-social-media-using-internet-users in real life too..."⁹, and at the same time cites a report in Word Press Hosting SEO, indicates that "...As universal as business use of social media can seem to be, 26% of companies still block access to social media sites in their workplaces. 31% have no social media policy in place."¹⁰ Other interesting facts reported include:¹¹

1. 82% of buyers say they trust a company more when its CEO and senior leadership team are active in social media.
2. And yet – 36% of executives say their CEO "either does not care, or cares little, about the company's reputation in social media."
3. It helps having a woman at the top. Female small business CEOs are 78% more likely to say social media is highly valuable to their firm's growth (20.8% vs. 11.6%), and 43% less likely to say it isn't valuable (14.2% vs. 25%).
4. 90% of Inc. 500 companies use at least one major social media platform. And 62% say social media is either "somewhat" or "very" necessary to their growth.

5. LinkedIn is the “social platform of choice” for companies in the Inc. 500, the index of the fastest-growing companies in the U.S. 81% of these firms use LinkedIn, compared to 67% on both Facebook and Twitter.

These observations complement the perspective that more senior employees have been ‘dragged into’ the world of social media networks by emersion created by the younger social circles, most notably families, with whom they want to remain in close contact. Since project managers are typically senior employees with much experience in project management, it follows that there are implications for project managers. Marketing strategist, James Cofflin, suggests the following are 5 things that every project manager should know when ‘...striking the right balance between team members in a world full of modern distractions and technological complications:’¹²

1. Discipline + Focus = No Distractions on Social Media—use social media to be a conduit for getting tasks accomplished, not an end in and of itself which causes distractions
2. Communications is Two Ways—social media is not just a one-way media, but it requires interactions that provide a measure of understanding of the current status of an activity.
3. Catch the Industry News instantly—project managers need to remain current and recognize any new methods/techniques that may impact the way you do business.
4. Keep in Touch with Clients 24/7—project managers need to stay close to their stakeholders and keep them aware of the project’s progress via updates; enhancing two-way communications for informative feedback.
5. Fun is Not Illegal—enhances rapport with team members by interjecting levity and using light-hearted challenges to motivate provide ‘welcome distractors’ as a way to build team pride and confidence.

Social media is a tool that can be used to keep in touch with colleagues and clients and thus enhance project management techniques.

In their paper “Directions for future research in project management: The main findings of a UK government-funded research network”, Mark Wintera, , Smith, Morris, and Svetlana Cicmil, suggested to change project management as instrumental process to project management as social process.¹³ In other words the thought process is to not consider the project life cycle as a production process but place more focus on social interaction among people as a way of

improving project success. And, in further commentary on social media and project management, one very important and key question was posed by Linky vd Merwe, founder of Virtual Project consulting in her blog and posting: “Can Social Media drive project success?” The author feels that with proper consideration to issues like security and confidentiality, social media tools can be used to enhance project delivery.¹⁴

Social Media Tools Available for Project Managers

In a study by Elizabeth Harrin, noted project management researcher, she indicates that there are ten social media tools that are available for project managers. The tools used by project managers are:¹⁵

1. **Blogs**[Online web pages used for the sharing of ideas, personal perspectives, & opinions with others]
2. **Collaboration tools**...[Collaborative software for managing group activities]
3. **Instant Messaging**[Online chat]
4. **Microblogs**[blogging designed for mobile devices with viewing limitations]
5. **Webinars**.....[Online educational seminar]
6. **Podcasts**..... [multimedia digital file made available on the Internet for downloading to a portable media player, e.g., iPod]
7. **Vodcasts**[video podcasts]
8. **RSS Feeds**[Really Simple Syndication—content distribution; Twitter, FaceBook, MySpace]
9. **Social networks**.....[infrastructure for information exchange]
10. **Wikis**.....[A web-based collaborative community knowledge management repository]

Other social media tools for project management include ‘yammer’¹⁶, an Enterprise Social Network that brings together people, conversations, content, and business data in a single location; slideshare.net, YouTube, and LinkedIn and are other ways to use social networking in project management.¹⁷ While these are organizational social media network tools, the advent of Twitter, Facebook, FaceTime, Google+, SnapChat, Texting, and others that are predominant

tools of choice among the current generation of professionals who are becoming project managers of tomorrow. The research questions that arise offer challenges to discovering which of the social media network tools show the greatest promise for improving project management; and, how to employ these latest of social media tools to significantly improve the dismal record of failed projects as reported by the Standish Groups' reports on factors that determine successful projects.

Social Media and Project Management: An Evolving Relationship

In a related study on “Social Media meets Project Management”, Michael Klynstra explains how social media can help project managers address troublesome team communication traps.¹⁸ This article extends the earlier study by Elizabeth Harrin and clearly lays down the different social media tools and how they are used in various project management communication settings.

Some examples are listed below:

1. Social vs. Shared folders
2. Deliver real-time news like Twitter
3. Build a community like Facebook, Yammer and Google +
4. Create a Free-Form, Flexible Space (Like a Wiki)
5. Deliver Material in an Engaging Way (Like Vimeo and YouTube)
6. Crowdsourcing Intelligence (Like Escort Live Nation)

In another study by Zizi Papacharissi, “The virtual geographies of social networks: a comparative analysis of Facebook, LinkedIn and ASmallWorld”, the findings corroborate the theory that social media tools are indeed a good way to interact and thus can be considered for use in project management.¹⁹ Additional outcomes of this study underscore the need for focusing on the need to differentiate work and personal information needs, especially in private and public settings. In summary, this socio-cultural study offers the following insights²⁰:

- Highlighting the need for private/public balance present in each social networking site;
- Identifying styles of self-presentation in spaces privately public and publicly private;
- Cultivation of taste [e.g., business] performances as a mode for sociocultural identification and organization; and,
- The formation of tight or loose social settings, depending on the circumstances, goals, and objectives of the relationships.

A research study by AtTask, Inc. advocates that knowledge-rich peer networks enhance project managers' ability to get work done in their study, "Project Management + Social Networking = User-Driven Product Improvements".²¹ The results of the study support the notion of synergism through collaborative sharing of knowledge that allows for greater focus and direction leading to task efficiencies and increased productive.

Another study by Michelle Symonds, "Where does social media fit into project management?"²² suggests that social media tools can be used to more effectively in day-to-day operations and thus find new lines of communications and new ways of sharing information with team members and other concerned people. Social media can also be used in project management to overcome geographical constraints (i.e., one member based in Chicago and another team member in Paris) by using, for example Facebook, to collaborate with team members). Project managers are required to exhibit characteristics of leadership, management, and administration that motivate the project team, structure and direct resources, track project performance and communicate project status. The current stream-of-thought suggests that social media networking tools can facilitate advancements toward enhancing the effectiveness of project managers in meeting their responsibilities for project integration management. Social media networks may provide the infrastructure that has been missing to support greater project success rates.

Exploring Social Media Tools Usage: A Proposed Study

It is clearly evident from recent developments and trends that the use of social media is rapidly increasing as seen in its ubiquitous adoption, especially by the younger workforce; they have

grown-up with it being an omnipresent commodity for use in both personal and professional activities. Its potential use in enhancing project management body of knowledge especially in the area of project communications and integration management is very promising. Based on the initial investigation of social media usage, its growth and impact on personal and organizational work effectiveness and efficiency, further investigation of trends in its use within organizations would provide greater insight into the impact of social media networks in project management. The purpose of this paper has been to establish a basis for identifying the need for a research agenda that will provide researchers and practitioners a greater understanding of best practices when establishing social media networks for project management communication and project integration management.

To further support this conclusion, the authors propose to study the usage of social media tools on various dimensions of project management communication and integration management to ascertain the impact these tools are having in enhancing project delivery and success. The first step in the process is to develop and pilot test an instrument to identify and determine the extent to which social media is currently being used by organizations in a major metropolitan area. The survey instrument will be distributed to project managers who are members of the local Project Management Institute (PMI) chapter. The attached spreadsheet provides a draft matrix of the potential social media tools and project management tasks/activities that are associated with coordinating aspects of project communication and integration management. These are not meant to be all inclusive or even those that will be included in the survey. They are meant to initiate discussion that will lead to a set that determined to be used in the initial survey that will establish a baseline for which social media network tools are currently be used most; their perceived and actual value, and the project management activities that may be best served through the inclusion of these techniques. The specific survey questions will be derived from the matrix.

The results of the pilot will be presented to the local PMI chapter during a monthly meeting, and from those results a more far-reaching survey instrument will be developed to be distributed to the larger network of PMI chapters (regionally, then nationally). The authors are currently working with PMI advocates in developing the survey project timeline and securing IRB

permission to conduct the survey. A survey project status report will be given at the meeting in Wilmington.

Social Media Tools and Project Management Tasks/Activities

Social Media Tools	Blogs	Collaboration tools	Instant messaging	Micro blogs	Webinars	Podcasts	Vodcasts	RSS	Social Networks	Wikis
Project Management Tasks/Activities										
Project Spec										
Project Changes										
Project Status										
Dignosing problems										
Solving Problems										
Milestone Communication										
Project Accomplishments										
Project Monitoring										
Sharing Project Ideas										
Interaction with Clients										
Real Time Project Inforamation										
Project Announcements										
Distributing Project Information										
Project Alerts										
Project Warnings										
Project Motivational Tools and Aids										
Project resource Allocations										
Sharing CBK										
Project management organization										
Connecting with Other Project Managers										
Best Practices on Project Management										
Finding Experts in Project Management										
Feedback from Customers										
Streamlined Problem resolution										
Real Time Project Adaptation										
Document Updates										
Capturing Project Events										
Creating Functional Space for project Team										
Collaboration with Team Members										
Overcome Geographical constraints										
Disseminate information to team members										

End Notes:

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- ¹ http://en.wikipedia.org/wiki/Demographics_of_the_United_States
 - ² <http://www.pewresearch.org/fact-tank/2013/06/06/cell-phone-ownership-hits-91-of-adults/>
 - ³ <http://www.pewresearch.org/fact-tank/2013/06/06/cell-phone-ownership-hits-91-of-adults/>
 - ⁴ Ibid.
 - ⁵ Ibid.
 - ⁶ <http://www.jeffbullas.com/2013/09/20/12-awesome-social-media-facts-and-statistics-for-2013/>
 - ⁷ Ibid.
 - ⁸ <http://socialmediatoday.com/tompick/1647801/101-vital-social-media-and-digital-marketing-statistics-rest-2013>
 - ⁹ Ibid.
 - ¹⁰ Ibid.
 - ¹¹ Ibid.
 - ¹² <http://www.dreamgrow.com/social-media-5-things-every-project-manager-should-know/>
 - ¹³ <http://www.sciencedirect.com/science/article/pii/S0263786306001268>
 - ¹⁴ <http://www.virtualprojectconsulting.com/can-social-media-drive-project-success/>
 - ¹⁵ "Social Media for Project Managers," Elizabeth Harrin, "Project Management Institute
 - ¹⁶ <https://about.yammer.com/who-we-are/>
 - ¹⁷ <http://office.microsoft.com/en-us/project-help/use-twitter-facebook-and-other-social-media-to-help-manage-projects-and-teams-HA101929375.aspx>
 - ¹⁸ <http://www.enterpriseappstoday.com/social-media/social-media-meets-project-management.htm>
 - ¹⁹ <http://nms.sagepub.com/content/11/1-2/199.short>
 - ²⁰ Ibid.
 - ²¹ <http://www.attask.com/press-releases/project-management-social-networking-user-driven-product-improvements>
 - ²² <http://blog.parallelprojecttraining.com/project-management-articles/where-does-social-media-fit-into-project-management/#ixzz2iWbCzj8N>

The Legal, Income Tax and Estate Planning Implications of Strategies to Alleviate the Health Care, Financial Security and Asset Protection Concerns of U.S. Retired Elderly Persons

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ABSTRACT/INTRODUCTION

The dramatic increase in the number of U.S. elderly persons, caused directly by an increase in the longevity of human life, has been empirically confirmed. Specifically, this article hypothesizes, by implication, that as the number of U.S. elderly persons increase, due directly to an increase in the longevity of life in the U.S. population, it necessarily follows that the degree of assistance needed by the elderly in their retirement years will also increase. More specifically, this article hypothesizes, by implication, that as the degree of assistance needed by the elderly in their retirement years increases, the retired elderly in the U.S. will face increasingly more complex health care, financial security and asset protection concerns that affect their day-to-day life. For example, “[u]ninsured medical expenses vie with retirement as the most pressing financial concern for Americans, according to a survey conducted for the American Institute of Certified Public Accountants by Harris Interactive.”¹ In particular, unexpected long-term care costs can easily exhaust a modest estate of U.S. retired elderly persons, given that (1) nursing home facility costs nationally average \$79,935 per year for a private room, assisted living facility costs nationally average \$37,572 per year, and in-home care costs nationally average \$19 per hour.²

Notwithstanding the foregoing, many U.S. retired elderly fail to give adequate consideration to the uncertainty as to what lies ahead, either out of a reluctance to confront their eventual death or a lack of knowledge as to the utter chaos that may result, either later in life or after death. However, given the proper education about proven financial and estate planning strategies (e.g., asset transfers into trust or otherwise, reverse mortgage arrangements, and sale-leasebacks), concerns of U.S. retired elderly persons about health care, financial security and asset protection (and succession) should motivate such persons to seek the assistance of a qualified financial and/or estate planner to alleviate such concerns.

With a view toward providing such education, by means of case study approach, the objective of this article is to provide guidance on strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons in the most common of financial scenarios. It follows that the purpose of this article is to enhance the

¹ www.aicpa.org/Press/PressReleases/2010Pages/

² Metlife Mature Market Institute. “The 2009 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs,” October 2009, pp. 19, 25, 31.

awareness of U.S. retired elderly persons as to the various financial and estate planning strategies that may be implemented by interdisciplinary professionals to alleviate the health care, financial security and asset protection (and succession) concerns of these elderly persons. Finally, this article argues that if this article's purpose and objective are met, there will be fewer instances of emotional and economic chaos resulting from the uncertainties of life and death, which particularly burden U.S. retired elderly persons.

Future research is described as extending the current research by taking the financial scenario presented in this article, which depicts the most common estate for U.S. retired elderly persons, and expanding it to include two other financial scenarios depicting estates of U.S. retired elderly persons that are each more robust, for the purpose of providing guidance on strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons in those more robust financial scenarios. In this manner, strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons can be compared and contrasted across a variety of financial scenarios.

In a case study approach, this article accomplishes its purpose and objective in a stepwise fashion as follows.

- In Part I, the case study facts, common to all possible financial scenarios of a U.S. retired elderly person (A), are presented. In addition, the legal, income tax, and estate planning implications of said facts are discussed within the context of how such implications affect the implicit health care, financial security and asset protection (and succession) concerns of a U.S. retired elderly person (A).
- In Part II, relative to the most common financial scenario of a U.S. retired elderly person (A):
 - the particular financial circumstances of A are identified;
 - given A's particular financial circumstances, A's concerns about health care, financial security and asset protection (and succession) are established;
 - to alleviate the established health care, financial security and asset protection (and succession) concerns of A, a financial and estate planning strategy is suggested; and
 - given implementation of the suggested strategy, the legal, income tax, and estate planning implications of such implementation are discussed.
- In Part III, the argument is presented that there will be fewer instances of emotional and economic chaos resulting from the uncertainties of life and death, which particularly burden U.S. retired elderly persons in the most common of financial scenarios, if such retired elderly persons implement the suggested financial and estate planning strategy to alleviate their health care, financial security and asset protection (and succession) concerns.
- In Part IV, future research is described as extending the current research, by taking the financial scenario presented in this article, which is the most common for U.S. retired elderly persons, and expanding it to others for the purpose of providing guidance on strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons in those less common, but more robust, financial scenarios. In this manner, strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons can be compared and contrasted across a variety of financial scenarios. Furthermore, with an even greater awareness by U.S. retired elderly persons of the various financial and estate planning strategies that may be

implemented by interdisciplinary professionals to alleviate the health care, financial security and asset protection (and succession) concerns of such persons, there will be even fewer instances of emotional and economic chaos resulting from the uncertainties of life and death, which particularly burden U.S. retired elderly persons.

I.
CASE STUDY FACTS OF A U.S. RETIRED ELDERLY PERSON (A)
COMMON TO ALL POSSIBLE FINANCIAL SCENARIOS AND
HOW THE LEGAL, INCOME TAX, AND ESTATE PLANNING IMPLICATIONS
OF SAID FACTS AFFECT A'S IMPLICIT HEALTH CARE, FINANCIAL SECURITY
AND ASSET PROTECTION (AND SUCCESSION) CONCERNS

A is 69 years of age and married. A's community spouse is 55 years of age. A has four adult children, two children with A's community spouse and two children from a previous marriage.

A lives with his community spouse and one of A's four children in a home that is owned debt-free by A and his community spouse in a tenancy by the entirety. The value of the home is between one-third and two-thirds of A's net estate.³ A owns no other real property.

Relative to this case study, a tenancy by the entirety is an ownership form that has two advantages over joint tenancy (with right of survivorship), i.e., greater protection against A's creditors and a more succinct right of succession (to A's community spouse). In particular, a tenancy by the entirety provides for automatic and immediate (by operation of law) succession of the home to A's community spouse, upon A's death. This type of succession is difficult to contest because a tenancy by the entirety is established only between married persons. Moreover, in such a tenancy, the property is generally protected from A's creditors at death, as well as during life.

However, a tenancy by the entirety has an income tax disadvantage. In particular, at death, upon succession of the home to A's community spouse by operation of law, A's community spouse takes a stepped-up, tax-adjusted basis in the home to the extent of only one-half. For example, if (1) A and the community spouse purchased the home for \$100K and (2) the fair market value (FMV) of the home on the date of A's death is \$500K, then A's community spouse takes a stepped-up, tax-adjusted basis in the home equal to \$300K (i.e., \$250K + \$50K), rather than \$500K, FMV date of A's death.

All other personal property is owned by A as a sole tenant. Upon the death of A, the title to the personal property passes to the beneficiaries of A's probated estate either (1) under the provisions of a will or (2) according to the probate law of intestacy in the state of A's legal residence. Relative to this case study, sole tenancy is ownership by one person with complete title to the property. Sole tenancy is commonly assumed for unregistered personal property (e.g., clothing and household furniture) as well as investment property (e.g., stocks, bonds, and mutual funds), IRA accounts and a retirement annuity.

3 ¶ 13.02[6] The Role of the Home in Retirement Planning

A has a last will and testament. Relative to this case study, A's last will and testament is a formal legal document instructing the named executor exactly how to settle A's probated estate. Even though A's "gross estate"⁴ will not be subject to an estate tax, because of the small amount involved, A's will and last testament is necessary for non-tax reasons. But for this will, A dies intestate (i.e., without a will) and thereby forfeits the opportunity to direct the settlement of his probated estate. In fact, without a will, by default, A transfers to his state of legal residence complete power to determine exactly how A's probated estate should be settled. But further, without a will, utter emotional and economic chaos may result from a variety of lengthy legal disputes causing (1) irreparable emotional damage to family relationships and (2) economic turmoil.

A is planning for his expected mental and physical incapacity. A knows that improvements in geriatric care have increased (1) his life expectancy and (2) the correlative likelihood that he will become incapable of managing his personal and financial affairs at some point in the future. As a consequence, A believes that he will lose control over (1) his personal health care decisions and (2) the management of his assets at some point in the future.

First, to alleviate A's concern about his expected loss of control over the management of his assets, A has prepared a durable power of attorney, general in nature. Relative to this case study, A's durable power of attorney designates an agent to act on A's behalf during his expected incapacity. But for this document, a state court would have to appoint a guardian (or conservator) to manage A's property if A were found to be incapacitated at a court hearing. But further, significant administrative actions of such appointed guardian would be supervised by a court and thereby involve much unnecessary time and expense.

Second, to alleviate A's concern about the expected loss of control over his personal health care decisions, A has prepared a "living will" and related "health care proxy." Within A's "living will," A has articulated his wishes, in advance (i.e., advance directives), with respect to the eventual use of life-prolonging measures when recovery from a particular condition is impossible and there is no chance of regaining a meaningful life.⁵ Relative to this case study, A's medical (advance) directives address A's wishes with respect to specific treatments across a variety of medical conditions and include a personal statement of A's rationale and feelings upon which his advance directives are based. These directives function to provide guidance to both health care personnel and family members as to A's wishes regarding life-sustaining treatment across a variety of medical conditions. But for this document, the decision to withhold or terminate life-sustaining treatment, which involves the weighing of many personal factors, would be left to A's guardian, family, and physician to provide the necessary "clear and convincing" evidence of A's wishes in a court of law, for such court to permit A to die, if he so "wished."

⁴ 26 U.S.C. § 2031.

⁵ See <http://www.caringinfo.org> for a general discussion of advance directives in a living will and examples of state specific advance directives.

Within A's "health care proxy" (i.e., a "health care power of attorney"), A has designated the person who shall make health care decisions on A's behalf, in the event of A's incapacity. Within such document, A has included a statement about life-sustaining treatment.⁶

II.
BASED UPON A PARTICULAR FINANCIAL SCENARIO
OF A U.S. RETIRED ELDERLY PERSON (A), PRESENTED ARE:
(A) STRATEGIES TO ALLEVIATE A'S HEALTH CARE, FINANCIAL SECURITY
AND ASSET PROTECTION (AND SUCCESSION) CONCERNS AND
(B) THE LEGAL, INCOME TAX, AND ESTATE PLANNING IMPLICATIONS
OF SUCH STRATEGIES

The Most Common Financial Scenario of a U.S. Retired Elderly Person (A)

A's net probate estate is \$200K, with his half interest in the home valued at \$200K.

A's Concern about Health Care, Financial Security and Asset Protection (and Succession)

Under the financial scenario referenced above, A has a minimal amount of fixed income (including social security benefits, an Individual Retirement Annuity (I.R.A.) account, a retirement annuity, and investment income) and net assets. A's concerns include asset protection, financial security for his family, and quality medical care for himself, since A anticipates incurring large health care expenses in the future due to a protracted illness and nursing home confinement. In particular, the high cost of nursing home care will rapidly deplete A's net probate estate, if these expenses are not covered by Medicaid, especially since A's fixed income has seen a decline due to the recent economic downturn, when both stock prices and interest rates have declined.

⁶ Here, a trap for the unwary is sourced in The Health Insurance Portability and Accountability Act of 1996 (HIPAA), Pub. L. No. 104-191, 110 Stat. 1936 (1996), which was designed, in part, to protect the medical privacy of patients, by preventing health care professionals from communicating information about a patient's medical condition without said patient's consent. In particular, under HIPAA, the designee of a maker's "health care power of attorney" may not be allowed enough medical information to ascertain the maker's incapacity. Accordingly, in this case, the maker's wishes may be foiled by the very law intended to protect the privacy of the maker. To defend against this trap, the maker (e.g., A) must prepare a HIPAA authorization form that permits the designee of a "health care power of attorney" to have access to medical information so that said designee is aware when the maker becomes incapacitated, thereby triggering the provisions of the "health care power of attorney."

Suggested Overarching Financial and Estate Planning Strategy to Alleviate A's Health Care, Financial Security and Asset Protection (and Succession) Concerns

Under the financial scenario referenced above, the suggested overarching financial and estate planning strategy is simply to qualify for Medicaid. In particular, A's concern with asset protection plan is alleviated if A qualifies for Medicaid. In this instance, A need not incur the debilitating costs of private insurance or otherwise, by being self-insured. Furthermore, by qualifying for Medicaid, A will maximize the financial security he may provide for his family (i.e., succession). Finally, if A qualifies for Medicaid, he will receive quality health care for himself, in the sense that he will obtain all necessary medical coverage.

The Legal, Income Tax and Estate Planning Implications of Implementation of the Suggested Strategy

Again, under this financial scenario referenced above, the suggested overarching financial and estate planning strategy is simply to qualify for Medicaid. Medicaid assistance is granted based upon satisfying (1) a medical needs test and (2) a financial needs test. If these tests are met, an elderly person of limited financial means can rely on Medicaid as his/her primary source of medical payment for necessary medical care, including long-term, nursing home care.

The medical needs test is fairly simple to state, i.e., to be covered by Medicaid, the medical care provided must be medically necessary. However, this test becomes much more complex in its application. For example, with regard to nursing home care, the necessity of such care is based on a comprehensive, needs assessment - a process which must reveal that the person requires nursing home care. Such process revelation may be sourced in a variety of conditions, including an unstable emotional, behavioral, or psycho-social condition, which would require continual nursing assessment intervention. The person with such an unstable condition, would require nursing home care in a structured, therapeutic environment. This person may also be cognitively impaired with memory deficits. Such a condition may severely compromise such person's safety, thereby requiring additional nursing home care, such a person is necessarily dependent on others in several Activities of Daily Living (ADL), which may include: (1) walking and standing by oneself; (2) feeding oneself; (3) dressing oneself; (4) bathing oneself; (5) toileting; and (6) continence.

At first glance, the financial needs test to qualify for Medicaid assistance is more difficult to describe, because the test is state-specific, i.e., the specifics of the financial needs test vary across the several states. However, generally and simply stated, the Medicaid applicant must be penniless at the exact time such applicant applies for Medicaid assistance. Specifically, the applicant must own no "countable" assets on the application date. If, instead, the applicant owns "countable" assets, he/she is ineligible for Medicaid assistance, because he/she is presumed to be capable of paying for his/her necessary health care. Furthermore, if a person who owns a significant amount of "countable" assets attempts to transfer those assets for the purpose of qualifying for Medicaid assistance, he/she must generally wait 60 months from the date of the last transfer before applying for Medicaid assistance. Initially, an applicant's "countable" assets include those "countable" assets owned by either the applicant or his community spouse. The County Welfare Agency (CWA) determines an applicant's "countable" assets at the time a

person applies for Medicaid assistance.⁷ However, the Medicaid Catastrophic Coverage Act (MCCA) of 1988 allows the community spouse to own “countable” assets up to a ceiling amount, i.e., the Community Spouse Resource Allowance” (CSRA), without adversely affecting the financial needs test and thereby the eligibility of the Medicaid applicant.⁸ In many states, the CSRA is fixed by reference to the federally determined amount, adjusted annually. For example, in 2010, that federally determined amount was \$109,560. Since the CSRA consists exclusively of “countable” assets, the community spouse may own assets that are not “countable” (e.g., the home, an automobile, and other personal effects) without adversely affecting the financial needs test and thereby the eligibility of the Medicaid applicant.

Finally, the community spouse is allowed to have a certain amount of income up to a ceiling amount, i.e., the “Minimum Monthly Maintenance Needs Allowance” (MMMNA), without adversely affecting the financial needs test and thereby the eligibility of the Medicaid applicant. Moreover, if the community spouse has income that is less than the MMMNA amount, any income of the Medicaid applicant will be allowed to benefit the community spouse as a “community spouse allowance.”⁹ But further, if the Medicaid applicant has insufficient income to allow the community spouse to have income equal to the MMMNA amount, the community spouse may request an increase in the CSRA for the purpose of funding such deficiency.¹⁰ For example, assume a \$200 per month deficiency in the MMMNA amount and a 5% rate of return on the community spouse’s “countable” assets. Upon request, the community spouse may acquire an additional \$48,000 ($(\$200 \times 12)/.05$) to fund the MMMNA deficiency.

Under the financial scenario referenced above, the suggested action plan to satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, is an asset-stripping technique that effectively renders A penniless. Specifically, A must transfer substantially all of his “countable” assets so that he satisfies the financial needs test for the state of his legal residence. However, if A were to transfer his assets in this manner, A would likely be ineligible for Medicaid assistance for a period of 60 months (i.e., the look-back period). In this instance, A must not even apply for Medicaid assistance until the 60-month period has expired.¹¹

Under the suggested, asset-stripping action plan, as referenced above, A is rendered penniless in four steps. In the first step of the asset-stripping action plan to satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, A transfers the home to his

⁷ 42 U.S.C. § 1396r-5(c).

⁸ 42 U.S.C. §1396r-5(c)(1)(A).

⁹ Deficit Reduction Act of 2005, §6013(a).

¹⁰ 42 USC §1396r-5(e)(2)(c).

¹¹ 42 U.S.C. § 3120a-7b(a).

community spouse, who takes a sole tenancy in the home.¹² However, A must also be concerned with being financially capable of paying his living expenses for the next 60 months for himself and his community spouse. These expenses include housing costs (i.e., maintenance, utilities, property taxes, and insurance) and health care costs, which may present a serious problem for A, given his limited amount of fixed income.

In the alternative, A may decide to convert the equity in his home into a positive cash flow. Because A fails to have any mortgage indebtedness borrowing capacity (i.e., A cannot qualify for an equity loan due to his limited amount of fixed income), the reverse mortgage arrangement effectively provides a positive cash flow “for unanticipated shortfalls later in life.”

¹³ Another arrangement that results in converting the home equity into a positive cash flow is a sale-leaseback arrangement with installment payments over 60 months involving one or more of his children. In the case of a sale-leaseback arrangement, A will incur no capital gain tax, since A has owned and occupied the home for at least 2 of the previous 5 years.¹⁴ Finally, the least advantageous arrangement, at least from an income tax perspective, to generate a positive cash flow during the 60-month look-back period, is a sale of a remainder interest in the home to one or more of the children, retaining a life estate for A. Here, the I.R.S. interprets 26 U.S.C. § 121 as requiring a sale of the entire interest in the principal residence to qualify for the exclusion of capital gain. Under this interpretation, since only a remainder interest in the home is sold, A would not be able to exclude the capital gain realized upon such sale.

In the second step of the asset-stripping, action plan, as referenced above, to satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, A takes his interest in a qualified retirement annuity and rolls it over into his I.R.A. account, if possible. In the alternative, if A is in need of a positive cash flow during the 60-month look-back period, A may assign his entire interest in his qualified retirement annuity, in exchange for a non-negotiable promissory note with an installment payout period of 60 months, or a lesser period.¹⁵

¹² In the alternative, if A’s child, who is living in the home with A and his community spouse, becomes a “caregiver child,” the home can be conveyed to such child, without triggering the 60-month look-back period, if A’s child has provided care to A for at least two years.

¹³ Pond. **Personal Financial Planning Handbook: With Forms & Checklists** ¶ 13.02[6] The Role of the Home in Retirement Planning.

¹⁴ 26 U.S.C. § 121.

¹⁵ The Deficit Reduction Act of 2005 (DRA 2005), § 6016, exempts a transfer of funds used to purchase an indebtedness from triggering the 60-month look-back period, if such indebtedness has a repayment schedule that is actuarially sound, as determined by the Office of the Chief Actuary of the Social Security Administration in actuarial publications. For an example of a promissory note that satisfies DRA 2005 § 6016, see ¶6.06 of *Representing the Elderly or Disabled Client*, by Begley and Hook (Thomson Reuters/RIA). In general, an actuarially sound, repayment schedule must have payments in equal amounts during the repayment period, with no

Under this alternative, if A assigned his entire interest in his qualified retirement annuity to a child, in exchange for a non-negotiable promissory note to himself, where the repayment of the note is in the form of a term annuity over 60 (or fewer) months, which complies with all of the provisions of DRA 2005, § 6016, the 60-month look-back period would not be triggered. Furthermore, because, in the exchange, A has received a non-negotiable promissory note, which lacks a readily ascertainable fair market value, the Open Transaction doctrine applies to cause the exchange not to be subject to income taxation. Instead, A recognizes ordinary income as the cash is received by A in the form of term annuity payments.

Finally, in the alternative, A may assign his entire interest in a qualified retirement annuity to a child, in exchange for a non-negotiable promissory note to A's community spouse, with an installment payout schedule that complies with all of the provisions of DRA 2005, § 6016. In this instance, A's child must make the payments to A's community spouse, in accordance with the terms of the note. Furthermore, similar to the discussion above, because, in the exchange, A's community spouse received a non-negotiable promissory note, which lacks a readily ascertainable fair market value, the Open Transaction doctrine applies to cause the exchange not to be subject to income taxation. Instead, A recognizes ordinary income as the cash is received by A's community spouse in the form of term annuity payments. Here, it is important to note that in using this asset-stripping technique, an asset owned by A is effectively transferred to A's child, in exchange for a non-negotiable promissory note in the name of the community spouse, and is thereby immediately converted to an income stream for the benefit of the community spouse. In this instance, A can more easily satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, because A's asset is effectively converted to an income stream for the benefit of the community spouse, where such income stream is not a "countable" asset under the financial needs test.

In the third step of the asset-stripping, action plan, as referenced above, to satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, A transfers his I.R.A. account to an insurance company in exchange for a term annuity over 60 months. In this instance, A will have stripped his estate of his I.R.A. by the expiration of the 60-month look-back period.

In the fourth step of the asset-stripping, action plan, as referenced above, to satisfy the financial needs test, for the sole purpose of qualifying for Medicaid assistance, A irrevocably transfers the bulk of his probate estate, including stocks and bonds, to the A Trust. Under the trust instrument, the community spouse has a life estate, while A's children have the remainder interest in said trust. In this manner, the trust contemporaneously provides for (1) the financial security of A's community spouse by giving her an income interest, where all income (including capital gains) is required to be distributed to A's community spouse and (2) the succession of A's assets to his children, where these assets have been safeguarded against unwise or extravagant spending. In particular, at the death of A's community spouse, the trust principal will be distributed to A's children under the terms of the trust instrument.

deferral payment and no balloon payment, where the cancellation of any balance upon the death of the creditor (i.e., Medicaid applicant) is prohibited.

Relative to this case study, trusts are flexible vehicles for the ownership of property. In general, the grantor (e.g., A) transfers property into the trust, where the trustee has legal title to the trust property, but the beneficiaries of the trust have equitable title. In this manner, the trustee manages the property transferred to the trust by the grantor for the benefit of the beneficiaries. A trustee is a fiduciary and is guided by the trust instrument, which is written in a way to accomplish the grantor's objectives. Many advantages can be achieved by establishing a trust. The trust can assist in asset succession or be used as a retirement tool to ensure that trust assets are well-managed, even if the grantor loses his capacity to manage.

In particular, a transfer of property to an irrevocable trust, as opposed to a revocable trust, severs the property from the grantor. Such transfer is considered to be a completed gift at the time of the property's transfer into the trust. Accordingly, after the transfer, the transferred property (1) is no longer included in the grantor's probated estate, thereby eliminating costly probate costs at the death of the grantor,¹⁶ and (2) is generally immune from lawsuits and creditors' claims against the grantor, both during life and at the death of the grantor. Within this context, however, there is an income tax disadvantage. Assuming the transferred property has appreciated, the trust takes a carryover, tax-adjusted basis in the property transferred, as opposed to a stepped-up, fair market value date-of-death value, if the grantor would have held title to the property until his death.

Finally, in the past, trust instruments would commonly authorize (or require) the distribution of net accounting income (e.g., interest and dividends) to the income beneficiary (e.g., A's community spouse), i.e., trusts generally do not authorize the current distribution of net capital gains. However, the imposition of the Net Investment Income (NII) tax on trusts can deplete the trust principal unnecessarily. For example, if a trust currently realizes and recognizes sufficient capital gains, where the trust instrument does not provide for the distribution of capital gains as part of trust income, then the effect of the NII tax is to subject the net capital gains not only to a 20% capital gains rate, but also to a 3.8% Medicare surtax.

¹⁶ Generally, the grantor can effectively transfer by will his/her personal effects of moderate value, even if the grantor's will is not formally probated. In contrast, without having his/her will formally probated, the grantor cannot transfer to designated heirs either assets, owned at death, of high-value or assets, owned at death, requiring a registration of title.

III
THE ARGUMENT:
IMPLEMENTATION BY U.S. RETIRED ELDERLY PERSONS
OF STRATEGIES TO ALLEVIATE THEIR HEALTH CARE, FINANCIAL SECURITY
AND ASSET PROTECTION (AND SUCCESSION) CONCERNS
WILL RESULT IN FEWER INSTANCES OF EMOTIONAL AND ECONOMIC CHAOS
CAUSED BY THE UNCERTAINTIES OF LIFE AND DEATH

Hypothesis:
U.S. Retired Elderly U.S. Will Face Increasingly More Complex
Health Care, Financial Security and Asset Protection Concerns

The dramatic increase in the number of U.S. elderly persons, caused directly by an increase in the longevity of human life in the U.S. population, has been empirically confirmed. At the very least, there is a positive correlation between the longevity of life in the U.S. population and the number of U.S. elderly persons. That is, as the longevity of life in the U.S. population increases, the number of U.S. elderly persons increases.

This article hypothesizes, by implication, that there is a positive correlation between the longevity of life in the U.S. population and the degree of assistance needed by the elderly in their retirement years. That is, as the longevity of life in the U.S. population increases, the degree of assistance needed by the elderly in their retirement years will also increase. In other words, as the number of U.S. elderly persons increase, due directly to an increase in the longevity of life in the U.S. population, it necessarily follows that the degree of assistance needed by U.S. retired elderly persons will also increase.

Furthermore, this article hypothesizes, by implication, that there is a positive correlation between the longevity of life in the U.S. population and the degree of complexity of health care, financial security and asset protection concerns faced by U.S. retired elderly persons. That is, as the longevity of life in the U.S. population increases, the degree of complexity of health care, financial security and asset protection concerns faced by U.S. retired elderly persons also increases. In other words, as the degree of assistance needed by the elderly in their retirement years increases, due directly to an increase in the longevity of life in the U.S. population, retired elderly in the U.S. will face increasingly more complex health care, financial security and asset protection concerns that affect their day-to-day life.

Proposition #1

Many U.S. retired elderly fail to give adequate consideration to the uncertainty as to what lies ahead, either out of a reluctance to confront their eventual death or a lack of knowledge as to the utter chaos that may result, either later in life or after death.

Proposition #2

Given the proper education about proven financial and estate planning strategies (e.g., asset transfers into trust or otherwise, reverse mortgage arrangements, and sale-leasebacks), concerns of U.S. retired elderly persons about health care, financial security and asset protection (and succession) should motivate such persons to seek the assistance of a qualified financial and/or estate planner to alleviate such concerns.

Conclusion

With a view toward providing education about proven financial and estate planning strategies (e.g., asset transfers into trust or otherwise, reverse mortgage arrangements, and sale-leasebacks), by means of case study approach, this article provided guidance on strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons in the most common of financial scenarios. Accordingly, this article argues that there will be fewer instances of emotional and economic chaos resulting from the uncertainties of life and death, which particularly burden U.S. retired elderly persons in the most common of financial scenarios, if such retired elderly persons implement the suggested financial and estate planning strategy to alleviate their health care, financial security and asset protection (and succession) concerns.

IV. FUTURE RESEARCH

Future research will extend the current research and take a similar step-wise approach. First, the financial scenario presented in this article, which depicts the most common estate for U.S. retired elderly persons, will be expanded to include two other financial scenarios depicting estates of U.S. retired elderly persons that are each more robust. Second, for each of the financial scenarios presented, health care, financial security and asset protection (and succession) concerns of a U.S. retired elderly person are identified. Third, one or more financial and estate planning strategies are suggested to alleviate the health care, financial security and asset protection (and succession) concerns of a U.S. retired elderly person in each of the three financial scenarios presented.

By taking this stepwise approach, strategies to alleviate the health care, financial security and asset protection (and succession) concerns of U.S. retired elderly persons can be compared and contrasted across three different financial scenarios depicting estates of U.S. retired elderly persons of different magnitude. As previously argued, with a greater awareness by U.S. retired elderly persons of the various financial and estate planning strategies that may be implemented by interdisciplinary professionals to alleviate the health care, financial security and asset protection (and succession) concerns of such persons, there will be fewer instances of emotional and economic chaos resulting from the uncertainties of life and death, which particularly burden U.S. retired elderly persons.

TOWARDS A DECISION SUPPORT MODEL FOR TITLE IX COMPLIANCE

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ABSTRACT

Nearly all U.S. universities receive federal funds, and therefore are required to comply with Title IX of the Education Amendments of 1972, a federal law which states that no person in the U.S. shall be subjected to discrimination under any education program or activity receiving Federal financial assistance on the basis of sex. This study is aimed at developing a decision support model to help athletic departments allocate resources while complying with Title IX. The paper presents an overview of our proposed model, a quantitative example and a summary of the implications of our study.

INTRODUCTION

U.S. universities contribute several million dollars per year to their athletic programs. Nearly all universities also receive federal funds, and therefore are required to comply with Title IX of the Education Amendments of 1972—a federal law which simply states that “No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance [14].”

In order to comply with Title IX, U.S. universities are required to (1) provide playing opportunities for men and women in a nondiscriminatory manner, (2) distribute scholarship resources to males and females within 1% of the proportion of the number of male and female athletes, and (3) equitably divide other benefits and services between male and female athletic teams. In the case of playing opportunities commonly referred to as participation, schools can comply in one of three alternative ways commonly known as the “three prong test.” The first of the three options, known as the ‘proportionality’ alternative, requires that universities must

“provide participation opportunities substantially proportionate to the ratio of males and females in the student body” [4]. Schools can also comply with participation requirements by surveying the interests of their student body and providing playing opportunities for men and women in proportion to their interests. Finally, schools who are not in compliance with actual playing opportunities can choose the third of showing a continuing practice of increasing the number of opportunities (practically by adding teams) for the under represented sex (usually women).

This study is aimed at developing a decision support model to help athletic departments allocate resources while complying with Title IX of the Education Amendments of 1972. The remainder of this paper is organized as follows: A review of the literature related to Title IX is followed by an overview of our proposed model. Next, we discuss a quantitative example and conclude with a summary of the implications of our study.

LITERATURE REVIEW

The Title IX literature has generally focused on interpretive and qualitative studies. Thelin [13], for example, reviewed the history of Title IX and the political and economic aspects of intercollegiate athletics. Carpenter et al. [4], as well as Hogshead-Makar and Zimbalist [5], discussed different legal issues of Title IX. Staurowsky [11] and Walton [15], on the other hand, analyzed Title IX from a rhetoric perspective.

The quantitative research literature is more limited. Kennedy [6] [7], for example, used different variables to rank schools according to their Title IX compliance performance. Stafford [10] developed a regression model to examine the relationship between participation and scholarship compliance. Anderson et al. [2] also used regression analysis to determine the likelihood of a school complying with the law, while Reisch and Seese [8] analyzed different accounting issues associated with Title IX.

With the exception of the last few references, the rest of the Title IX papers provide interpretive or qualitative insights into the problem. Our study is aimed at developing a decision support model to help athletic departments allocate resources while complying with Title IX, a topic which has been primarily discussed in a qualitative manner in the literature. This paper represents an attempt to close the gap between qualitative and quantitative research.

MODEL

The proposed decision model is formulated as an optimization model that employs weighted goal programming to simultaneously solve for the best combination of Title IX compliance goals. Weighted goal programming is a multi-criteria decision making approach suitable for complex decisions such as the ones involved in Title IX compliance, where decision makers at athletic departments must consider multiple conflicting objectives simultaneously. Goal-programming was selected as the modeling tool because it represents a flexible technique that can easily accommodate a large number of objectives and it has a large body of reported implementations in different modeling areas [3] [9] [12].

The different components of the model formulation were identified via an analysis of public and institutional discourses surrounding Title IX as well as interviews with athletic administrators of NCAA Division I-A universities. A brief description of the model formulation is included next.

Goals

Considering the decision maker's preferences, the proposed model will effeciently:

- i. Allocate total participation opportunities in athletic teams in the way that most closely reflects the institution's proportionality score.
- ii. Assign athletic scholarship dollars in a way that matches the proportionality score within a 1% deviation level.
- iii. Allocate recruiting funds in the way that most closely reflects the institution's proportionality score.
- iv. Distribute funds for coaching salaries in a way that reflects the institution's proportionality score.
- v. Allocate the remaining athletic budget in the most proportional possible way.

Constraints

The model will achieve the goals subject to the following constraints:

- i. Maximum participation levels must not be exceeded.
- ii. Minimum participation levels must be met.
- iii. Total athletic budget must not be exceeded by more than a pre specified level.
- iv. Minimum coaching levels must be satisfied.

SAMPLE PROBLEM

In order to demonstrate and validate the proposed model and framework, a numerical example was developed using data from a Title IX compliance plan for the University of Connecticut [1]. The sample problem explicitly quantifies the tradeoffs among the model components that were described in the previous section. The following figure displays some of the different constraints and parameters included in the sample problem.

KS		Team Selected														
	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	S
1		Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Spring	Spring	Spring	Spring	Spring	Spring	
2		M	M	M	M	W	W	W	W	M	M	M	M	M	M	
3		Cross			Water	Cross	Field								Outdoor	
4		Country	Football	Soccer	Polo	Country	Hockey	Soccer	Volleyball	Baseball	Golf	Lacrosse	Tennis	Track	Volleyball	
5	Team Selected	1	1	1	0	1	1	1	1	1	1	0	1	1	0	
6	Required	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
7	Start up Needed	0	0	0	25000	0	0	0	0	0	0	7000	0	0	0	
8																
9	Participants															
10	NCAA Maximum	12	115	32	16	12	30	32	14	28	10	30	12	25	14	
11	Minimum	10	80	28	16	10	26	28	12	25	9	26	10	23	12	
12	Suggested	12	85	28	16	12	28	30	12	25	10	26	12	23	12	
13	Total Counted	12	85	28	0	12	28	30	12	25	10	0	12	23	0	
14	AFA/Participant	1800	8600	1750	500	1825	2500	1900	3600	4250	8000	2500	3250	2100	4200	
15	Total AFA	21600	731000	49000	0	21900	70000	57000	43200	106250	80000	0	39000	48300	0	
16																
17	Scholarship \$/Award	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	
18	# Scholarships Awarded	1.08001	1.09019	1.0742	1.016	0	0.97353	0.9734	0.9860258	1.02855	1.0247	1.0316	1.024	1.02784	1.015938	0
19	Total Scholarship \$ Required	8640	8721	8594	0	0	7788	7787	7888	8228	8198	0	8192	8223	0	
20	Total AFA and Scholarships	30240	739721	57594	0	21900	77788	64787	51088	114478	88198	0	47192	56523	0	
21	Recruiting \$ Budget	9000	238000	8500	5000	12500	5000	11000	26750	25000	5000	9000	5000	5000	10000	
22	Total Recruiting \$ Required	9000	238000	8500	0	12500	5000	11000	26750	25000	5000	0	5000	5000	0	
23	Coaching															
24	Head Coach \$	35000	750000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	
25	Max # Assistants	1	12	2	1	1	2	2	3	5	1	3	1	1	3	
26	Min # Assistants	1	6	1	1	1	1	1	1	2	1	1	1	1	1	
27	Cost per Assistant	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000	
28	Total # Assistant Coaches	1	8	1	1	1	1	1	1	2	1	1	1	1	1	
29	Total Coaching \$ Required	77000	1086000	92000	0	92000	92000	92000	92000	134000	92000	0	92000	92000	0	
30	Other Operating \$ Budget	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	
31	Other Operating \$ Required	14000	14000	14000	0	14000	14000	14000	14000	14000	14000	0	14000	14000	0	
32	Total Budget \$	130240	2077721	172094	0	140400	188788	181787	183838	287478	199198	0	158192	167523	0	
33																

FIGURE 1: MODEL PARAMETERS AND CONSTRAINTS

The problem was solved using the Risk Solver Platform from Frontline Systems, Inc. A figure with the results associated with the different goals included in the model formulation is included below.

	A	B	C	D	E	F	G	H	I	J
1	Student Body Membership:			%						
2	Females	14,732	0.5317	0.53169						
3	Males	12,976	0.4683	0.46831						
4	Total	27,708	1.0000							
5										
6		Weight	Weight	%	%					
7	Goals:	Over	Under	Over	Under	Goal	Target	%	Totals	
8	Participants								577	
9	Females	10	10	0.0000	0.0014	0.5317	0.5317	0.5303	306	
10	Males	10	10	0.0014	0.0000	0.4683	0.4683	0.4697	271	
11	AFA and Scholarships \$								2,130,200	
12	Females	5	5	0.0000	0.0747	0.5317	0.5317	0.45696	973,426	
13	Males	5	5	0.0747	0.0000	0.4683	0.4683	0.54304	1,156,774	
14	Recruiting \$								388,300	
15	Females	1	1	0.0000	0.1448	0.5317	0.5317	0.38694	150,250	
16	Males	1	1	0.1448	0.0000	0.4683	0.4683	0.61306	238,050	
17	Coaching \$								3,236,233	
18	Females	1	1	0.0000	0.0538	0.5317	0.5317	0.37344	1,208,552	
19	Males	1	1	0.0538	0.0000	0.4683	0.4683	0.62656	2,027,681	
20	Total Budget \$					8,190,442	8,250,000		8,190,442	
21	Females	10	1	0.0000	0.0633	0.5317	0.5317	0.46841	3,836,487	
22	Males	10	1	0.0633	0.0000	0.4683	0.4683	0.53159	4,353,955	
23										
24	Objective:									
25	MinMax Variable	1.86802								
26										
27										

FIGURE 2: MODEL GOALS

The quantitative example illustrates how decision makers at athletic departments can analyze more than one objective at the same time. It incorporates the decision makers' knowledge *a priori* and provides a mechanism for allowing athletic administrators to easily explore alternative "what-if" solutions by changing one or more of the different goal weights and/or any of the model parameters.

CONCLUSIONS

This research represents the initial step towards the development of a decision support model to help athletic departments allocate resources while complying with Title IX of the Education Amendments of 1972, which prohibits sex discrimination at educational institutions receiving federal financial assistance.

In this particular context, a weighted goal programming optimization model is proposed. The proposed weighted goal program allows decision makers at athletic departments to consider multiple objectives, include preferences *a priori* and explore more than one possible solution to the problem. A sample problem was developed and solved in order to validate the model.

Decision makers at athletic departments must use financial resources efficiently and effectively communicate their decisions to multiple audiences. Overall, the use of a structured decision making approach such as the one proposed in this paper can help make decisions visible, lead to more efficient solutions and reflect positively on decision-makers as well as their institutions.

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A STUDY OF UNBALANCED BIDDING IN CONSTRUCTION PROCUREMENT AUCTIONS

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PROPOSED RESEARCH

Public agencies in the state of South Carolina must open all construction projects to competitive bidding. The contract is awarded to the lowest bidder. Twice a week, the Procurement Services of the South Carolina Budget and Control Board publishes a list of new construction projects open for bidding. This twice-weekly publication (South Carolina Business Opportunities - SCBO) lists proposed procurements that involve construction, goods, services, and information technology that are worth \$10,000 or more. The SCBO website provides one-stop access to contracting opportunities for statewide public contracts. Potential contractors may download complete specifications for jobs they want to bid on. The bidding process is sealed. Once the deadline for submitting bids has passed, a list of each participating contractor and their bid amount is made available to the public.

These competitive procurement auctions for state agencies in South Carolina operate as unit price contracts. Such contracts operate as follows. The state (the buyer) estimates the quantities of all goods and services (items) required to complete the construction project. The bidding contractors must specify a separate unit price for every item – this includes all costs needed to complete the task (labor, materials, overhead, etc.). The sum of all the unit costs is the “score” of the bidding contractor’s offer. The firm with the lowest score wins the contract and the buyer pays for the work as completed.

Unit price contracts are typically used when it is difficult to estimate the exact quantity of materials that will be needed. Buyers typically use unit price contracts in order to share some of the risk with the contractor. The contractor does not need to bid the worst possible case because if the units differ from those in the original contract, then the buyer pays for overages and the contractor is not paid for unneeded items. However, the contractor does risk not recovering fixed costs and target profits if an item is not installed. Conversely, if more units of an item are needed, then the contractor will likely recover excess fixed costs. Therefore, bidding contractors take into account both the possibility of overruns and underruns.

Unbalanced bidding occurs in unit price contracts when an item does not carry its appropriate share of fixed and variable costs. For example, contractors might estimate some unit costs on the

high side and some on the low side dependent upon their views of the risk of overruns and underruns. This is called “mathematically unbalanced” bidding. There is also “materially unbalanced” bidding in which the bid amount for some items does not even cover the actual cost of the work and, for other items, obviously overstates the cost. Unbalance bidding appears to be a common practice and it is of interest in the proposed paper to investigate whether it occurs in state procurement auctions in South Carolina.

Previous research by Gransberg and Riemer [2] looked at the impact of unbalanced bids in highway construction jobs in Oklahoma. The authors found that unbalanced bids were often due to perceived inaccurate bid quantities of big ticket items. Missbauer and Hauber [4] study the unit price contracts awarded by the Austrian government. The authors found existence of unbalanced bidding because there was incentive for bidders to “skew” the bids by improperly allocating fixed costs to variable costs. Since actual volumes needed can differ from volumes specified in the contracts, the actual payments can differ from the bid prices, leading to asymmetric bidding. Li and Philips [3] studied the aggressive strategies of entrant and incumbent bidders in Utah construction jobs. These authors found that the variation in bids was much larger than for incumbent bidders. The variation in the bids of entrant contractors could be mistaken for unbalanced bidding. Ewerhart and Fieseler [1] develop a mathematical model for analyzing the strategic behavior of contractors interested in profit maximization when bidding unit price contracts. The authors note that unit price contracts sometimes select a contractor with inferior abilities but it also leads to superior contractors bidding more aggressively.

The research proposed here is to investigate the behavior of bidding contractors for state procurement auctions in South Carolina, specifically looking into unbalanced bidding and entrant versus incumbent bidders. As a result of the Freedom of Information Act, data on all of the bidding contracts for all State agencies are publically available upon request. We have chosen to analyze data for SCDOT (South Carolina Department of Transportation) contracts, which are available on-line for all contracts starting in 2001. The authors plan to analyze data from a number of years and present the results at the conference.

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EFFECTS OF SOCIAL MEDIA USAGE ON HBCU COLLEGE STUDENTS' ACADEMIC PERFORMANCE

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ABSTRACT

Since Facebook was introduced to many college campuses in 2004, it has become nearly ubiquitous at universities. For instances, in late 2010, an EDUCAUSE Center for Applied Research study of 36,950 students from 126 US universities and one Canadian university discovered that of the 90% of students who used social networking sites, 97% said they used Facebook. This 97% students performed daily activities on the site [9]. Students in another study reported spending an average of over 1 hour and 40 minutes a day on the Facebook [4]. It is clear that social networking sites such as Facebook affect the college students' daily life, especially, their academic performance because if they spend too much time on the site for socializing such as viewing friends' profile, posted pictures, posted videos, or playing games, they will not have enough time to be used on their studies.

Quite many studies have investigated the relationship between college students' social networking site activities and their academic performance. For example, Pasek et al. [8] examined the relationship between Facebook use and academic performance, and found there was no relationship between Facebook use and grades; Kolek and Saunders [7] found that there were no differences in overall grade point average (GPA) between users and non-users of Facebook; Kirschner and Karpinski [6] discovered that Facebook users reported a lower mean GPA than non-users; meanwhile, Facebook users reported fewer studying hours per week than non-users. One recent study by Junco [5] examined the relationship among multiple measures of frequency of Facebook use, participation in Facebook activities and time spent preparing for class and actual overall GPA, and found that time spent on Facebook was strongly and significantly negatively related to overall GPA and only weakly related to time spent preparing for class. While almost all of the research on digital inequalities focuses on the Internet and communication technologies, Hargittai [3] conducted the only published study of gender, ethnic and socioeconomic differences between users and non-users of social networking sites. Her study found that Latino students were less likely to use Facebook than Caucasians.

Scholastic success is an important gateway to occupational choices, yet non-White students from urban high schools have the largest drop-out rates for students in the United States [2]. It has the similar large drop-out rates for under-resourced Historically Black College and University (HBCU) colleges, which is a set of underrepresented socioeconomic university, in the United States. As we know, positive social relationships can aid in one's confidence to perform well in school. Baker [1] found that a nurturing and safe school social climate significantly affected school satisfaction and academic success among urban, low-income African American students.

This study tries to explore whether we can effectively use social networking sites such as Facebook to help students build positive social relationships with their peers and professors, and furthermore, to reduce the drop-out rate, in other words, to increase the students' retention rate in HBCU colleges. To be more specific, authors try to reveal how social media usage i.e., Facebook in this study, affects college students' academic performance in a HBCU university, located in a South large city in the United States. Instead of only focuses on the time spending on Facebook, activities performed on Facebook, this study tries to discover whether the Facebook can be used for academic platform with the college professors' intentional lead. Specially, authors like to identify the facilitating function of social networking site on academic communication among students, and between students and professors, and then further discover whether the better communication can improve the students' academic performance in an entry level technology learning class. This is a longitudinal study that extends through a whole semester by comparing two sections of this entry level technology class. One section will be given the Facebook treatment, and the other one will work as control group without the Facebook treatment. The two section students' academic performance in this class will be compared at the end of the semester.

This study fills a research gap by comparing the students' real academic performance in a class other than the self-reported GPA; furthermore, it explores the rarely studied HBCU college students' academic performance and the social media usage. The findings of the study can provide higher educators in HBCU colleges with tips of using social media effectively to improve student engagement, persistence and learning.

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What is a Good Predictor of Success in an MBA Program?

A follow-up study

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ABSTRACT

The goal of this study is to determine if work experience might be a better predictor of success than a GMAT score by examining how successful students have been in an MBA program in a suburban metropolitan university. In an earlier study, the authors of this paper used the available data for a newly started MBA program to study if GMAT scores were good predictors of success in that MBA program. Success in the MBA program was measured by overall GPA for students completing the program. The study also examined the benefits of offering a GMAT Waiver to individuals with significant and leadership experience. Other characteristics, such as age, gender, race, undergraduate GPA and undergraduate upper division GPA were also studied. In that earlier study, results indicated that significant leadership and administrative work experience were better predictors than GMAT scores in predicting the overall success of students enrolled in that MBA program. There appeared to be very little correlation between GMAT scores and the overall GPA that students received in the program. However, since the study was done only three years after the start of that MBA program, data for only three cohorts of graduates (with only 61 students) was available at the time and the authors feel that they need to re-examine those findings in that study using the data that is available to us after 3 more years. The study should be beneficial to universities considering the criteria on which to place the most emphasis when making admissions decisions. Included in the paper will be a discussion of alternatives to offering the GMAT.

REVIEW OF THE LITERATURE

In a part-time program such as the one being studied in this paper, students are often older and have more significant leadership and management work experience than students admitted to a traditional MBA program. To maximize the number of admittances and improve the retention and graduation rates, it is

important that those involved with the administration of MBA programs understand the likely predictors of graduate student performance to be able to make quality admission choices (Sulaiman and Mohezar, 2006). More and more schools have recognized that the GMAT, including the GMAT Analytical Writing Assessment (AWA), should be waived for individuals with significant work experience (Braunstein, 2009). Fish and Wilson (2009) indicated that there also are other differences in factors, such as age, in predicting graduate performance in a part-time MBA compared to a one-year MBA program. This should be of particular interest to us at Clayton State University (CSU), because its 20 month is geared towards working professionals. Sulaiman and Mohezar (2006) stated that the majority of graduate department admission committees compare total work experience and undergraduate GPA when making an admittance decision. The article by Sulaiman and Mohezar (2006) gave six hypothesis, one of which stated: “H₁: Work experience will predict student performance.” They concluded that, “Those with longer previous work experience may more readily see the relevance of the management concepts taught. Thus, they would likely perform better than those with less work experience”.

Some leading schools, such as Northwestern University’s Kellogg School of Management, now base their enrollment on undergraduate academic records and work experience (Jones, 2005). As Kellogg’s Julie Jones indicated in a 2005 Business Week article, it does not make a lot of sense to require the Chief Financial Officer of an organization, who had an undergraduate GPA of 3.7 as an accounting major, to take the GMAT. Jones (2005) added that Kellogg places a major emphasis on the value and range of work experience that applicants can bring to the program. Many executive MBA programs now waive the GMAT exam (Gloeckler, 2005). In fact, in 2005, only 12 of Business Week’s top 25 MBA programs required the GMAT. About one-third of the applicants for the North Carolina Kenan-Flagler Business School opted for a GMAT waiver instead of taking the GMAT (Gloeckler, 2005).

Among the issues that need to be addressed are the standards for granting a GMAT waiver (i.e., not requiring the GMAT) and the requirement of the Analytical Writing Assessment (AWA) when a GMAT waiver is granted. In an MBA program for working professionals, such as the one at CSU, work experience might be a better predictor of success in the MBA program than the GMAT score or undergraduate work experience (Adams, 2000). Adams (2000) also indicated that work experience appears to be a better predictor of success for MBA students than even the GMAT or undergraduate GPA. He did so using ANOVA analysis and pointed out that the percentage of MBA having significant work experience has risen over time. It must be noted that, based on conflicting evidence about the GMAT as a predictor of success in MBA programs, the AACSB has stopped requiring GMAT scores for admissions into many types of MBA programs. In addition, previous research has also shown that some characteristics such as race and gender might affect the predictive validity of GMAT (Gropper, 2007). David Gropper was the assistant dean and executive director of Auburn’s MBA program when Auburn’s MBA was ranked 26th of the nation’s public institutions (Granger, 2005). He found that

other factors, such as substantial career advancement, are better predictors of success in MBA programs. He also indicated that factors such as loyalty, stability, and time management may be better predictors of success in business and therefore in a non-traditional MBA program.

In another significant article, Rogers and Rjntner (2001) stated that the GMAT Analytical Writing Assessment (AWA) gave no indication of a writer’s needs, and that the actual essays did not represent the type of content that MBA students usually had in their writing assignments. Rogers and Rjntner (2001) also pointed out that business school assignments usually concentrate on relevant business topics such as employees, co-workers, consumers, investors, and the macro community, whereas the AWA is more of an analytical writing associated with the academic environment.

As shown in Table 1 (GMAC, 2008), as the age of applicants increases, the mean GMAT scores decrease, indicating that age is apparently an important factor. Many individuals in the CSU MBA program are over the age of 40.

Table 1: Comparison of different age groups on the GMAT

Age	Mean GMAT Score
28 – 30 years old	551
31 – 34 years old	539
35 – 39 years old	516
40 – 49 years old	485

(See GMAC, 2008, Table5)

Further, research indicated that there are usually significant differences, in terms of gender and subgroups, relevant to how well the different groups score on the GMAT. The data shown in Table 2, shown below, must then be considered.

Table 2: Comparison of different age groups on the GMAT in 2007 – 2008

U.S. Subgroup	U. S. Mean Total Score	
	Men	Women
White (non-Hispanic)	560	521
African American	453	418

(See GMAC, 2008, Table6)

Based on the above review of the literature, there appears to be evidentiary ground for not using or giving less weight to the GMAT variable when considering admitting decisions. There also appears to be evidentiary evidence indicating that other factors, such as race and gender, should be considered when reviewing the success of students in an MBA program. The literature appears to support the hypothesis.

DESCRIPTION OF DATA

We have the data for 12 cohorts of our MBA graduates with exactly the same variables that we had conducted the previous study. We are able to re-examine our findings using a data set with much more observations.

MODEL

We divide our population into two groups: One group includes students that have taken GMAT and those who had a GMAT waiver. This permits the authors to compare the two groups using two sample tests of our hypothesis: The mean of MBA GPA is greater for those students who had GMAT waiver (due to work experience) than the students without a GMAT waiver. We use the t-test function in Microsoft Excel to compare the mean of the two samples: The one with GMAT waiver and the one without.

We also try to answer the following question: For the students without GMAT waiver, did GMAT score predict their success and was there any difference in their success based on their overall undergraduate

GPA, age, race, or gender? To answer this question we will run the following multiple regression model:

$$\text{MBA GPA} = b_0 + b_1 \text{GMAT Total Score} + b_2 \text{Undergrad GPA} + b_3 \text{Age at Start} + b_4 \text{White} + b_5 \text{Female}$$

where variables White and Female are two dummy variables with values equal to one when the student's race and gender are white and female, respectively, and zero otherwise. The results are somewhat similar to those of the previous study. Our study showed confirmed the previous findings.

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THE EFFECT OF IMPERFECTION ON PROCESS CONSTRAINT LOCATION

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ABSTRACT

This paper explores the relationship between imperfection and constraint location within simple serial processes, and how these affect process throughput. Constraint location is part of the physical structure of the production system, and is important because it has a direct effect on system performance. Our results cast doubt on the findings of prior studies that implicitly assumed perfect quality and concluded that a constraint position near the front of the line was preferable. Using simple deterministic models, we show that imperfection (yield loss) can cause the system constraint to appear in a different location than expected based on the nominal capacities of each process stage.

INTRODUCTION

This paper explores the relationship between imperfection and constraint location within simple serial processes, and how these affect process throughput. We look at a single type of production system – the simple serial flow line – and focus on two critical independent variables, specifically the nominal constraint location and the degree of imperfection within the process. The nominal constraint is determined by the stage that first reaches 100% utilization in the absence of imperfection, and the proxy for imperfection is yield loss percentage at the various stages. The dependent variable was taken as production system throughput. Models of serial processes were created within a spreadsheet environment and a series of deterministic simulations were conducted.

The motivation for this study was based in the author's personal knowledge that much effort and a great deal of money are wasted in misguided "improvement" efforts. This personal experience and observation are supported by accounts of failure or disappointing results from quality programs [2][10][13]. Accordingly, the purpose of this paper is to expand our understanding of how simple serial production systems respond to imperfection (yield loss) based on the bottleneck location within the process. Ultimately, this knowledge can guide management in more effectively making improvements to the process.

CONSTRAINT LOCATION AND PROCESS IMPERFECTION

Imperfection in processes is real. Spoilage, defects, and rework are common occurrences in manufacturing. An Industry Week survey of 884 responding manufacturing plants found that scrap and rework costs were estimated as two percent of sales [9]. In some industries this internal failure cost is much greater. For example, it is estimated that defective work costs aerospace/defense companies an average of six percent of their total sales [11].

While spoilage, defects, and rework are often encountered, the impact of this poor quality on the production system is not well understood [1]. Producing defective items results in lower yield. Adding more inspection or testing to find defectives adds time and money to the process. Rework reduces line yield losses but increases cycle time and process costs.

Much of this impact is manifested by increases in variability. Hopp and Spearman [6] claimed that *quality problems are one of the largest and most common causes of variability* and warned that such problems can have extreme consequences on operations. They showed that poor quality lowers throughput (yield) and increases cycle time for any given level of work-in-progress (WIP) inventory, because rework causes increases in both variability of process times and average utilization of affected workstations. Impact of poor quality on the overall line differs depending on the workstation where the defective item is produced. High WIP levels tend to amplify financial losses due to poor quality because of the larger time between processing the defective item and detecting the defect.

Scrap, which can be seen as the most extreme form of rework, is often treated as a deterministic quantity (e.g., 10%) when in almost all real situations the scrap rate for a given process is a random quantity [7]. For example, the *mean* scrap rate may be 10% but scrap may actually vary from 0% to 20% in different parts of the production cycle or at different workstations within the line. Most manufacturing systems use some form of job size inflation to compensate for average or expected yield losses and to protect customer due dates. The consequences for a specific order for a specific customer may be felt as increased lead time, waiting to fill out a lot due to low yield, or increased finished goods inventory resulting from excess goods caused by high yield. The more variable the yields, the greater the cost and disruption.

Constraint location is part of the physical structure of the production system, and is important because it has a direct effect on system performance. Layout affects throughput, productivity, and material handling cost and time [5]. A system consists of components that interact, and overall system performance is influenced by this interaction. Within a production system, interactions of component workstations is determined by the system structure, i.e., the arrangement of locations and relationships. If the location of the constraint changes, then the pattern of connections and interactions among system elements is different. The location of the constraint resource is therefore quite important to system performance. Given the constraint's critical role within a production system, it is highly plausible that the specific location of the constraint will have a significant effect on system performance, yet the literature on production systems contains few studies about the effects of constraint location in flow lines [8], or any system configuration for that matter. Both Chakravorty and Atwater [3] and Kadipasaoglu et al

[8] recommend additional research regarding how the location of the constraint workstation within a production line affects the throughput potential of the line.

LITERATURE REVIEW

Kadipasaoglu et al [8] investigated how the location of the constraint affected system performance in a simple, asynchronous four-stage line with unlimited interstation buffers. They measured performance in terms of mean job transit time (line cycle time), mean WIP in queue, and mean waiting time in queue. They did not directly measure throughput, which might be inferred using Little's Law ($Th = WIP / CT$) except that total system WIP was not reported, only WIP in queue. Their results showed that the closer the constraint workstation was to the front of the line, the better the system performed on all three measures, because a constraint position closer to the front avoided the progressive accumulation of variability and related starvation at the constraint. This study modeled a "push" system with mean time of Poisson-generated arrivals set to maintain 95 percent shop utilization, by which the authors meant constraint utilization. Most importantly, this study modeled the system as producing perfect quality, i.e., no defectives, an assumption that is arguably unrealistic.

Fry et al [4] investigated how bottleneck (BN) positioning in a multi-stage job shop affected shop performance (WIP level and due dates) and concluded that a location for the constraint resource near a gating operation at the lowest level in the BOM (bill of material) was generally preferable. They forced 95% utilization at the BN and two levels of "shop congestion" being 60 and 80 percent utilization at non-BN resources, by changing mean process times of all non-BN resources to achieve these utilizations. Their study assumed perfect quality, did not incorporate machine failures, and did not measure throughput.

Weston [12] investigated how bottleneck positioning in a ten-stage flow line affected system performance (measured as WIP in queue and aggregate work station idleness) and concluded that a location for the constraint resource at the front of the line was preferable. Weston measured the total time for a constant output quantity to be processed through the line. His study assumed perfect quality and did not include resource failures.

Investigations of constraint location are rare. Those cited here all have in common the conclusion that a constraint location at the front of the line results in improved system performance. It is important to note that none of these studies of constraint location have incorporated yield loss effects. Preliminary work in this study shows that not only is yield loss an important factor in choosing a location for the constraint, but that cumulative yield loss can actually influence the location itself.

All the cited works used WIP as a performance measure, however from a systems perspective the goal is throughput maximization not WIP minimization. Although not clearly described, the flow control in all the cited studies seems to have been a simple push mechanism. Given this means of flow control, it is easy to understand the use of WIP as a performance measure. Traditional push systems control release rates and measure WIP while pull systems control WIP and measure output rates. Cycle times are very sensitive to release rate but relatively insensitive to WIP

levels. Pull works better than push because it caps WIP and gives immediate feedback on the output rate. This study assumes a pull type flow control. While WIP levels are observed, this study focuses on throughput (by keeping the constraint busy) as the primary system performance measure.

MODEL AND RESULTS

Assumptions about the System and its Components

The following assumptions are used in the models:

1. Incoming raw materials are always available.
2. Raw material enters Stage 1 only; no raw material added at other stages.
3. Units leave Stage 1, proceed to Stage 2, and so on to Stage 5.
4. There are no reentrant points.
5. Units exit from Stage 5 and become sales.
6. One product only is being made.
7. No setups are involved.
8. There is ample buffer space between workstations so no starving or blocking occurs.
9. Inspection is performed by the worker at each stage.
10. Inspection is perfect (no errors and all defective units discovered).
11. Defective units are discarded when found (no defectives enter a downstream stage).
12. Capacities shown are deterministic.
13. There are no resource (machine/worker) failures or other downtime.
14. Transfer batch size equals one.
15. Transfer between stages is instantaneous.
16. There is no rework of defective units.
17. Resources at each stage are identical in number.
18. Each worker has an identical work schedule and costs.
19. One piece of raw material is required per finished good.
20. Production at each stage is limited to that needed by the constraint (pull flow control)
21. Defect rates are deterministic.
22. The goal is to maximize throughput.

Model Descriptions and Results

The models used in this study were static, deterministic models of a serial flow line. Deterministic simulation models have no stochastic elements, and they use fixed, non-random values to specify the model and any particular variant of the system under investigation. Because there is no randomness, the output is also fixed for any specific set of inputs. Rerunning the simulation with the same input factors will always give the same result. A typical accounting spreadsheet is a static, deterministic financial model of an enterprise. Some static models can also contain random input elements. Monte Carlo methods represent a class of static, stochastic simulation models in which random sampling over input distributions is used to perform

numerical integration of a static system. Since injection of greater variability into any process tends to degrade performance, the lack of variability in the models studied here would mean, it is believed, that the findings will be less severe in this study than if variability was included. The static, deterministic models considered in this study were created in a spreadsheet environment. These flow processes have a simple dependent resource structure, and all products have the same linear flow, e.g., the traditional assembly line.

One finding from the static investigation for example, was that it is not just the constraint that must be considered for yield improvement but the full path from and including the constraint, to the end of the line.

Consider a simple five-stage (five workstation) serial production system making one product. Raw materials and components enter the system at the first stage. Jobs flow through the stages, in sequence, with no re-entrant points. The system structure is depicted in Figure 1, with workstation capacities and yields shown in Table 1.

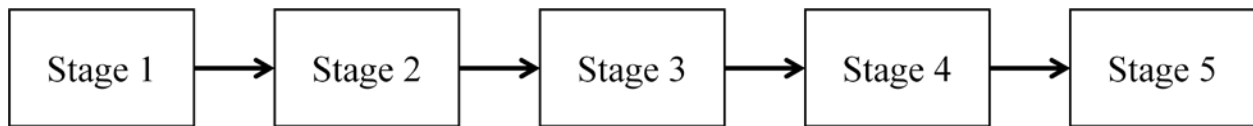


Figure 1. System Flow Diagram

A specific configuration of the system depicted in Figure 8, with given capacities and yields, is represented by the values shown in Table 1.

Table 1. Workstation Capacities and Yields for System 1

Stage	1	2	3	4	5
Capacity (units/hr)	10.00	10.00	10.00	10.00	9.50
Yield	100%	100%	100%	100%	100%
Throughput (good units)	9.50	9.50	9.50	9.50	9.50
Utilization	0.950	0.950	0.950	0.950	1.000

For the process specified by Table 1, it is obvious that Stage 5 is the nominal capacity constraint, i.e., bottleneck. The bottleneck (BN) stage has a physical production capacity such that its capacity will be exhausted before that of other stages. The capacity of the process is dictated by the capacity of the bottleneck, and in this case is 9.50 units per hour.

A second specific configuration of the same system is represented by the values shown in Table 2. From the given capacities and yields, it is clear that without consideration of yield loss, Stage 5 is again the nominal process bottleneck, Stage 5 has the lowest capacity and with perfect

production would constitute the system constraint. But Stage 5 does not reach 100% utilization, so it is not the BN. In fact, Stage 1 is the BN, reaching its capacity limit, but not sending enough product downstream to satisfy the capacities of any of the other four stages. Here we see that the nominal capacity constraint is not the system constraint, purely because of imperfection in the form of yield loss.

Table 2. Workstation Capacities and Yields for System 2

Stage	1	2	3	4	5
Capacity (units/hr)	10.00	10.00	10.00	10.00	9.50
Yield	97%	97%	97%	97%	97%
Throughput (good units)	9.70	9.41	9.13	8.85	8.59
Utilization	1.000	0.970	0.941	0.913	0.932

As a third example, consider the specific configuration of the same system represented by the values shown in Table 3. From the given capacities and yields, it is clear that without consideration of yield loss, Stage 5 is again the nominal process bottleneck, Stage 5 has the lowest capacity and with perfect production would constitute the system constraint. But Stage 5 does not reach 100% utilization, so it is not the BN. In fact, Stage 3 is the BN, reaching its capacity limit, but not sending enough product downstream to satisfy the capacities there. Here we see again that the nominal capacity constraint is not the system constraint, purely because of imperfection in the form of yield loss.

Table 3. Workstation Capacities and Yields for System 3

Stage	1	2	3	4	5
Capacity (units/hr)	12.00	11.00	10.40	10.60	10.20
Yield	95%	99%	99%	97%	99%
Throughput (good units)	10.51	10.40	10.30	9.99	9.89
Utilization	0.921	0.955	1.000	0.971	0.979

SUMMARY AND CONCLUSIONS

This purpose of this study was to explore the relationship between imperfection and constraint location within simple serial processes, and how these affect process throughput. We looked at a single type of simple production system – a serial flow line. We found by investigating several examples that yield loss can actually cause the system constraint to appear in a different location than expected based on the nominal capacities of each stage.

Prior studies concluded that a constraint position near the front of the line was preferable, but all that research assumed a system having perfect quality. The location of the constraint resource within a system interacts with cumulative yield loss to produce severe affects upon the system. If the constraint is located at the first position, then a fraction of all good units passing the constraint will be scrapped. This fraction is equal to the cumulative yield loss of all stations following the constraint. The additional capacity of these succeeding stations is useless to counteract the loss. The closer to the front the constraint is located, the greater will be this loss (other things remaining equal). On the other hand, if the constraint is located at a downstream station, then less of its productive capacity is destroyed by subsequent yield loss, and stations preceding it can use their additional capacity to produce extra units to compensate for losses between stage one and the constraint.

Our findings cast doubt on the conclusions of prior studies and because these studies assumed perfect quality, they should be replicated with the introduction of imperfection. This could take the form of yield loss, as in this study, or stage failure and repair episodes. Stochastic simulation should be performed as well, rather than the static, deterministic models used here.

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ACCOUNTING CURRICULUM CHANGE PROPOSALS: A COMPARISON OF THE THREE PROPOSALS

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ABSTRACT

Over the past 20 to 30 years, the “model” accounting curriculum has undergone a number of significant changes. In 1986, the Bedford Report, issued by the American Accounting Association (AAA), spelled out the need for change in accounting programs, criticizing the traditional lecture-based pedagogy typically used by accounting faculty. Subsequent to that report, partners from the eight largest international accounting firms issued a report, *Perspectives on Education*, describing what they believed were essential skills for a successful career in public accounting. Much of that report supported the findings of the Bedford Report. Most recently, in July 2012, a joint committee of the AAA and the American Institute of CPAs (AICPA) issued the Pathways Commission report stressing the continued need for a radical change to accounting education. This paper proposes to evaluate similarities and differences between the three reports.

INTRODUCTION

Over the past 20 to 30 years, the “model” accounting curriculum has undergone a number of significant changes. In 1986, the Bedford Report [2], issued by the American Accounting Association (AAA), spelled out the need for change in accounting programs, criticizing the traditional lecture-based pedagogy typically used by accounting faculty. The report suggested that accounting firms, a primary employer of accounting graduates, needed students to be more adaptable to meet the changing needs of businesses. They believed they could train their employees in the specifics of their firms’ operations but they needed students to come to them able to think critically and creatively.

Subsequent to that report, partners from the eight largest international accounting firms issued a report, *Perspectives on Education* [6], describing what they believed were essential skills for a successful career in public accounting. Much of that report supported the findings of the Bedford Report. Most recently, in July 2012, a joint committee of the AAA and the American Institute of CPAs (AICPA) issued the Pathways Commission report stressing the continued need for a radical change to accounting education. [3]

The remainder of this proposal is organized as follows. First, a brief overview of the literature is presented. This will include a discussion of the three major reports and then subsequent research conducted on the changes made to the accounting curriculum of several individual colleges and universities. Next, the proposed research question to be addressed will be discussed.

REVIEW OF THE LITERATURE

In 1986, the American Accounting Association (AAA), the professional organization for accounting academics, formed a committee to evaluate the effectiveness of the current accounting curriculum. The product, The Bedford Report [2], highlighted the need for extensive change in the curriculum of accounting programs. They cited the changing environment of business and the inability of accounting education to prepare future employees adequately. In particular, they were critical of the traditional lecture-style classroom, suggesting it did not prepare students to think critically or broadly. The report highlighted what the committee believed were three expected needs of the accounting profession. First, they suggested that “accounting services are becoming both broader and more specialized.” [2] They stressed that the accounting information needs of organizations change constantly. For instance, while auditing services once represented the primary service provided by accounting firms, it had become a much smaller segment of most accounting firms’ activities. More specialized areas such as consulting, special investigations, fraud investigations, and litigation support had become, and were expected to remain, some of the more prevalent services provided by accounting firms.

Second, they reported that “many of the new accounting services are more innovative-thinking than standard-intensive.” [2] The ever changing requirements of clients necessitate firms use more innovative approaches in order to meet these needs. This leads to a need for highly skilled specialists or, more specifically, individuals that are able to adapt quickly to change. Finally, the Bedford Report concluded that “accountants who remain narrowly educated will find it more difficult to compete in an expanding profession.” [2] This report stressed the need for accounting graduates to have the ability to understand the big picture of how an organization operates as well as being able to adapt quickly to changes in the business environment.

The Bedford Report also argues that a successful undergraduate accounting program should include a substantial liberal arts component. Liberal education requirements “would develop in students the capacities for inquiry, abstract logical thinking, and critical analysis; literacy, which includes writing, reading, speaking, and listening; understanding numerical data; historical consciousness; and appreciation of science; the study of values; the experience of art; international and multicultural experiences; and study in depth.” [2] The report suggested that this broad core knowledge base would provide students with the ability to determine what information would be important in making decisions and applying accounting skills. The Bedford Report did not suggest that the core accounting education be ignored. Instead, the report proposed the inclusion of accounting courses which focused on the importance of information development and disclosure, not just memorization of rules and facts. A successful program would give students “the knowledge, techniques, sensitivities, and abilities all accountants should have for entry into the accounting profession and the capacity to apply those qualities under reasonable supervision.” [2]

Three years after the issuance of the Bedford Report, the accounting profession issued its own report highlighting what they considered to be the critical skills and knowledge required of successful future accounting professionals. Their findings paralleled those of the Bedford Report. They stressed that accounting programs should produce graduates that possess good communication, intellectual, and interpersonal skills. While the stereotypical view of the

accountant is an introverted, shy individual unable to interact with others, the reality is that an accountant must have the skills and ability to deal with a variety of individuals in a variety of circumstances.

In addition to these skills, an accounting graduate must bring a large body of knowledge to the table. In particular, the accounting professionals suggested that the ideal accounting curriculum would “include a sufficiently large, broad and deep general education component to yield a level of knowledge that is characteristic of broadly educated person.” [6] Accounting professionals also “must have an understanding of the economic, social, cultural and psychological forces that affect organizations.” Finally, students should graduate with a “strong fundamental understanding of accounting and auditing ... (as well as an understanding of) the history of the accounting profession and accounting thought.” [6]

The participating accounting firms were so committed to their findings that they donated \$4 million dollars towards the development and improvement of accounting curricula by colleges and universities. This financial commitment led to the creation of the Accounting Education Change Commission (AECC) which then funded ten universities and two community colleges in their efforts to change their accounting curriculum. The funded projects ranged from several institutions making broad, sweeping changes to their entire accounting programs to others looking only at a narrow issues such as improvements to the first accounting course offered to students.

Over 20 years later, a joint committee of the American Accounting Association and the American Institute of CPAs issued the Pathways Commission Report analyzing the future of accounting education, focusing on both the education of the accounting educator and the accounting student. Seven recommendations were presented by the joint committee, ranging from the need for the integration of accounting research, education and practice to the development of a dynamic curricula model that can attract “high-potential, diverse entrants into the profession.” [3] Since this report was just issued in July 2012, little, if any, research has been conducted on its impact on accounting education.

Following the issuance of the first two reports, many colleges and universities initiated changes in the specific programs they offered. In particular, Deines and Valentine [4] describe the changes made by Kansas State University while Albrecht, Clark, Smith, Stocks and Woodfield [1] discussed Brigham Young University’s process to overhaul their entire accounting program. Other studies, such as Porter & Carr [7], Klimek [5] and Taylor and Rudnich [8], describe the efforts made by other institutions to “perfect” their accounting curriculum.

PROPOSED RESEARCH QUESTION

The proposed study will compare and contrast the three major reports on recommended changes to accounting curriculum: the Bedford Report, *Perspectives in Education* and the *Pathways Commission Report*. Understanding the similarities and differences in these proposals potentially will provide a better perspective of what should and should not be included in the accounting curriculum of colleges and universities. In addition, it will provide an historical perspective into accounting education over the last 30 years.

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USING A SUMMER CAMP TO PROMOTE COMPUTER SCIENCE

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ABSTRACT

The number of undergraduate students studying computer science is not keeping pace with demand. Studies have shown that middle school is a key age in which students develop an interest in the sciences. This article presents the results of a pre and post camp survey of students to determine the impact of a summer computer camp on students' attitudes about computer science. The results show that the camp had a positive impact and camp participants may have had a predisposition to computers.

INTRODUCTION

As the need for computer science professionals increases, the number of undergraduate students studying computer science is not keeping pace. The U.S. Bureau of Labor Statistics Office of Occupational Statistics and Employment (OOSE) projects a 22% employment growth rate in computer related fields for the 2010-2020 decade compared to 14% for all occupations [12]. However, enrollment trends may not meet this demand.

One way to increase interest in computer science is to start the process with younger students.. Rodgers found that students start forming opinions about possible careers in middle school [16]. That is also about the time students begin to form opinions of science and mathematics. These opinions influence their interest in pursuing a career in those subjects [10]. While many middle school students have an understanding of careers in professions such as medicine, education, or business, and learn about others (ex. forensic science and law) through the media, they do not have a good idea of what a career in computer science involves [16].

To help address this problem, universities and colleges have developed summer computer camps directed at middle school students [6] [4] [7] [10] [1] [13] [19]. The National Science Foundation and Google have created grant opportunities to help prepare K-12 teachers to teach computing concepts. In February 2013, the US House of Representatives passed the Academic Competition Resolution of 2013 to promote Science, Technology, Engineering, and Mathematics (STEM) through developing mobile apps.

This paper presents the results of a camp designed to increase student knowledge and interest in the computing area. The study adds to the body of work already conducted in this area and highlights the need to reach a broader audience. The author co-conducted a computer camp for

middle school students, grades 7-8 (12-14yrs). The approach we took in designing the academic camp was to expose students to computer science concepts through games and ‘hands on’ exercises. We present related work, camp design including goal and activities, methodology, and results of pre and post-camp surveys.

RELATED WORK

Summer computer camps for middle school age students have become popular in recent years. Research has shown that these camps can increase awareness and interest in computer science [14]. Many camps have targeted a specific demographic to increase interest in populations underrepresented in the computer science field, such as females [6] [19] [15] or Latina/os [8]. These camps were designed around the general interests or cultural diversity of specific populations.

Camp designs have focused on a broad spectrum of subjects such as cryptography [18] and web-authoring [15] or introductory computer teaching tools such as Alice [19] [2] or Scratch [1]. The idea of using games to stimulate computing interest in middle school students has been well received [6] [10]. Middle school students’ interest of games spans culture and gender. A computer camp using games as the main motivation for teaching computer science to girls was successfully received by the attendants [5] [9].

The need for computational thinking is well documented. Douglas Rushkoff [17] said “When human beings acquired language, we learned not just how to listen but how to speak. When we gained literacy, we learned not just how to read but how to write. And as we move into an increasingly digital reality, we must learn not just how to use programs but how to make them.” Wing proposed the idea of computational thinking and of incorporating it across academic fields in 2006 [21]. Wing now defines computational thinking as “the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent” [22]. The National Science Foundation established the Innovative Technology Experiences for Students and Teachers (ITEST) in response to the projected shortage of professionals in Science, Technology, Engineering and Mathematics (STEM) [11]. The ITEST Computational Thinking Working Group states that computational thinking involves defining, understanding, solving problems and abstraction. The working group postulated that computational thinking has benefit for youth both in and out of school. The authors review computational thinking in game design and robotics, areas that may be of particular interest to youth [2]. Qualls and Sherrell [16] state that computational thinking activities must start in the primary grades and continue through the secondary grades and beyond, if computational thinking is to become as common as reading, writing and arithmetic. The importance placed on computational thinking by the National Science Foundation (NSF) is evidenced by the many grants that require or promote computational thinking, www.nsf.gov. Barr and Stephenson present computing concepts that can be applied across disciplines in an effort to help develop computational thinking in K-12 [3].

CAMP DESIGN

The camp facilitators developed a one week academic summer camp for middle school students. The primary camp goal was to increase the students' knowledge or interest in the computing area and help develop computational thinking. The facilitators designed the camp to expose students to computer science concepts through games and applied exercises.

The camp was conducted Monday through Friday, 9:00am to 4:00pm. The camp was limited to twenty-four students with one college student assistant. The participants were in grades 7-8 (12-14yrs) with no other specific population or demographic. The facilitators' university advertised the camp through an open call to the community.

The camp's stated goals were:

- Encourage students to consider computer science as a career
- Promote an understanding of computers that goes beyond using them
- Help students recognize the underlying purpose and capability of technology
- Break the stereotype of what/who is a computer scientist
- Inspire an interest in learning, creativity and inventiveness.

The camp's activities were selected to facilitate the camp goals:

- Participants developed computer games to introduce the concept of software development.

To introduce the concept of software development students developed a computer game using GameMaker. GameMaker Lite was chosen because it was already on the campus computers and one facilitator had previously used the software. This activity addressed the goals to inspire interest and encourage a career in computer science. Many middle age students are interested in playing computer games and the facilitator expected that voluntary participates in a computer camp might have a greater pre-disposition to enjoy computer games.

- Participants solved puzzles and played games that inspire computer science. An example game reinforced the idea of binary numbers. Following a presentation about binary numbers, participants played a binary numbers magic game that used cards displaying the powers of two for numbers one to thirty one. By challenging the students to think through puzzles the students could develop an understanding of computers beyond just using them. Furthermore, asking students to consider how computers could be used to help solve puzzles encouraged them to consider the capability of technology.

- Participants looked inside a computer, identified parts of a computer, and installed/uninstalled memory and expansion boards.

To help demystify computers, the camp instructors guided the students in looking inside a computer's system unit and identified such parts as the motherboard, memory, expansion cards and drives. This activity was accomplished using obsolete or broken computers from the university's IT department. Allowing students to uninstall and install memory and expansion boards was intended to assist students in realizing that some maintenance and upgrade activities can be performed by a non-professional. Looking inside the computers was intended to promote a richer understanding and appreciation of the computer, beyond using the software.

- Presentations by camp conductors.

The instructors provided presentations and videos on a variety of topics to address the goals including emerging technology, security, software pilferage and illegal downloading, networking, and binary numbers. The goal of breaking the stereotype of what/who is a computer scientist was addressed through example. The camp presenters were females of different races. By providing role models of different ages, interests and backgrounds, the stereotypical view of the computer scientist was challenged.

METHODOLOGY

Two surveys were developed for the study. The first survey was completed by camp participants before the camp began; the second survey was completed by camp participants on the last day of the camp. The camp surveys included questions to assess Confidence in learning computer science and programming, Attitude toward success in computer science, CS as a male domain, Usefulness of computer science and programming, Computational Thinking, and Camp Experience. We developed the survey using questions from Wiebe [20], adapted the questions for middle school students, and added questions based on the goals of the camp. Table 1 shows the Cronbach's alpha for the Wiebe questions.

The pre and post camp surveys consisted of thirty questions. Four questions addressed camp attitude, for example: Being regarded as smart about computers would be a great thing. Four questions guided the analysis of confidence, for example: I am not comfortable with learning things about computers. Four questions assessed computing as a male dominated field, for example: Girls who enjoy studying computers are a bit peculiar. Ten questions focused on computational thinking, for example: I can use computers to help solve real life problems. Four questions addressed the usefulness of computers, for example: I see computer skills as something I will rarely use in my daily life. Four questions addressed camp experience, for example, I think I will enjoy (I enjoyed) this camp.

TABLE 1 Cronbach's Alpha	
1. Confidence in learning computer science and programming	0.91
2. Attitude toward success in computer science	0.86
3. Computer science as a male domain	0.83
4. Usefulness of computer science and programming	0.91

RESULTS

The camp size was small, 8 participants. The demographics were concentrated with one female, one visiting Japanese male, and 6 white males.

The survey used a 5-point Likert scale. The pre and post camp surveys were analyzed to determine pre-camp attitudes and if these attitudes had changed at the conclusion of the camp.

All but one student had a positive attitude about being considered “smart about computers” prior to the camp. One student, Student 6, selected the lowest rating, level 1, for the question Being first in a contest about writing programs would please me; this same student selected the middle ground, level 3, for all other attitude questions.

Students rated Confidence at 4.68 during the pre-survey. Student 6 selected the equivalent of 2 on a 5-point scale for one question but rated the other questions consistent with the other students.

The question of computer science being a male domain brought mixed conclusions. Usefulness revealed some conflicting answers, Students 4 and 6 indicated that they expect to use and will rarely use computer skills as a part of their daily lives. The students expected and received a positive camp experience. Summary results are shown in Table 2

Survey Area	Pre to Post results
Attitude	positive pre and post
Confidence	increased
Computational Thinking	increased
Domain	increased girls as good as boys
Usefulness	increased
Camp Expectations	high pre and post

CONCLUSION

- ▶ Camp participants already had positive impression of CS
- ▶ Positive impact on CS domain
- ▶ Grant to decrease cost of camp
 - ▶ Increase participation
 - ▶ Increase economic diversity
- ▶ Conduct survey in controlled environment

Many resources exist to assist with developing an academic computer camp. Free software is available that can be used in an academic setting. Some software has associated resources to assist educators. Software that is also free to the individual allows a student to continue independent learning. This will further promote computational thinking skills. Some organizations that provide grants to help promote computer science and computational thinking, such as Computer Science for High School, make grant proposals publically available. Organizations such as CS Unplugged, CS for Fun, and CSTA provide a wealth of information and activities. Some activities include not only instructions but also speaker’s notes. As researchers and teachers continue to share what works, it may be easier to increase the number of educators that intentionally include activities that help promote computational thinking and increase the number of students that have an opportunity to attend a computer camp that helps to promote computer science.

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What in the World is Going On?

Sheila Foster and Robert E. Freer

The accountant of today is very different from the accountant of times past. Today's accountant is a far cry from the Bob Cratchit of Charles Dickens's *A Christmas Carol*, sitting on his high stool in the cold office with his neck scarf and patched coat, kowtowing to his boss, Ebenezer Scrooge, and hoping to get off a few minutes early on Christmas Eve. A student entering the profession today is viewed as a vital member of the management team. He or she is expected to do more than just periodically prepare paper reports from a back office that can be issued to stockholders and sometimes used by management to make decisions about operations. Instead, today's accountant is expected to attend management meeting and be able to immediately provide and interpret information that will help in the decision-making process.

This means that today's accounting student must be more than technically prepared. It is not enough to be able to leisurely prepare financial statements from "the books" at the end of the accounting period using textbooks and last period's financials as a guide. The accountant, and especially the management accountant, must be able to analyze information "on the spot" in order to contribute to the team. He or she must be able to use the tools learned in the past to respond quickly to changes in the business environment – both inside and outside the organization.

We, as educators, have to broaden our curriculum to assure the graduates we send out are ready to take a place around the management table and be ready to assume the duties the organization expects of a contributing member of the core decision-making group? Of course, we need to make certain that the accounting student has a thorough grounding in the basics of accounting. Students need to go out from our tutelage armed not only with the technical accounting tools that will be needed for the job, but also with enough practice with those tools to be able to determine which best fits the situation of the moment, to quickly and accurately use the tool selected, to correctly interpret the results, and to clearly

communicate the results to other members of the team in language they can understand so that the best course of action can be determined.

But is more needed? Is there another side of their education as future business leaders that may be receiving less attention in the accounting classroom than might be needed? While students may be able to learn the technical side of accounting, the ability to incorporate outside information into the process may be more difficult and, probably, receives less attention in the classroom. How do we help students become able to look at events happening around them and see how those events may affect the organization? How do we help them to recognize vents that will have an impact while ignoring the others that will be less likely to influence future outcomes?

What's going on in the World?

One way to address this other side of the education of future business management leaders is to require students to focus on what is happening in the world around them. Professors may feel that the world outside the classroom already is the primary focus for today's students. With email, tweeting, twittering, friending, linking, and the constant presence of electronic devises, it seems our students are constantly "in touch" with the outside world – frequently to the detriment of what is happening in the classroom. However, while today's student may be "plugged in," the world he or she is plugged into may be very limited. It may consist primarily of family, friends, and friends they have never met but whose every move seems important and needs to be constantly communicated. It is enlarged by on-line videos, downloaded music, and attention-grabbing games. News, in the form of print or from radio, television, or on-line, may account for a very small part of the student's field of information.

To spur a broader level of awareness, we begin each class with the same questions, “What is going on in the world? What has happened since we last met?” At the beginning of the semester, students usually have little, if anything, to contribute. They simply have not watched, heard, or read any news. Gradually, however, as they are encouraged to watch news, they will begin to at least come to class with one current affairs item. At first, it is usually something from the world of sports. What team won? Where is a big sports event happening? What athlete is behaving badly?

Other students will usually laugh when sports are initially brought up in an accounting class as a news item, but the follow-up question, “So, how would that affect us as managers?” eventually gets most students to think about the impact of the item on businesses and managers. As the semester passes, students usually begin to show more interest in the news and more insight into the effects of events on businesses and their management teams. Students have brought up sports and Obamacare, of course, but they have also considered the possible effects of business closings, unemployment and jobs reports, increased gasoline prices, elections, IPOs, actions of the Federal Reserve, and frauds by businesses and their managers.

While front-page stories dominate the discussions, from time to time, it is interesting to bring up something that might shock students but also make them think. For example, what would be the implications for management of patients dying of rabies from organ transplants? What would be the implications of young people in Japan choosing not to have sex resulting in a falling national birth rate?

Does this exercise that begins each class make a difference? Because class time is being used for this activity, it seems natural to track the results to see if students are actually making connections between

the outside world and what they were learning. Therefore, the following question was included on the final examination for MBA students in August 2013.

During the semester we have discussed many items in the news that impact managers. Jobs! Jobs! Jobs! seems to be the topic that interests most Americans. At the national level we have read about and heard discussions by politicians, business people, and media "talking heads" on many topics that affect the future of businesses and employment across the country. The President has asked that anyone with ideas share those with his administration. You are ready to write a letter to the President with your ideas.

You probably could list more, but because your time is limited, begin your letter with a list of what you consider to be (no more than) the top three issues facing businesses; how you see those issues affecting businesses, and what suggestions you would make for dealing with them. Be SPECIFIC. Broad sweeping statements are really of little help – everyone wants world peace and for no child to go to bed hungry. However, making a broad, general statement like that does not constitute a suggestion that will help the administration format a game plan for action or gain you any points on this assignment.

Complete the letter: (You are limited to one full page – Times New Roman, 12 font.)

Dear Mr. President:

To encourage them to do their best, students were told that their answers might be shared – at least – with one of our Senators.

This was in August of 2013, prior to the rollout of The Affordable Care website on October 1, 2013. Our responding cohort includes thirty-three MBA students. The "letters" were respectful and sincerely offered suggestions or, at least, explained positions. Nineteen students (57.6%) mentioned three areas of concern; eleven (33.3%) mentioned two; three (9.1%) mentioned only one area. Of those who mentioned only one area, two were concerned about health care and one was concerned about tightening requirement for welfare recipients.

Students concerns have been grouped around twenty-six different issues. Health care issues were mentioned most frequently (seventeen students – 50%). Taxes of one kind or another were the second most mentioned area (twelve students (36.4%). Following are the issues mentioned by these future managers.

Areas of Concern to Future Business Managers

1. Obamacare - 17 students (51.5%)
2. Taxes – 12 students (36.4%), including raising taxes on the rich (1 student); implementing land tax breaks for farmers (1 student); lowering business taxes (3 students); instituting a flat tax (3 students); eliminating corporate taxes (1 student); eliminating employer payroll tax (1 student); eliminating the death tax (1 student); and putting in place tax incentives for small businesses (1 student)
3. Government spending and fiscal responsibility – 6 students (18.2%)
4. Education – 4 students (12.1%)
5. Welfare program, including tightening restrictions on welfare recipients – 4 students (12.1%)
6. Energy cost and energy independence, including one mention of Keystone XL pipeline – 4 students (12.1%)
7. Outsourcing – 3 students (9.1%)
8. Economic uncertainty – 3 students (9.1%)
9. Government interference and restrictions – 3 students (9.1%)
10. Support for small businesses, including stipends – 3 students (9.1%)
11. Social Security – 2 students (6.1%)
12. Immigration, including enforcement – 2 students (6.1%)
13. Lack of skilled work force – 2 students (6.1%)
14. Hiring practices – 2 students (6.1%)
15. Job creation, giving more attention to this area – 2 students (6.1%)
16. Lending practices for small businesses - 2 student (6.1%)
17. Forcing companies to pay benefits resulting in part-time jobs – 1 student (3.0%)
18. National security, including leaks – 1 student (3.0%)
19. The Federal Reserve – 1 student (3.0%)
20. Raising the minimum wage – 1 student (3.0%)
21. Adam Smith’s “invisible hand” – bailing out poorly run companies – 1 student (3.0%)
22. Forgiving student loans, opposed especially for foreign students – 1 student (3.0%)
23. Deregulation of banks and financial institutions – 1 student (3.0%)
24. Foreign aid – 1 student (3.0%)
25. Lack of technology knowledge – 1 student (3.0%)
26. Making big business the “enemy” – 1 student (3.01%)

We are satisfied this exercise of beginning the class with a short discussion of “What is Going on in the World?” has forced students to have some interaction with the news media and with events going on outside their immediate circle of family, friends, and internet “friends.” Hopefully, this has sparked some flame of curiosity that will continue to burn after the semester ends and there is no requirement for students to listen to, watch, or read the news. Follow-up in later MBA classes might be studied to see if their interests continue.

The Effects of Total Quality Management on Company Profits: A Managerial Perspective

Michael P. McCarthy

Mahesh S. Raisinghani

Amit Arora

Abstract:

This paper documents both the cause and effect of Total Quality Management upon company profits and long-term sustainability of organizational operations. The author attempts to prove that Total Quality Management's goal is to maintain standards through development of improved systems and process to increase customer satisfaction. This paper also seeks to identify, measure, and define the cost of implementing Total Quality Management standards and procedures in relation to increased and sometimes decreased in company profits. The author identifies those aspects of the Baldrige National Quality Program and both empirical and case study evidence to justify the case for implementing TQM procedures within organizations.

Introduction:

Total Quality Management (TQM) is commonly defined as a process of employing an all encompassing and formalized approach to managing organizations who seek to improve the quality of both products and services offered to a targeted consumer groups to maximize company profits. This process is based upon continuous feedback between the organization and consumer ultimately resulting in a never ending cycle of sustained improvements of the item or service being produced. TQM can be industry standardized in accordance with International Organization for Standardization (ISO 9000) or tailored specific to any individual organization (banks, non-profit, Government, assembly line production, etc.) by utilizing any number of TQM tools such as "Benchmarking, "Scatter Charts", "Six Sigma", etc. Whatever the TQM tool employed, it should be noted that any changes in TQM measurements should always be based upon immediate quality deficiencies and customer feedback that affect company profits. These standard TQM measurements include; 1) Plan – collect data and define the problem, 2) Do – develop and implement a resolution, 3) Check – confirm results, and 4) Act – document and develop recommended changes via the organization's Configuration Management system.

The goal of TQM however is not to simply maintain quality standards but instead to develop a system of quality governance that seeks to develop a product or service that is acceptable to the customer the very first time that product or service is tried or tested. If customer satisfaction is able to be achieved the very first time, it stands to reason that the customer base will increase thereby increasing company profits. However, if customer satisfaction is not captured upon initial contact with the company's product or service or worse yet, customer satisfaction experiences a decline due decreasing emphasis on TQM resulting in gradual degradation of the at product or service, it stands to reason profits will ultimately decline. In fact, numerous studies have shown the extreme importance of capturing and maintaining customer loyalty since dissatisfied customers are more likely to express their negative experiences with their peers rather than a positive buying experience - by approximately 10 times.

It should be noted however that TQM is both profitable and expensive to an organization. Profitable as discussed above and expensive to implement and maintain. However if implemented properly, the organization should experience continuous long-term Returns on Investment (ROI) as profits increase by negating the need to (re)spend capital resources by, 1) duplication of (production) efforts, and 2) establishing and maintaining customer loyalty. It is also equally important to note that according to various industry statistics, it will cost a company approximately 5 times the amount to capture new customers as opposed to retaining its current customer base. This therefore is the prime reasons why, if implemented properly, organizational-wide TQM is required – to attract and maintain a satisfied customer base to increase profits.

Although TQM in theory has always played some part in business, the philosophy as solid business principle is generally credited to Dr. W. Edwards Deming (1900-1993). Deming observed that worker motivation and product quality where inexorably tied together. However,

quantity (vs. quality) output was tied to incentives and inspection of flawed products was conducted after those flawed products were identified. By working with Walter A. Shewhart, a Bell Telephone Company statistician, Deming and Shewhart developed a statistically controlled management process that provided managers with a means of determining when or if to stop and inspect the production process. Sent by the U.S. State Department to implement his statistical process control in Japan as part of a post-war reconstruction effort designed to quickly bolster Japan back to pre-war production capability, Deming's work enabled Japan to re-establish a new-found dedication to quality control and productivity in the Japanese industrial and service industries that eventually culminated in Japan's shared market-dominance throughout the 1950s-1980s. As a result and response to Japan's significant rise to global shared-dominance throughout the 1970s-1980s, U.S. production efforts were then forced to incorporate Deming's statistical process control theories resulting in eventual significant market gains by 1990s - eventually surpassing once held Japanese dominance market sectors by the late 1990s.

Literary Review and Synthesis:

Although changes in both production methods and human resource practices have changed since the official inception of Deming's TQM theories and principles, the basic tenants still are in place today. Regardless of those changes, continued emphasis on quality, teamwork, and proactive philosophies of management and process improvement still remain unresolved by academia and the business world at large. As stated by Howard Weis and Mark Gerhon in *Production and Operations Management*, "the terms quality management, quality control, and quality assurance often are still used interchangeably. Regardless of the term used within any business, these functions are directly responsible for the continued effectiveness of the TQM system." Furthermore, Weis and Gerhon also broke-down the essential factors of TQM by identifying them as, 1) policy, planning, and administration; 2) product design and design change

control; 3) control of purchased material; 4) production quality control; 5) user contact and field performance, 6) corrective action, and 7) employee selection, training, and motivation.

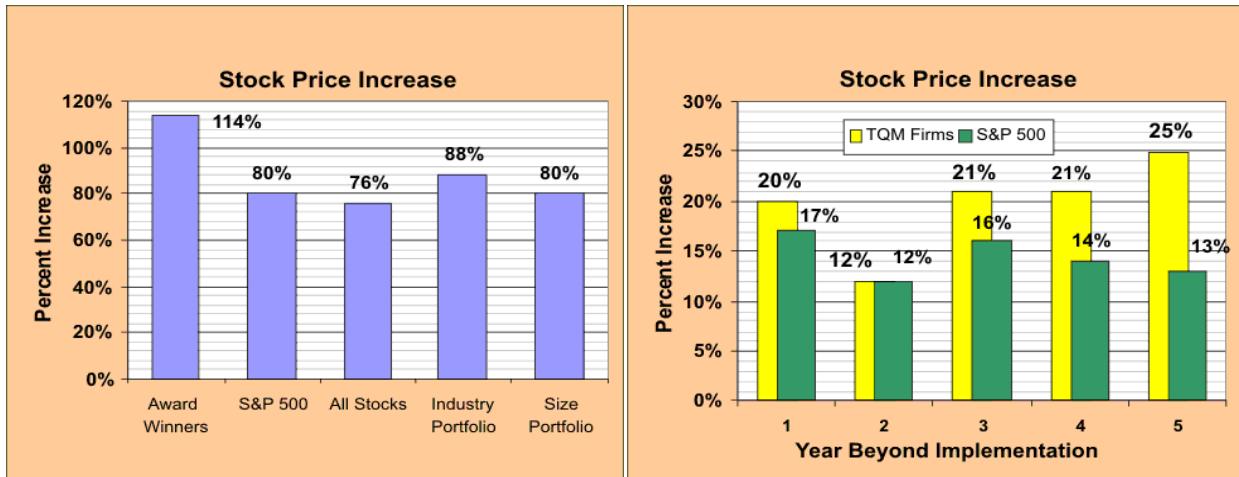
Implications for Research:

To date, the cost benefits of full TQM implementation as a standard organizational process initiative remains one of the most debatable and anecdotal and empirical researched theoretical concepts within the business world today. According to Victor B. Wayhan and Erica La Balderson, anecdotal research and the cost benefit of TQM far outweighed the number of empirical studies. In a review of approximately 100 case studies, research indicates that of approximately 100 case studies, more than 90% of those organization's have revealed that they have experienced substantial gains from implementing a TQM program within their organization. Furthermore, according to additional anecdotal research conducted by Wayhan and Balderson, published case studies "seem to indicate that TQM is effective in helping firms meet organizational goals in such areas as cost, customer satisfaction, cycle time, employee participation and profit." However, it should be noted that anecdotal evidence is just that, 'anecdotal' and suspect to positive vs. negative influences by organization's reporting the effects of TQM on profits. Therefore, given the inherent weakness of anecdotal research, a more significant evaluation of the empirical research findings are warranted.

Hiam (1993) identifies that the most significant 'practitioner-sponsored' research effort thus far has been the International Quality Study which researched 584 automotive, computer, banking and health care firms in Canada, Europe, Japan, and the United States conducted under the oversight authority of the American Quality Foundation and Ernst and Young. The study found that although TQM practices such as process improvements and supplier certification, improved organizational performance and increased company long-term profits, many of the

researched firms were not entirely successful in fully implementing all standard measurements of TQM. In his findings, Hiam also identified another large-scale survey conducted by the Gallup Organization that indicated 62% of senior executives and 71% of directors reported positive results from implementing a TQM program within their organizations. Additionally, Fitzeral and Erdmann conducted a study based on a survey of 280 automotive suppliers. On average, according to those surveyed, company profitability improved approximately 17% over a period of 2-3 years. Furthermore according to the Hiam study, the General Accounting Office conducted a numerical cost benefit analysis of TQM processes on organization performance. The GAO study analyzed 22 firms that were winners of the Baldrige Awards and reviewed their comparable financial records to compare pre and post-award changes in annual performance measurements. The analysis resulted in findings that indicated most firms experienced a rise in performance measurements and increased Government award fees as based upon based upon market share, return on sales, etc. Furthermore, as Johannes Freiesleben cites (via numerous economically based formulas) in his study, *The Economic Effects of Quality Improvement*, the formulated evidence suggests that increased TQM initiatives provide a positive effect on total company profits. Johannes concludes that given both the cost and price of implementing TQM, “quality improvements benefit a company both in terms of costs and revenues.” or rather, “quality improvements increase the profitability of a company.” In addition to these studies, there also exists a mutual fund (General Securities Fund) that trades only company stocks that have implemented the TQM system. This study found that the GSF has at least matched the Standard and Poor’s 500 stock performance using very conservative stock mix – including a 4-star 5-year performance award granted by Morningstar. Additionally, *Business Week* has recently evaluated the performance of 10 Baldrige winners stocks against the total market and found that those stocks have appreciated a cumulative average of 89% compared to just 33% against

Standard and Poor's 500. The following two charts provide a graphical representation of the relationship between TQM and stock performance:



Also supporting the hypothesis that increased focus on implementing TQM principles in an organization increases productivity and profits, a 1994 study of 184 New Zealand manufacturing companies found that there were significant relationships between quality (defined by the number of rejects, scrap, rework, product returns and customer complaints and those operational factors such as products constructed via process utilization, process output, production output, production costs, work-in-process, inventory levels, on-time deliveries) and operational and financial performances (measured by return on assets, return on sales, sales volume, and market share). Additionally, a like study of 146 American and Taiwanese manufacturing firms also found significant relationships between both quality (using the same measuring tools above) and production output and financial gains.

These positive finding however do not emphatically prove that adoption of the TQM philosophy always leads to company profits. Indeed, many studies that claim TQM equates to increased profits may be biased towards its principles since those companies being evaluated are already heavily invested in its anticipated (i.e. hoped for) profit gains. In fact, there are many studies that suggest implementing TQM does not maximize company profits. As evidence to the

suspect expectations of TQM=Profit, Powell casts doubt on this belief by stating , “Even TQM advocates agree that TQM attributes conflict with the existing philosophies and practices of most U.S. firms (e.g. Crosby, 1984)”. The issue becomes even more clouded when considering that smaller companies have less opportunity to benchmark successful TQM companies that possess significant Research and Development capabilities. Additionally, many modern-day TQM philosophies have since been discredited as being “fundamentally incompatible” with U.S. managerial business practices (including business development) since many TQM techniques were based upon those developed in the 1940s-1950s are incompatible with Japanese managerial assumptions given significant differences in its institutions, employee behavior, business relationships, cost management, and employee performance criterias.

Implications for Management:

Although TQM is a critical success factor to gaining market dominance, placing too much importance over philosophy, theory, techniques, etc. over employee retention, lower costs and streamlined operations can be proven to be detrimental to the bottom line – profit. In fact, according to Lakshmi and Rao Tatikonda, even companies that have won the Malcolm Baldrige National Quality Award have experienced financial failures – as shown in the following studies:

1. Only one-third of companies surveyed by the Boston Consulting Company credited TQM as having any significant increase in company profits.
2. Nearly two-thirds of the 30 quality programs studied by McKinsey Company either were stalled or fell short of delivering real improvements
3. Sixty percent of companies surveyed by the Electronic Assembly Association fail to reduce internal defects by 10%, despite having TQM programs in place for an average of three years. Furthermore, after having TQM programs in place for an average of two and one-half years, 80% of companies surveyed failed to reduce supplier defects by 10% or more.

Although Lakshmi and Rao Tatikonda identify that despite the time and effort organizations spend on TQM, sometimes in the millions of dollars, many companies still fail to realize the full

beneficial potential of the TQM process. While there often is no clear reason for these failures.

Lakshmi and Rao Tatikonda cite the following common characteristics and reasons why TQM can fail within an organization:

1. **“Lack of Vision”**: Companies expecting results from static TQM process usually experience a lack of growth and long term improvement with company expansion. These companies need to change their way of thinking and create a culture of continuous improvement.”
2. **“Lack of customer focus”**: A misunderstanding of customer satisfaction, a lack of feeling for what drives customer loyalty, and an improvement in areas that add little or no value to the customer can lead to TQM failure.
3. **Lack of Management Commitment**: Most TQM program fail due to lack of managerial commitment. Lack of participation in the TQM process (i.e., training, inspections, etc.) affect the cultural influence of TQM within the organization.
4. **TQM training with no purpose**: Without proper focus and direction employees may be wasting significant amount of time on TQM without any merit.
5. **Lack of Cost and Benefit Analysis**: Many companies do not measure the results of TQM processes thereby wasting time and money on unneeded TQM processes. Furthermore, management often confuses process with results manifesting themselves as improvements to internal process not aligning with customer satisfaction.
6. **Organizational Structure**: Organizational must possess empowerment, cross-disciplinary and cross-departmental efforts are essential for a successful TQM program. Quality improvements gained through empowered cross-function teams can be 200% to 600% more effective than improvement obtained through functional teams.
7. **TQM creating its own bureaucracy**: TQM can eventually become a parallel process that can create layers of bureaucracy with its own rules, standards, and reporting staff. These process will then result in irrelevant quality reports, diffusion and complexity of the original TQM goals resulting in no measurable effect on company growth.
8. **Lack of Measurements or Erroneous Measurements**: Inappropriate measures encourage short-term performance at the expense of long-term performance and many improve performance of one department at the expense of another. Successful companies follow customer-based measures to monitor quality progress.
9. **Rewards and Recognition**: Strategic goals, performance measurements and rewards/ recognition are the three main areas that build organizational improvements to the TQM process. Behavior is significantly influenced by recognition and rewards. Therefore, to make TQM effective, organizations should recognize and reward teams that perform well and help make quality improvements real.

10. **Accounting Systems:** Accounting systems can distort and understate the cost of quality and obscure impacts and potential impacts to company profits. For example, costs related to poor quality products, such as warranty, are not treated as product costs. Also too, customer dissatisfaction and lost sales are not reflected in accounting ledgers.

However, whether pro or con, an organization should never discount the benefit of a sound TQM process nor rely solely on a TQM program for guidance on long-term company direction. However, if there is no adherence to, or worse yet, total disregard of TQM principles and practices, both immediate and long term negative consequences will most likely result – especially when consumer safety is involved.

Negative effects of reducing implementation of a TQM system within an organization can and have been proven to negatively affect company profits and long-term reputations. Perhaps the most significant recent example of TQM failure is that of Toyota. The article, “*How Toyota Lost its Way*” (Taylor A. (2010)) chronicles Toyota’s fall as the TQM leader within the automobile industry. As Taylor documents, company chief engineers or ‘shusas’ assumes complete responsibility for vehicle design from beginning to end – sometime lasting the entire life cycle of that particular model or product line. Besides overall authority over design, the shusa is responsible for identifying and defining the vehicle market including target cost, weight, performance, and quality. Within Toyota, there are 38 shusas who are granted absolute authority over their product designs and/or areas of specialty (logistics, finance, HR, etc.)

However, under the leadership of then President Watanabe (2005-2009), shusas were directed to increase profits by aggressively cutting costs across the board notwithstanding that most customer are located globally whereby customer feedback would naturally be delayed leading to Toyota executives being shielded from real-time market information. For example, when customers began to initially complain of perceived diminished quality of their vehicles, those problems were discounted by the shusas as anomalies refusing to consider that identified

problems were possible indications of Toyota's reduced TQM measures. Furthermore, Toyota cultural influences mandated that management 'save face' therefore they were reluctant to take reported problems to top management. Combined with the company direction to reduce TQM costs and the cultural influence of saving face subsequently resulted in dozens of recalls throughout 2010 and 2011. In response, Toyota appointed a chief quality officer, created an advisory panel on safety, and restructured its reporting system in the U.S. and abroad to communicate defect issues in real-time. Again however, due to Toyota's effort to reduce TQM costs, Toyota has to issue its now first ever global recall for 4.1 million vehicles and paying out approximately \$16.4 million in fines for slow response time - and the recalls seem to keep coming in. For example, the following year, 133,469 Priuses were recalled due to a faulty software program for the brakes. Sienna minivans were then recalled due to tire rusting (53,281 vehicles) followed by 9,411 Lexus sport utility recalls due to another faulty software program designed to prevent the vehicle from rolling over. A further consequence of Toyota's decision to reduce its TQM program, the company was forced to increase its marketing incentives spending hundreds of millions of dollars to hold on to its existing customers. Also too, Toyota has had to pay out billions of dollars more in worldwide class action lawsuits from injuries sustained since it first started issuing mass recalls beginning 2010. Unfortunately, Toyota still hasn't received the message on the importance of TQM and those TQM changes that have been made seem little more than cosmetic as Toyota as recently as October 2012 has once again issued a recall on dozens of models due to safety concerns.

Toyota however is not the only major company that has lost revenue share due to reduced or misaligned TQM processes. For example;

- Despite being QS 9000 certified (QS is the equivalent to ISO for the automotive industry) Ford Motor Company has recalled over 24 million vehicles since 2004.

General Motors 1.9 in March 2010 alone, and Chrysler had doubled its recall of minivans as late as 2011.

- Honda has internally established the Global Honda Quality Standard (G-HQS) based on ISO 9001. Additionally, as of March 2011 43 of 46 production facilities attained ISO 9000 registration. However, in September, 2011, Honda recalled over 1 million vehicles with electrical problems which could have caused fire in addition to allowing the vehicle to roll backwards in the forward or drive position.
- Endo Pharmaceuticals, despite being ISO 900/9001/9004/19011/2000 certified recalled over 1.4 million blister packages of oral contraceptives due to a labeling error reversing the consumption sequence. This could have resulted in millions of unplanned pregnancies.
- In 2007 Mattel (ISO 9000 certified) recalled over 11 million toys due to lead paint and potential choking hazard. Also note that the Chinese company that manufactured the toys was also ISO 9000 certified.
- Bridgestone/Firestone (also ISO 9000 certified) recalled over 6 million tires in 2000 after a federal investigation revealed that tire tread separation was linked to 46 deaths. Further investigation discovered that the rubber used to make the tires was past its shelf-life and other parts were compromised due to improper TQM controls and inspection practices.

Implications for Management:

The message to all managers should be that whether implementing a minimal or robust TQM program, it is important to remember that all TQM programs should be tailored to that organization's specific business model. As discussed and demonstrated by the findings above, the question therefore becomes how to implement TQM within the organization and its applicability to increased market share and profitability. A 'Balanced Scorecard Approach' modeled on the Baldrige methodology should be seriously considered as methodology that has been used with much success by government(s), businesses, non profit organizations to align business goals and objectives to increase long-term viability and increased profits through measured customer satisfaction. Per the Balanced Scorecard Approach originators (Dr. Robert Kaplan and Dr. David Norton) it gives organizational managers to crystallize the organization's vision by identifying TQM weaknesses and addressing those weaknesses against financial

expectations by providing a continuous systematic management-employee-customer feedback mechanism. Per Kaplan and Norton, “The balanced scorecard retains traditional financial measures. However, financial measures only tell the story of past events.” Furthermore, “These financial measures are inadequate for guiding and evaluating the journey that information age organizations must make to create future value through investment in customers, suppliers, employees, processes, technology and innovation.”

According to Kaplan and Norton, the balanced scorecard approach per Kaplan and Norton should address four main perspectives. These perspectives, which can be measured by instituting metric measurement tools, are:

1. Learning and Growth via employee training and adjustment to organization culture with emphasis on increasing customer satisfaction.
2. Business Process improvement through identification of whether the organization’s product and services are tailored to meeting customer expectations (customer satisfaction).
3. Customer Expectations are measured to determine customer satisfaction. If customers needs and wants are not being met, those customer’s will find other resources to meet their needs. Furthermore, poor performance in this key perspective is a leading indicator that the long-term sustainability of the organization is in jeopardy.
4. Financial speaking, Kaplan and Norton do not disregard the need to keep historical financial data and metrics to measure customer satisfaction. Historical records identify organizational key decision points which have impacted profits and/or retention of customer base. However, most organization focus solely on financial returns thereby leading to an ‘unbalanced’ approach to market share. Therefore, measures need to be implemented to include risk assessment and cost-data benefit analysis to balance the organization’s approach to customer satisfaction.

Conclusion:

Despite nearly two decades of research on TQM’s benefit to company profits, the relationship between the two is still being debated. Supporters and those against full

incorporation of TQM can cite both empirical and anecdotal studies including both various economic models and hypothesis supporting their views. Despite this, TQM is universally recognized as a means by which organizations can reduce redundancies in operational processes and document those processes which have proven most beneficial to company success. Conversely, if full implementation of TQM was always a guarantee of company profit success, countless articles, advice column, seminars, etc. would not be necessary. Although the cited empirical and case study analyses provide a strong documented relation between TQM and increased company for-profits and sustainability of organizational objectives, there will always be a cottage industry of TQM self-help gurus and countless empirical studies citing both the benefits and negatives again implementing TQM processes and methodologies. Therefore, the reviewer of this paper should conclude that TQM is a management philosophy which ultimately requires a long-term commitment and willingness for adjustment dependent upon measured returns of investment (ROI).

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To Ship or Not To Ship: That is the Question

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To Ship or Not To Ship: That is the Question

Abstract

The past decade has seen a significant growth in the number of cars sold in online marketplaces such as eBay Motors. A growing proportion of these cars are sold to buyers located a significant distance from the seller. The purchased vehicle is often shipped from the seller to the buyer and we have seen a sizable increase in the direct consumer procurement of shipping providers for cars and other large items. Today consumers can directly procure a shipping provider for such items in open, online, and often auction-driven marketplaces. This results in an interesting decision problem for shippers, who must decide which subset (if any) of a large numbers of possible items should be selected for pickup and delivery while considering the impact on currently committed jobs and routes. This paper presents preliminary ideas and results associated with this problem.

To Ship or Not To Ship: That is the Question

1.0 Introduction

Direct consumer procurement of a shipping provider for large items (such as a car), is a relatively new and rapidly growing phenomenon. Today many consumers arrange to have large items shipped in open, online, and often auction-driven marketplaces. We are therefore motivated to study the way in which shipping providers should select jobs and associated routes to fulfill customers' demands in order to maximize maximizes profits.

We will introduce a detailed example below that involves purchasing a car via eBay Motors and having the car shipped from the seller to the buyer. Five or ten years ago, this type of purchase was rare, however today it occurs hundreds or even thousands of times per day. eBay Motors alone has sold nearly 5 million vehicles online. During the 3rd quarter of 2012, the Gross Merchandise Value (GMV) of vehicle sold on eBay Motors was approximately \$2 billion. Of these sales, 77% were interstate transactions increasing the likelihood of the need to ship the newly purchased vehicle (eBay Inc. 2013).

The result has been a lucrative market for shipping providers to meet the increased demand of shipping these large products. Since this market is relatively new and demand is high, we see weak competition between shipping providers. This has resulted in no actionable incentive for the shipping providers to attempt to optimize job and route selection in a systematic way.

1.1 Problem Example

Thousands of vehicles are sold on eBay Motors every day and an increasing number of these sales are taking place with large distances between the buyer and seller. In such cases, the buyer

has two options to receive the vehicle: get to the vehicle and drive it home or have the vehicle shipped. We focus on the latter option which has seen a growth in popularity in recent years (uShip.com 2013).

We will present a hypothetical example to better describe the type of problem we are trying to solve. This example is based on real-world data from eBay.com and uShip.com.

We approach this problem from the standpoint a single, independent shipping provider specializing in vehicle transport. The shipping provider drives one truck that can haul up to 6 cars at a time. Each Monday, the provider will assess the jobs available and decide which jobs to accept and which route to drive the truck to make the necessary pick-ups and deliveries for the upcoming week. The provider must consider the cars currently loaded on the truck when making this decision as those cars must be delivered.

We assume that at the time of the decision we are modeling, the truck is leaving New York City and needs to end the trip in Greensboro. Currently the truck has 5 cars on-board that are destined for Baltimore, Cincinnati, Lexington, Toledo, and Virginia Beach. The provider has narrowed down to 10 the potential jobs to consider. The revenue for each of the 10 potential jobs is known. The cost of driving between the 26 cities associated with the 10 potential jobs, 5 on-board jobs, and our starting point (New York City) is also known. The revenue for the 5 cars already on-board is ignored since those vehicles must be delivered in any feasible solution. For now, we will ignore any time windows associated with the pickups and deliveries of the potential jobs.

We propose a model to determine a profit maximizing solution to the above example that determines the optimal set of jobs to accept and the associated routes the driver should take to complete these jobs.

1.2 Vehicle Routing

Broadly speaking, we are trying to determine the optimal set of arcs in a road network for a truck to traverse. As such, this type of problem is known as the vehicle routing problem (VRP) which has become a classic optimization problem. The VRP has been formally studied in the Operations Research literature since its introduction in 1959 (Dantzig and Ramser 1959). Since 1959, the VRP research has both enhanced our ability to model and solve the problem as well as broadened the base of what constitutes a VRP by adding constraints and extensions to the original model. Online shipping procurement is an example of broadening the general VRP base by requiring that we consider other constraints and aspects of the problem in order to produce an accurate model.

We have been unable to find evidence of published research that relates specifically to this type of problem. What makes this problem unique is the combination of the capacity constraints on the truck, direct delivery requests, and the need to select which jobs to accept. There is, however, a large array of research that has been conducted looking at the various individual components that make up our problem which we will review below.

The purpose of the remainder of this paper is to model and solve the aforementioned problem as a mixed integer linear program (MILP). In related work, authors typically omit a MILP based solution in order to focus on solving larger problems. This typically leads the focus of the publication towards algorithm development of heuristic based solutions in order to solve the largest problems possible. However, we would like to explore if there are benefits to exact solutions to this problem even if that implies that the problem size will need to be limited.

2.0 Literature Review

As mentioned previously, the VRP is a classic optimization problem and, as such, has volumes of literature describing different formulations, solutions, and aspects of the problem. A review of the VRP, both in terms of recent formulations and solutions is offered by Toth and Vigo in (Toth and Vigo 2002a) as well as (J-F Cordeau et al. 2002). A specific look at exact solutions to the VRP under capacity and time constraints is offered by (Baldacci, Mingozzi, and Roberti 2012).

The problem we wish to solve combines elements of several different VRP variants including:

- Capacitated Vehicle Routing Problem (CVRP)
- Vehicle Routing with Pickups and Deliveries (VRPPD)
- Pickup and Delivery Selection Problem (PDSP)
- General Vehicle Routing Problem (GVRP)

The Capacitated Vehicle Routing Problem (CVRP)

The CVRP is the problem of selecting routes for a fleet of trucks that simultaneously meet the demand of customers while abiding by the capacity of the trucks. Trucks in a CVRP are loaded at a depot location and then travel to the customer sites. Typically other constraints are also added such as time windows, truck types, and possibly optional deliveries. The typical objective function of the CVRP is to minimize the cost of serving the selected routes. The CVRP is a well-studied problem in the literature that has recently been studied with respect to exact algorithms (Baldacci, Mingozzi, and Roberti 2012), demand uncertainty (Gounaris, Wiesemann, and Floudas 2013), and optimizing with respect to specifically minimizing fuel consumption as

opposed to cost or distance (Xiao et al. 2012). Additional overview references pertaining to the CVRP are available in (Toth and Vigo 2002b; Golden, Raghavan, and Wasil 2008).

The Vehicle Routing Problem with Pickups and Deliveries (VRPPD)

In the VRPPD, the goal is to select an optimal set of routes to meet the demand of customers at minimal cost. However in the VRPPD, each transportation request has an origin and a destination as opposed to the origin always being a depot location. Typically models assume that all requests must be fulfilled and ignore situations where job selection would be required.

Frequently loads being shipped in the VRPPD are handled as commodities in that there is no specific destination for an item once it is picked up, just that it will need to be delivered to a location that has a need for the item (i.e. a delivery node). Obviously in the case of shipping cars, each car has specific pickup and delivery locations. The VRPPD is a well-studied problem with over 30 years of published research support (Berbeglia et al. 2007). As such, many surveys and generalized discussions exist including (Savelsbergh and Sol 1995; Toth and Vigo 2002a).

The Pickup and Delivery Selection Problem (PDSP)

As the name implies, the PDSP is focused on the optimal selection of transportation requests. In contrast to the CVRP or VRPPD, the typical objective function in the PDSP is to maximize profit by selecting the most profitable jobs. The general focus of the PDSP is on selection of jobs as opposed to the actual routing aspect. However, optimal route selection can be included in the model if such an objective is desired (Savelsbergh and Sol 1995; Schönberger, Kopfer, and Mattfeld 2003; Maes et al. 2012). In the reviewed literature discussing problems modeled as a PDSP or a variant of the PDSP, the authors focus their solution efforts on large problems and heuristic solutions. Therefore, a contribution of this work will be to look at exact solutions to a smaller sized problem.

The General Vehicle Routing Problem (GVRP)

Goel and Gruhn model and solve a problem which they refer to as a “General Vehicle Routing Problem” (Goel and Gruhn 2008). While the authors are focused on solving large problems, they do attempt to combine elements similar to those we have proposed in our example problem. However, the authors forgo exploring an exact solution and go directly towards developing a custom heuristic based solution.

3.0 Model

We model the problem described above as a multi-commodity network flow problem where each car represents a specific commodity. Thus, each car k will have an associated network. Each such network consists of a common set of nodes N and arcs $(i, j) \in A$. We let P_k and D_k denote, respectively, the pickup and delivery locations (nodes) for car k . Let S_c denote the set of cars for which firm pickup/delivery commitments have already been made: $S_c = \{ k \mid \text{car } k \text{ must be picked up and delivered} \}$. Let S_p denote the set of potential cars we may decide to pick up and deliver: $S_p = \{ k \mid \text{car } k \text{ may be picked up and delivered} \}$. We then let:

- x_{ijk} be a binary variable which has a value of 1 if arc (i, j) is in the route used to pick up and deliver car k ;
- δ_k be a binary variable with a value of 1 if we decide to pick up and deliver car k , and a value of 0 otherwise;
- $U_i \geq 0$ specify the order in which node i is visited in the route.

We also define the following parameters:

- C_{ij} is the cost of traveling along arc $(i, j) \in A$
- r_k is the revenue gained for fulfilling the job associated with car k ;
- Q is the capacity of our truck.

Our formulation of the problem is given as follows:

Maximize Profit:

$$\sum_{k \in S_p} r_k \delta_k - \sum_{(i,j) \in A} C_{ij} x_{ij0} \quad (1)$$

Subject To:

$$\sum_{k \in S_c \cup S_p} x_{ijk} - Q x_{ij0} \leq 0, \quad \forall (i,j) \in A \quad (2)$$

$$\sum_{j:(i,j) \in A} x_{ijk} = 1, \quad \forall k \in S_c, i = P_k \quad (3)$$

$$\sum_{i:(i,j) \in A} x_{ijk} = 1, \quad \forall k \in S_c, j = D_k \quad (4)$$

$$\sum_{j:(i,j) \in A} x_{ijk} = \delta_k, \quad \forall k \in S_p, i = P_k \quad (5)$$

$$\sum_{i:(i,j) \in A} x_{ijk} = \delta_k, \quad \forall k \in S_p, j = D_k \quad (6)$$

$$\sum_{j:(i,j) \in A} x_{ijk} - \sum_{i:(i,j) \in A} x_{ijk} = 0, \quad \forall k \in S_c \cup S_p, i \neq P_k, j \neq D_k \quad (7)$$

$$|N| x_{ij0} + U_i - U_j \leq |N| - 1, \quad \forall (i,j) \in A, i > 1, j > 1, i \neq j \quad (8)$$

The objective in (1) is to maximize profit, which will consist of a revenue component and a cost component. The revenue is simply a given parameter: if we pick up and deliver car k (i.e. $\delta_k = 1$)

we will receive the revenue r_k associated with car k . The cost component in the objective is the estimated cost of traveling between the selected nodes without specifically taking into account the fuel consumption costs associated with a particular load. According to Franzese and Davidson (Franzese and Davidson 2011), the addition of a relatively light load of a single car will only make a small difference compared to the cost that will be incurred simply by driving the truck. In other words, trucks are quite efficient when it comes to hauling loads.

Because we have formulated the problem in a layered approach, constraint (2) captures how many cars we are carrying on any given segment across all layers and ensures that we do not exceed our capacity Q .

Additionally, this constraint serves as a “master layer” constraint. We consider layer zero ($k=0$) to represent the master layer of our problem; this is where we will derive the actual route that will be taken to obtain the value calculated by our objective function. This constraint ensures that only routes used in the master layer may be used by any of the other layers.

Constraint (3) specifies that we leave the pickup node $i=P_k$ for each car k in the committed set S_c once. Essentially, our layer k will start by leaving pickup node $i=P_k$. We can also use this constraint to capture committed cars already on board, in which case P_k is the starting node of our truck.

Constraint (4) specifies that we enter the delivery node $j=D_k$ for each car k in the committed set S_c once. In other words, layer k will end at delivery node $j=D_k$.

Constraint (5) specifies that we leave the pickup node $i=P_k$ for each car k in the potential set S_p if we decide to pick up and deliver car k ($\delta_k = 1$). If $\delta_k = 1$, layer k will begin at pickup node $i=P_k$.

Constraint (6) specified that we enter the delivery node $j=D_k$ for each car k in the potential set S_p if we decide to pick up and deliver car k ($\delta_k = 1$). If $\delta_k = 1$, layer k will end at delivery node $j=D_k$.

Constraint (7) is a fairly typical balance of flow constraint which ensures that the net flow through a transshipment node is 0.

Constraint (8) is a Miller-Tucker-Zemlin sub-tour elimination constraint (Miller, Tucker, and Zemlin 1960). It is worth noting that we use the total number of cities that can be visited (the cardinality of N , or $|N|$), not necessarily the number that *are* visited since the number of cities is subject to decision variable values.

3.1 Preliminary Results

We implemented this model as a MILP based on the problem described earlier in the introduction and further explained in more detail below. Recall that our truck capacity is 6, and we are driving from New York to Greensboro with 5 cars on board. Potential jobs and revenue parameters were obtained by observing actual vehicle shipments from uShip.com. We calculated the distance between each city in our model (all $(i,j) \in A$) and used that distance as the basis for the cost components in the objective function. Our objective then is to select the set of jobs and the associated route that will maximize profit per the job candidates listed in Table 1.

Car	From	To	Revenue (\$)
1	-onboard-	Cincinnati, Ohio	0
2	-onboard-	Toledo, Ohio	0
3	-onboard-	Baltimore, Maryland	0
4	-onboard-	Louisville, Kentucky	0
5	-onboard-	Virginia Beach, Virginia	0
6	Boston, Massachusetts	Atlanta, Georgia	800
7	Chicago, Illinois	Raleigh, North Carolina	740
8	Philadelphia, Pennsylvania	Miami, Florida	975
9	Jacksonville, Florida	Cleveland, Ohio	850

10	Indianapolis, Indiana	New Orleans, Louisiana	800
11	Columbus, Ohio	Tampa, Florida	1150
12	Charlotte, North Carolina	Pittsburgh, Pennsylvania	650
13	Memphis, Tennessee	Lexington, Kentucky	725
14	Washington, D.C.	Newark, New Jersey	450
15	Nashville, Tennessee	Greensboro, North Carolina	550

Figure 1 below shows a map of the potential jobs with the pickup and delivery cities linked. Colors are provided as a convenience to visually associate pickup and delivery locations associated with a job. Both the source and delivery city associated with a potential job are numbered according to the car numbers listed in Table 1. Delivery cities for cars already on board when leaving New York (i.e. committed jobs) have a gray label.

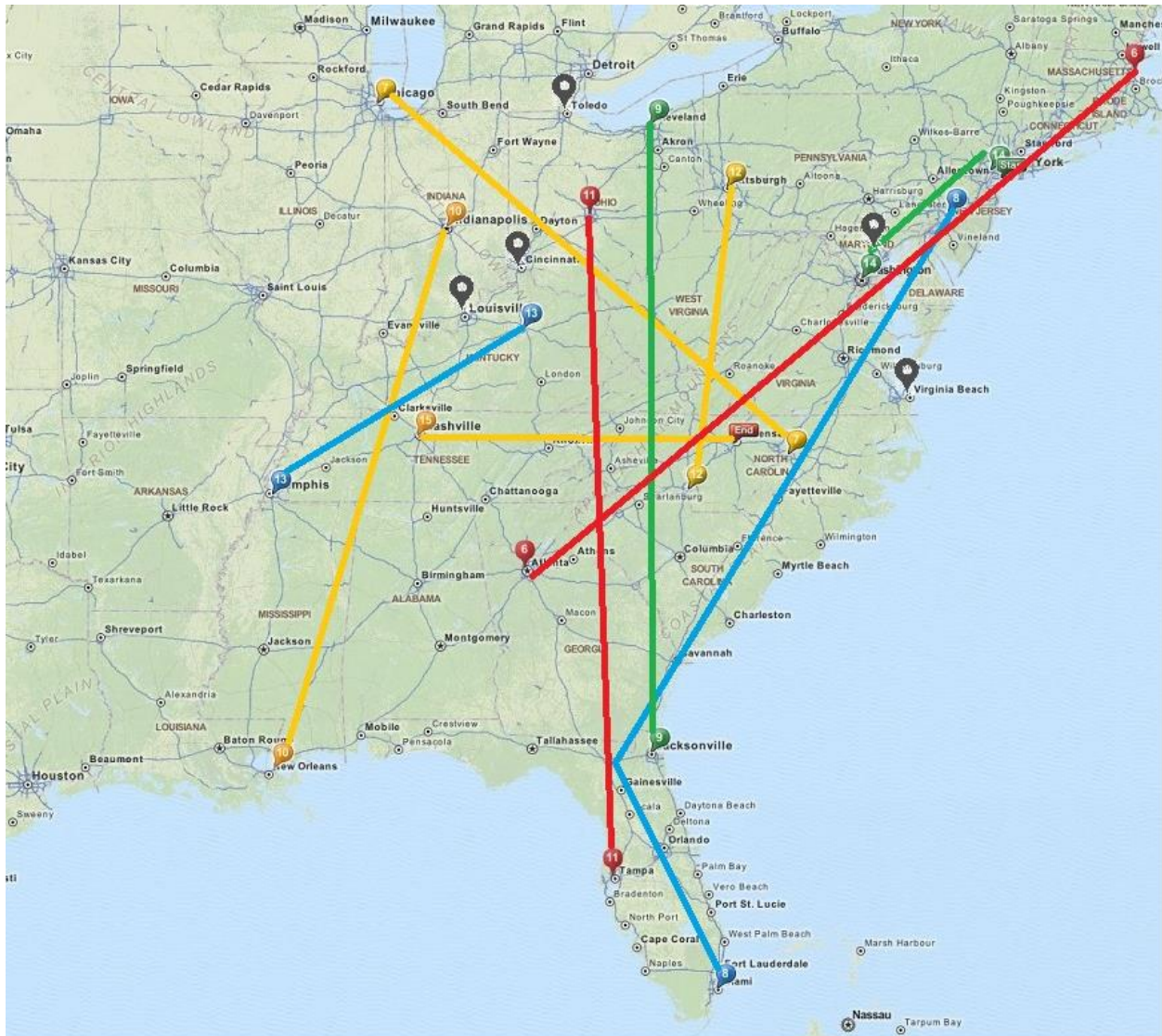


Figure 1: Potential Jobs

Solving our MILP formulation using CPLEX 12.5 results in the optimal route displayed in Figure 2.

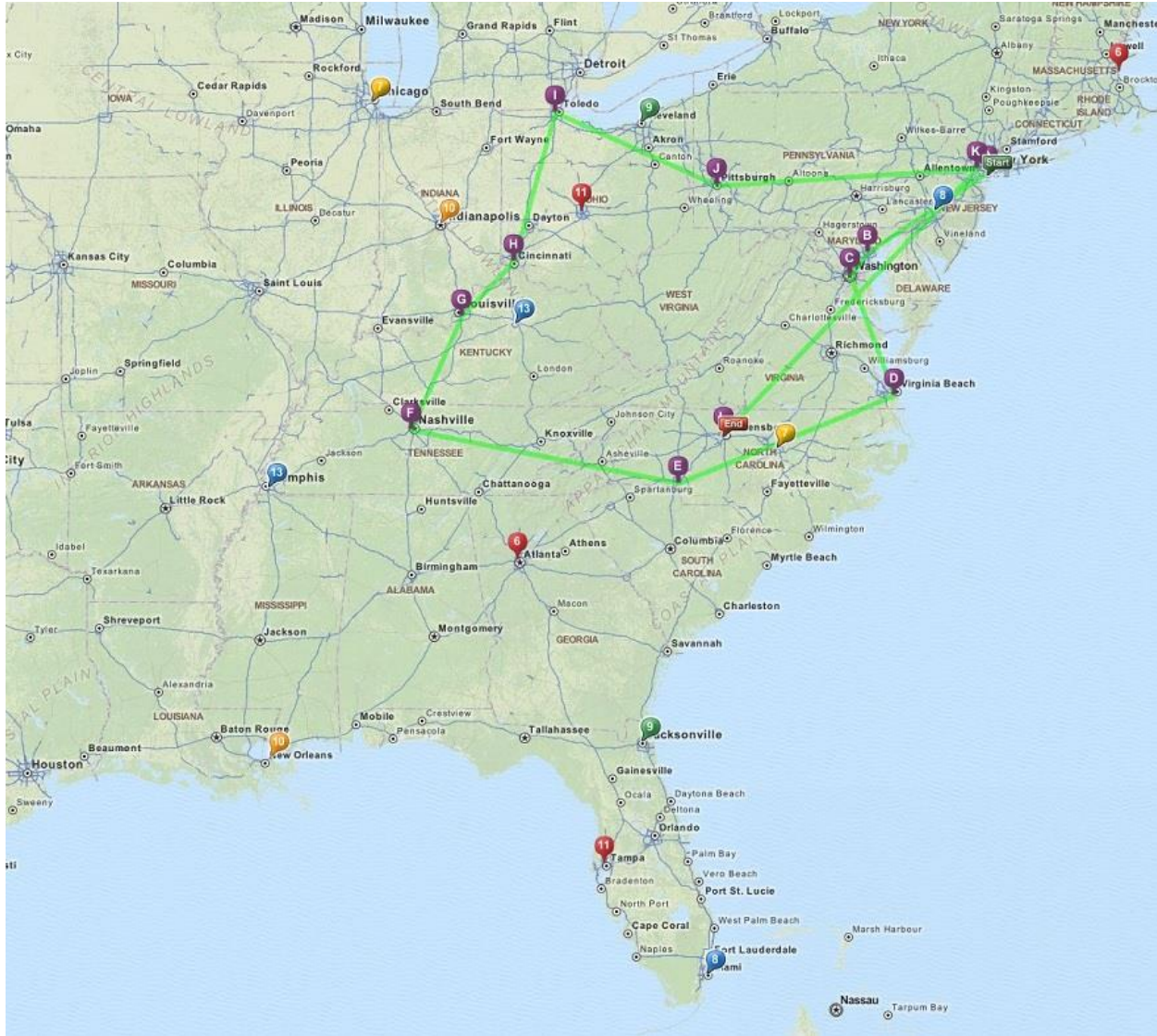


Figure 2: Optimal Route to Maximize Profit

The optimal route is shown by the green line with the order of cities visited being denoted in alphabetical order. To reach the optimal solution, we pick up and deliver cars 1-5, 11, 12, 14, and 15 while we chose not to fulfill the other potential jobs. For ease of reference, the unfulfilled jobs retained their original labels for pickup and delivery locations from Figure 1.

4.0 Implications and Future Research

At this point, we have not performed sufficient experimentation to publish the results as to how this model formulation performs given significant changes in either problem size or parameters. Those experiments are still in the preliminary stages but will be the topic of future research.

In the future we plan to incorporate additional constraints motivated by real-world car shipping problems. Time windows for pickups and deliveries will need to be incorporated into the model. Variable load costs such as those described in Xiao et al. (Xiao et al. 2012), should also be explored to see if that has an substantive effect on the solution as compared with our current fixed treatment of costs.

5.0 Conclusion

In this paper we have introduced, modeled, and solved a car shipping problem. Rather than focusing our efforts on seeing how large of a problem we can solve, we explore an exact solution to a smaller sized problem. Due to increased popularity of online auction-driven shipping procurements by consumers wishing to ship cars (or other large items), this is a problem worthy of further study.

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**Does Quality still Pay? Establishing a Conceptual Link between Quality
Management and Supply Chain Resilience**

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Introduction

This research is grounded in the domain of supply chain resilience and risk management. This research domain has garnered interest in recent years from both academics and practitioners. Interest in research on supply chain risk management comes at a time of increasing awareness of the severe financial consequences that firms face when their operations are affected by disruptions, in some cases taking up to two years for their operational performance to recover from their disruptions (Hendricks and Singhal, 2005). Additionally, and more importantly, disruptions have been shown to affect not only firms, but also their supply chain partners as well. An oft-cited example that illustrates the cascading effect of disruptions is the case of the fire in a Phillips semiconductor plant that had severe financial consequences for Ericsson, a major customer (Norrman and Jansson, 2004; Tomlin, 2006; Zsidisin and Wagner, 2010).

Research into supply chain risk management can be generally classified into two trends: formal disruption risk management, and supply chain resilience. Research into formal disruption risk management consists of prescribing frameworks that typically consist of a process of identifying risks, assessing the risks, and selecting the appropriate risk mitigation techniques (Kleindorfer and Saad, 2005; Cucchiella and Gastaldi, 2006; Blackhurst et al, 2008; Manuj and Mentzer, 2008).

The development of supply chain resilience is an alternative approach to managing risks. Supply chain resilience is defined as “the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function” (Ponomarov and Holcomb, 2009, p. 131). Research into supply chain resilience comes from the

recognition that the source of risk is not the sole determinant of the occurrence of a disruption.

A key determinant is the susceptibility of the supply chain itself to the potential risk (Wagner and Bode, 2006; Wagner and Neshat, 2010). Supply chain resilience is an internally focused concept that seeks to minimize and/or eliminate the susceptibility of the supply chain to the detrimental consequences of risks. Developing supply chain resilience can therefore complement traditional formal risk management techniques (Pettit et al, 2010). Research on supply chain resilience still exists in its nascent phase and its nature is still largely unclear. As demonstrated by the question posed by Bhamra et al (2011), “it is essential to understand whether resilience is: a measure, a feature, a philosophy or a capability” (p 5389).

Nonetheless, while studies on supply chain resilience is still in its nascent phase, the current academic trend in the development of resilience frameworks consists of isolating and identifying a set of strategies and practices into a comprehensive resilience framework. For example, resilience as being bolstered either by building in flexibility or redundancy (Christopher and Peck, 2004; Sheffi and Rice, 2005; Zsidisin and Wagner, 2010). More recently, Pettit et al (2010) attributes resilience to a set of management controls that counter supply chain vulnerabilities. These management controls include flexibility in sourcing and order fulfillment, having reserve capacity, and contingency planning. The development of the concept of supply chain resilience in this format is problematic because it leads to a tradeoff type of thinking, i.e., the development of supply chain resilience is achieved at the expense of other operational strategies. The most clear-cut example of this trade-off perspective presents itself in the trade-off between how lean and efficient the supply chain is and how vulnerable it is to disruptions. It is commonly asserted that efficient intra-firm and inter-firm business processes, such as single supplier sourcing, have the unintended consequence of making firms more

susceptible to consequences of risks (Juttner et al, 2003; Harland et al, 2003; Tang, 2006). Consequently, researchers suggest reducing efficiency levels via increasing buffers as a means of managing risk and improving resilience (Zsidisin and Ellram, 2003; Giunipero and Eltantawy, 2004).

The purpose of this study is to present an alternative development of the concept of supply chain resilience that avoids the tradeoff nature of prior research. This study is grounded in the cumulative capabilities model (Ferdows and De Meyer, 1990) and a closely related competitive progression theory (Rosenzweig and Roth, 2004), in which trade-offs can be avoided and operational capabilities can enforce one another if pursued in a specific sequence. These theoretical frameworks suggest that resources should first be directed at enhancing quality, then other operational capabilities i.e. dependability, flexibility and cost efficiency can be improved without compromising on each other.

Drawing from the cumulative capabilities perspective, this study presents resilience as the consequence of the development of quality management practices. This perspective is appropriate for several reasons. First, research has identified poor quality products (both upstream and downstream) as a major supply chain risk (Wagner and Bode, 2006; Manuj and Mentzer, 2008). Second, with increasing attention to the potential severities of disruptions, supply chain risk management is taking on a strategic role in several firms (Peck, 2006; Williams et al, 2008). Quality management already plays a strategic role in firms (Narasimhan and Mendez, 2001; Sousa and Voss, 2001) and as a result, there is a need to examine the potential convergence between the strategic elements of resilience and quality management. Researchers have suggested that it is the tacit features of quality management, such as a culture receptive to change, a motivation to improve and leadership qualities that enable effective quality

management to be a competitive advantage. Consequently, there is need to examine the potential convergence between the strategic facets of quality management and resilience strategies.

Following, we present a literature review on quality management and demonstrate how strategic facets of quality management converge with strategies that are commonly linked to supply chain resilience. Following Ponomarov and Holcomb (2009)'s definition of resilience, the following literature review emphasizes three important aspects of resilience: the ability to detect disruptions, avoid disruptions, and/or quickly recover from disruptions through agile responses to disruptions. It is also important to note that in this study, the definition of supply chain covers the firm's internal supply chain, which focuses on the processes that a firm has domain over. Thus, the examination of supply chain processes is restricted to the firm's efforts to form collaborative and coordinated activities with their suppliers and customers. This restriction of the level of supply chain analysis allows for the generation of insight into supply chain resilience, as it would be impractical to analyze every process of the firm's extended supply chain (Swafford et al, 2006).

Related Literature

The most commonly cited conceptual framework regarding quality management was developed by Flynn et al (1994). Drawing parallels from the Malcolm Baldrige National Quality Award Criteria, this framework contains seven interrelated dimensions, namely: Top management support, quality information, process management, product design, workforce management, supplier involvement and customer involvement. Top management support is the enabler of the remaining six dimensions, the outcome of which is continuous improvement, customer satisfaction and competitive advantage.

Top management support

The requirement of top management support in the development of quality practices in an organization is perhaps the most dominant theme in quality management. Top management support is essential for the development for establishing a corporate culture with a focus on quality, achieved by establishing an environment in which quality performance is rewarded (Flynn et al, 1994). Further evidence of the requirement of top management support is found in the views of Deming, Juran, and Crosby (March, 1986).

Elements of the requirement of top management support are also found in literature dealing with organizational and supply chain resilience. Christopher and Peck (2004) posit that the creation of a risk management culture is an essential component of the development of a resilient supply chain. A risk management culture is vital, since supply chain risks are one of the most serious threats to business continuity, and consequently, resilience has strategic implications for the organization that need to feature in corporate level decisions (Christopher and Peck, 2004). Top management support also features in the resilience framework developed by Pettit et al. (2010) whose premise is that management controls create capabilities to counteract vulnerabilities in the supply chain.

Therefore, we propose that top management support in creating a quality management culture facilitates easier creation of a risk management culture within the organization. This is grounded in the logic that top management support is essential in fostering within an organization a culture that is receptive to strategic initiatives and strategic changes.

P1: Top management support in creating a quality management culture facilitates easier creation of a risk management culture within the firm.

Quality information

According to Flynn et al (1994), information is important to TQM on two dimensions. First, information about quality performance provides feedback to employees. This feedback is essential not only for the maintenance of quality-oriented behaviors, but also for providing employees with the inspiration to achieve higher goals. Second, quality information, collected in a decentralized manner at its source, provides the assurance that manufacturing processes are operating as expected. This is essential for the setting of appropriate quality targets, as well as for timely decision-making and problem solving.

The necessity of information also finds a significant theme in literature regarding supply chain resilience. For example, taking a systems perspective of the supply chain, Skilton and Robinson (2009) posit that in complex supply chain networks (which are the most common configurations of supply chains in today's business environment) disruptive events are often very catastrophic in nature. Therefore, for the assurance of business continuity, it is imperative to understand how disruptive events occur. This understanding is only possible to the extent of traceability and transparency within the supply chain. Furthermore, information may serve not only as a disruption detection tool, but also as a warning capability. Information, about potential disruptive events allows for the proactive planning for disruption avoidance at the organizational level, as well as at the supply chain level (Blackhurst et al, 2005; Craighead et al, 2007).

Therefore, we propose that structures that facilitate the obtaining of information on quality performance will also facilitate the collection of information that is vital to detect potential disruptions, understand how they occur, and potentially re-design the supply chain such that similar future disruptive events may be mitigated, if not avoided. Thus,

P2: Managerial investments in structures that facilitate obtaining information on quality performance increases a firm's disruption warning and detection capabilities.

Process Management

In close relation to the need for quality information, Flynn et al (1994) refer to process management as ensuring of manufacturing processes occurring as expected. This includes the assurance that the manufacturing process is running smoothly despite workforce variability and machine downtimes. Therefore, an important component of process management ensures that both pre-emptive and non-pre-emptive downtimes have none or minimal effect on the objectives of the manufacturing process.

The assurance that processes occur as expected with minimal interference from variations and downtimes is the very nature of resilience. In a multi-disciplinary study, Ponomarov and Holcomb (2009) define resilience as “the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function.” Consequently, agility is a commonly posited dimension of resilience. Agility is the ability of the supply chain to adapt or respond in a speedy manner to a changing marketplace environment (Swafford et al, 2006). By enable quick and efficient changes, agility is found to be an important component of resilience, identified by several researchers (Christopher and Peck, 2004; Tang and Tomlin, 2008; Braunscheidel and Suresh, 2009).

Therefore, it is posited that effective process management that improves quality performance are essentially agile processes that are capable of avoiding disruptions, or enabling the firm to recover quickly from disruptions via agile reconfiguration of business processes to maintain continuity of operations. Thus,

P3: Managerial investments in process management to improve quality performance improves a firm's capability for agile responses to disruptions.

Workforce Management

In Flynn et al (1994)'s framework, effective workforce management contains three important aspects. First, careful recruitment of employees at all levels especially the shop floor level for the assurance that the workforce has a commitment to quality. Second, employee empowerment in making their own decisions by ensuring the decision making structure is decentralized positively impacts product quality. Decentralization results in autonomy, in which different managers observe different information and control different decisions without a need for communication to a single central decision-maker (Teece, 2007). Finally, effective workforce management using quality-oriented training programs positively affects product quality.

Effective workforce management also contributes to resilience. Worker perceptions of potential and actual disruptions greatly influence decision making in risk management (Zsidisin, 2003; Zsidisin and Wagner, 2010; Ellis et al, 2011). Consequently, for appropriate decision making purposes, adequate employee training is essential. Furthermore, job dissatisfaction and high employee turnover has also been demonstrated to positively impact supply risks (Jiang et al, 2009). Therefore, employee morale also contributes to resilience. Pettit et al (2010) list learning, accountability and empowerment, teamwork, cross-training and culture of caring as an employee-related organizational management control that contributes to resilience.

Therefore, firms that encourage employee involvement in quality management practices create a culture that empowers employees to be proactive in decision-making. This organizational culture not only improves employee morale thereby reducing supply chain risks,

but also with decentralized decision-making capabilities, disruption detection, avoidance and recovery is improved, as decentralized firms tend to be more responsive than centralized firms (Teece, 2007). Thus:

P4: Employee involvement in quality management practices facilitates employee involvement in a firm's resilience efforts.

Product Design, Supplier Involvement, Customer Involvement

In this study, we group product design, supplier involvement and customer involvement in the same category because they all share similar characteristics that relate to resilience. Following, we discuss each separately in their connection to TQM, and discuss common characteristics in their relation to resilience.

Citing previous literature, Flynn et al (1994) attribute product design issues as the greatest source of product failure issues. As a result, quality assurance in product design is a multi-faceted and multi-functional process consisting of three major aspects. The first aspect is concurrent engineering, in which members of procurement, marketing, manufacturing are included in the product design process to ensure designs meet and exceed customer expectations. The second aspect is reliability engineering, which is ensuring low failure rates emerge from the production process. The third aspect is design for manufacturability, which involves designing the product in such a manner that minimizes potential pitfalls during the manufacturing process.

Supplier involvement is also important as quality issues can arise from materials sourced from suppliers (Flynn et al, 1994). Supplier quality is often identified as the most important criterion through which organizations select suppliers (Talluri and Narasimhan, 2004). In addition to quality being an order qualifier, improved buyer-supplier relationships have been

shown to improve product quality. An increase in buyer supplier coordination occurs simultaneously with a reduction in suppliers due to the high level of managerial effort required to maintain these relationships (Langley and Holcomb, 1992). Consequently, companies are likely to improve the quality of their products, due to among other reasons, reduced variability in products from suppliers (Chen et al, 2004; Chen and Paulraj, 2004).

The collaborative benefits of firm-supplier relationships are generalizable to firm-customer relationships. Additionally, maintaining close relationships with customers maintains product quality through the assurance that customers' needs are met in the product design, development, manufacturing and delivery processes (Flynn et al, 1994). Customer involvement, especially in the product development phase can eliminate several quality problems.

Aspects of product design, supplier involvement and customer involvement are also to be found in resilience. First, among the several typologies of risk suggested by research, a commonly identified risk is poor quality yield from suppliers (Blackhurst et al, 2008; Manuj and Mentzer, 2008; Zsidisin, 2003). Second, increased coordination with supply chain partners facilitates resilience by the enabling of disruption detection due to increased communication and visibility, as well as proactive disruption detection and avoidance (Blackhurst et al, 2005; Craighead et al, 2007; Skilton and Robinson, 2009).

Therefore, collaborative efforts at both the firm level and the inter-firm level to improve quality performance generate resilience-related capabilities that are essential to coordination. At the firm level, coordinated design and development can reduce risks associated with failure to meet customer expectations, and potential reduction in poor supplier selection. At the inter-firm level, collaboration between firms enables improves the supply chain's ability to detect

disruptions and either avoid them or quickly recover from them, due to the improved visibility that is generated from the collaborative efforts. Thus:

P5: Collaboration between intra-firm departments in achieving quality product designs increases the firm's capability to develop coordinated responses to recover from disruptions.

P6: Collaborative efforts between firms and their suppliers and customers to achieve quality product designs increase the supply chain's capability to develop coordinated responses to recover from disruptions

Conclusion

Academic Implications

The implications of this research are twofold. First, we extend the theoretical frameworks of the cumulative capabilities model (Ferdows and De Meyer, 1990), and a similarly related competitive progression theory (Rosenzweig and Roth, 2004). These models only consider the traditional operational performance metrics, i.e. cost, quality, delivery and flexibility, as having implications in manufacturing strategy. However, with increasing awareness of vulnerabilities and disruptions in supply chains, resilience is becoming an increasingly important factor to consider at the strategic level (Williams et al, 2008).

Second, this research has implications on the conceptual developments of resilience, specifically, the resilience-profitability tradeoff. It is commonly held that resilience capabilities act in opposition to strategies commonly employed to improve profitability. For example, resilience is posited to be achieved via adding redundancies to attenuate the effects of the disruption of potential critical paths (Sheffi and Rice, 2005; Craighead et al, 2007; Zsidisin and Wagner, 2010). An additional example includes the resilience framework developed by Pettit et al (2010) in which the excessive development of managerial controls that do not balance

vulnerabilities erodes profitability. In this research, we argue that resilience is a capability acquired through investing in quality management strategies, and as a result, the tradeoff between developing resilience and compromising on efficiency does not necessarily apply. Moving forward, the empirical validation of the propositions developed will yield better insights into how quality management strategies develop supply chain resilience.

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**MOBILE CONSUMER SELF-CONFIDENCE AND BEHAVIORS: INVESTIGATING
THE CONSEQUENCES OF CONSUMER SELF-CONFIDENCE WITH M-COMMERCE**

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ABSTRACT

General self-confidence has been frequently cited as an important construct for understanding consumer behaviors. Consequently, researchers have been developed and validated measures to assess consumer self-confidence and tested its role among other important consumer behavior variables. However, no study has been investigated mobile consumers' self-confidence. The purpose of this research is to develop and validate scales to measure the various dimensions that underlie mobile consumers' self-confidence and to test its role in a nomological network. This research will employ survey methodology while using CFA for the measure development and SEM for the path analysis.

INTRODUCTION

Mobile commerce (m-commerce), the use of handheld wireless devices for purchasing goods and services from any location, is neither new nor diffident thing anymore. We can easily find its emerging relevance to our daily life. It has already taken off. According to eMarketer, M-commerce is the fastest growing form of electronic commerce (e-commerce) while majority of internet users in United States will rely on mobile devices as their primary device for accessing the Internet within five year. In 2013, m-commerce will account for about 16 percent of total US retail e-commerce sales and by 2017, retail m-commerce will climb to well over \$100 billion [13].

M-commerce provides a broad range of services including buying a coffee at a café by scanning a mobile wallet (e.g., Starbucks Cards on smartphones), downloading digital music to MP3 players wirelessly, finding local restaurants with GPS enabled mobile devices, monitoring local traffic via tablet PCs, depositing checks into mobile bank accounts with mobile phones, and paying bills on mobile trading portals. Due to the natures of mobile devices, wireless technologies, and location-based applications, m-commerce can provide consumers many benefits, such as efficiency, spontaneousness, and ease of use. It is especially well-suitable for 1) when location-based information is desirable, 2) when time critical needs are present, 3) when spontaneous decisions are demanded, 4) when entertainment needs are craved, and 5) when there are ambitions and mobility related needs [2]. However, due to the natures of m-commerce, mobile consumers are faced with new challenges at the same time, which range extend from personalized location-based marketing messages to targeted threats of mobile devices' security breach. The former could cause severity of information overload and interruptions of decision making to consumers. The latter could lead identity theft and severe financial losses. M-commerce is changing the way consumers gather, process, and interact with information. Consequently, consumers often feel less-confident with to their decisions and behaviors on mobile marketplace.

Consumer self-confidence, which reflects subjective evaluations of one's ability to generate positive experiences as a consumer in the marketplace [1], is critical in m-commerce because consumer self-confidence is key to understand consumer behaviors on mobile marketplace where

emerging technologies are altering traditional consumer behavior frameworks. For example, under the traditional consumer behavior frameworks, consumers with high self-confidence could show less external information search activities because consumers with high self-confidence are thought to be more confident of their own judgments and consequently less influenced by external information [23]. Under m-commerce, however, consumers, who constantly access external information from their mobile devices, might show different information search activities to solve immediate buying problems.

M-commerce provides tremendous power to marketers because mobile devices have a much broader reach in terms of possible customers. Mobile devices can capture what consumers do in every second and also can control in very sophisticated way which marketing messages consumers are exposed to. Consumer self-confidence has been used as a distinguishing characteristic of market-segment profiles [10]. Marketing managers, who would like to utilize these incredible expansion opportunities and need to know how to keep a diffident and picky customer with substantial discretion (it is generally much easier for mobile consumers to find alternatives on their mobile devices than for regular customers to go to the next stores physically in traditional marketplace) in their mobile marketplace, want to know how consumer self-confidences are different among consumers on mobile marketplace. However, as we know of, no study has developed measures relevant to mobile consumers' self-confidence and tested the role of customer self-confidence in m-commerce.

The purpose of this research is, therefore, twofold. First, we aim to develop and validate scales to measure the various dimensions that underlie mobile consumers' self-confidence. Second, we intend to test the role of consumer self-confidence in the nomological network of consumer behaviors on mobile marketplace.

The remainder of the paper is organized as follows: first, in the literature review section, we discuss 1) consumer self-confidence concept in consumer behaviors, 2) consumer self-confidence related constructs, and 3) consumer self-confidence measures development. Then, our research model is presented followed by discussions of sample data descriptions, along with data analyses and their results. Concluding remarks are made in the final section.

LITERATURE REVIEW

Consumer Self-Confidence

Understanding consumer behavior is critical to marketers. Many factors, including demographics and prior product class experience, have been studied in an attempt to understand consumer behaviors. Among the factors, consumer self-confidence has been considered a crucial element to understanding consumer behaviors [3].

Researchers have defined consumer self-confidence 1) as the extent to which an individual feels capable and assured with respect to his or her marketplace decisions and behaviors, and 2) as a relatively stable self-appraisal that is assumed to be readily accessible to the individual because of the pervasiveness of consumer activity in everyday life [3].

Although there are slight disagreements among the definitions, consumer behavior studies seem to agree upon that consumer self-confidence is a trait as an individual difference, but it is derived from more basic traits. There are three major theories in personality study: 1) psychoanalytic theory (believes that personality is derived from conflict between the hedonistic demand of the id as biological needs and the moralistic prohibitions of superego as societal norms and services), 2) socio-psychological theory (suggests that human behavior results from interpersonal orientations such as compliant, aggressive, and detached), and 3) trait-factor theory (assumes that personality comprises pre-dispositional and quantitative attributes called traits). Basic traits and consumer self-confidence are different since a trait is seen more from other person's viewpoint (e.g., psychologist's observation) while consumer self-confidence are formulated from an internal standpoint. Each trait should be conceptualized as a facet of a person. So, it is difficult to see as a combined system. In the other hand, consumer self-confidence is viewed as a multifaceted disposition [1]. Moreover, while basic traits (e.g., self-esteem, perceived control, and dominance) are more global and central dispositions, which are enduring across-situational individual differences, consumer self-confidence is considered as a secondary disposition that is more closely related to consumer phenomena. In other words, consumer self-confidence represents product- or situation-specific confidence [3].

Bearden et al (2001) argued that consumer self-confidence results not only from more basic traits but also from the collection of the individual's prior marketplace experiences. They called this type of consumer self-confidence (from the collection of the individual's prior marketplace experiences) as general consumer self-confidence. General consumer self-confidence could differentiate individuals within product-decision categories and purchase experiences. Consequently, general consumer self-confidence could predict individual tendencies across product- or situation-specific conditions. And, even in instances where the level of product- or situation-specific confidence may be low for most consumers, general consumer self-confidence will still vary across individuals.

Gerbing, Hamilton, and Freeman (1994) also conceptualized consumer self-confidence as a multidimensional concept consisting initially of two higher-order factors. The two higher-order factors are consumer self-confidence (1) to make effective decisions; and (2) to protect himself or herself from marketing tactics. These two higher-order factors are also consistent with the most frequently studied roles of consumer self-confidence in the consumer behavior and marketing literature. For example, Park et al. (1994) and Wright (1975) propose that self-confidence operates as an antecedent to marketplace choices and subjective knowledge perceptions. Likewise, Luce (1994) and others relate self-confidence to the individual's ability to protect himself or herself from harm under emotional strain and to resist persuasive attempts emanating from others in the marketplace.

Related Constructs to Consumer Self-Confidence

1) Computer Self-Efficacy

From the IT perspective, using mobile devices to buy a product or service by itself is an effort involving operating mobile technology. So the mobile consumer's computer self-efficacy might be an important factor. The construct self-efficacy from the psychology literature in general, and computer self-efficacy [7] in particular may explain the mobile consumer's intention and behavior. Generally, self-efficacy is assumed to represent the evaluative component of one's self-evaluation of one's abilities and performance in the marketplace. In general, high self-efficacy should enhance consumer self-confidence, and thus self-efficacy scales should have a modest, positive relationship with measures of consumer self-confidence.

The construct computer self-efficacy (CSE) denotes people's overall judgment of their abilities of operating computers for different tasks [7] [19]. CSE has been examined as an antecedent for dependent variables such as computer performance and outcome expectation. Some factors that affect CSE include task complexity, personal innovativeness in IT, computer anxiety, and prior experience. CSE has been investigated for its effect on computer training and education [14]. CSE is also studied as a factor in an integrated theoretical model to forecast whether users will continue using World Wide Web [15]. In the context of online electronic service, Internet self-efficacy has been examined for its impact on user acceptance [16]. Integrated with a decomposed theory of planned behavior, another study evaluates the role of CSE for predicting users' continued usage of electronic service [17].

E-Commerce consumers have two roles of both shoppers and information technology users [6]. Therefore, we argue that computer self-efficacy affects mobile consumers' online purchase intention and behavior. In the E-Commerce context, previous research found constructs similar to Internet self-efficacy play important roles. For example, general web apprehensiveness is negatively correlated with the amount of time spent online [22]. Moreover, comfort level with the web has a positive correlation with Internet shopping tendency [20].

One factor closely related to the Internet self-efficacy construct is users' web experiences. Internet users' web experiences affect their trust in E-Commerce [9]. Compared to the traditional shopping experience at physical stores, online shopping experience is more complex [8]. Online shopping process involves various tasks such as browsing, searching, selecting, comparing and evaluating information [8]. Thus, mobile consumers with different levels of technology experiences may exhibit different patterns of behavior.

2) Perceived Risks

In the recent years, as the Mobile Technology becomes easier to use and broadband Internet is more readily accessible, many individuals and businesses move their transactions on mobile

devices. The past decade witnessed the tremendous development of Internet and mobile technology, the steady growth of e-commerce and mobile-commerce adoption, and the creation of various innovative business models exploiting the potentials of this technology advancement. Online consumer behavior and e-commerce adoption became important research topics. Technology acceptance model [11] has been applied to the E-Commerce context.

To predict the intention to purchase physical item online, the perceived benefits and perceived risks were found to be significant factors [5]. In a study examining the antecedents of the amount spent online, both the consumers experience with online shopping and the comfort level of providing personal information online (privacy concern) were found significant [21]. However, surprisingly privacy concerns were not significant in predicting online spending [21]. In another study investigating expert household end users' online behavior, the privacy-active behavior was found not significant in increasing the likelihood of online purchase or subscription [12]. However, perceived online risk did have a significantly negative impact [12]. In another empirical study, in addition to perceived risk, computer self-efficacy and personal innovativeness were found as significant predictors for the intention to shopping online [4].

3) Consumer Knowledge

Alba and Hutchinson (1987) define consumer knowledge as having two major components: familiarity and expertise. Familiarity, in this case, is the number of product-related experiences that have been accumulated by the consumer. Expertise is defined as the ability to perform product-related tasks successfully. They also identify five dimensions of expertise: (1) automaticity that reduces the cognitive effort; (2) the cognitive structure categorization, used to differentiate products, becomes richer, more complete, and more accurate; (3) the ability to analyze information by separating the important and relevant from unimportant and irrelevant; (4) the ability to elaborate and make accurate inferences from limited information; (5) the ability to remember product information (memory).

Consumer expertise represents the individual's ability to perform product-related tasks successfully [23]. Product expertise includes both the cognitive structure and the processes required to effectively use product information and beliefs stored in memory. As such, expertise, which typically increases as product-related experiences accumulate, reflects product-specific issues [23].

Consumer Self-Confidence Measure Development

Researchers have been developed and validated measures to assess consumer self-confidence. Preeminent in this stream of research is the work in marketing of Bearden et al (2001). While empirically establishing a measure of consumer self-confidence, Bearden et al (2001) found that the two-factor higher-order model and the six-factor correlated model provided the best fit to the data when compared with the other models investigated. The two higher-order constructs are Decision-Making Self-Confidence and Protection. The six-dimensions are:

- Information Acquisition (IA): consumer confidence in his or her ability to obtain needed marketplace information
- Consideration-Set Formation (CSF): consumer confidence in one's ability to identify acceptable choice alternatives, including products, brands, and shopping venues.
- Personal Outcomes (PO): consumer confidence in one's ability to meet purchase objectives such that choices are personally satisfying
- Social Outcomes (SO): consumer confidence in one's ability to meet purchase objectives such that choices generate positive outcomes in the form of the reactions of others
- Persuasion Knowledge (PK): consumer confidence in his or her knowledge regarding the tactics used by marketers in efforts to persuade consumers
- Marketplace Interfaces (MI): consumer confidence in the ability to stand up for one's rights and to express one's opinion when dealing with others in the marketplace

Bearden et al (2001) initially identified seven conceptual dimensions (six dimensions above + Information Processing dimension) but Information Processing factor and its items cross-loaded with the IA items and CSF items. The model was revised and then resulted in six factors. The final set of confidence items is depicted in Appendix A along with their dimension labels and factor loadings from Bearden et al (2001)'s Study 3.

RESEARCH METHOD

This research will employ survey methodology. The survey that this research uses is shown in Appendix B. This research has two studies. In the first study, we validate the scales that we adopted from Bearden et al (2001) empirically. In our second study, we test the role of consumer self-confidence in the nomological network with related constructs of consumer behaviors on mobile marketplace. We employ CFA for study one and SEM for the study two.

*** Study 1 & 2, Analyses, Results, and Conclusions Sections will be available and presented at the Conference**

Appendix A

Factor item	Factor loading
Information Acquisition (IA):	
I know where to find the information I need prior to making a purchase	.80
I know where to look to find the product information I need	.82
I am confident in my ability to research important purchases	.62
I know the right questions to ask when shopping	.60
I have the skills required to obtain needed information before making important purchases	.64
Consideration-Set Formation (CSF):	
I am confident in my ability to recognize a brand worth considering	.85
I can tell which brands meet my expectations	.64
I trust my own judgment when deciding which brands to consider	.72
I know which stores to shop	.55
I can focus easily on a few good brands when making a decision	.60
Personal Outcomes Decision Making (PO):	
I often have doubts about the purchase decisions I make	.81
I frequently agonize over what to buy	.67
I often wonder if I've made the right purchase selection	.73
I never seem to buy the right thing for me	.50
Too often the things I buy are not satisfying	.65
Social Outcomes Decision Making (SO):	
My friends are impressed with my ability to make satisfying purchases	.89

I impress people with the purchases I make	.89
My neighbors admire my decorating ability	.53
I have the ability to give good presents	.53
I get compliments from others on my purchase decisions	.68
Persuasion Knowledge (PK):	
I know when an offer is "too good to be true"	.70
I can tell when an offer has strings attached	.73
I have no trouble understanding the bargaining tactics used by salespersons	.62
I know when a marketer is pressuring me to buy	.68
I can see through sales gimmicks used to get consumers to buy	.74
I can separate fact from fantasy in advertising	.61
Marketplace Interfaces (MI):	
I am afraid to "ask to speak to the manager"	.79
I don't like to tell a salesperson something is wrong in the store	.79
I have a hard time saying no to a salesperson	.59
I am too timid when problems arise while shopping	.67
I am hesitant to complain when shopping	.77

Appendix B

	Strongly Disagree			Neutral			Strongly Agree
Information Acquisition (IA)							
1. I know where to find the information I need prior to making a purchase on my mobile device	1	2	3	4	5	6	7
2. I know where to look to find the product information I need in an m-commerce situation	1	2	3	4	5	6	7
3. I am confident in my ability to research important mobile purchases	1	2	3	4	5	6	7
4. I have the skills required to obtain the needed information before making important mobile purchases.	1	2	3	4	5	6	7
Consideration-Set Formation (CSF)							
5. I am confident in my ability to recognize a brand worth considering for my mobile purchases	1	2	3	4	5	6	7
6. I can tell which brands meet my mobile purchase expectations	1	2	3	4	5	6	7
7. I trust my own judgment when deciding which brands to consider for my mobile purchases	1	2	3	4	5	6	7
8. I know which stores to shop for my mobile purchases	1	2	3	4	5	6	7
9. I can focus easily on a few good brands when making a mobile purchase decision	1	2	3	4	5	6	7
Personal Outcomes Decision Making (PO)							
10. I often have doubts about the mobile purchase decisions I make	1	2	3	4	5	6	7
11. I frequently agonize over what to buy in a mobile setting	1	2	3	4	5	6	7
12. I often wonder if I've made the right mobile purchase selection	1	2	3	4	5	6	7
13. Too often the things I buy via my mobile devices are not satisfying.	1	2	3	4	5	6	7

	Strongly Disagree			Neutral			Strongly Agree
Social Outcomes Decision Making (SO)							
14. My friends are impressed with my ability to make satisfying purchases on my mobile device.	1	2	3	4	5	6	7
15. I impress people with the mobile purchases I make.	1	2	3	4	5	6	7
16. I get compliments from others on my mobile purchase decisions	1	2	3	4	5	6	7
17. My neighbors admire my mobile ability.	1	2	3	4	5	6	7
Persuasion Knowledge (PK)							
18. I know when a mobile offer is "too good to be true"	1	2	3	4	5	6	7
19. I can tell when a mobile offer has strings attached	1	2	3	4	5	6	7
20. I know when a mobile marketer is pressuring me to buy	1	2	3	4	5	6	7
21. I can see through mobile sales gimmicks used to get consumers to buy	1	2	3	4	5	6	7
Marketplace Interfaces (MI)							
22. I am too timid when problems arise while mobile shopping	1	2	3	4	5	6	7
23. I am hesitant to complain when mobile shopping	1	2	3	4	5	6	7
24. I don't like to comment when something is wrong in a mobile store.	1	2	3	4	5	6	7
25. I have a hard time saying no to a mobile salesperson.	1	2	3	4	5	6	7

Section 2 (Beliefs, Attitude & Intention toward m-Commerce Systems)

DIRECTIONS: Please focus on m-commerce systems such as online shopping malls, iPhone applications, and auction websites available to your recent mobile purchasing experience. Indicate your response by circling the appropriate number next to the correct answer from 1 to 7, where 1 indicates "Completely Disagree," 4 indicates "Neither Agree nor Disagree," and 7 indicates "Completely Agree."

	<i>Disagree</i>			<i>Agree</i>			
	1	2	3	4	5	6	7
Using the m-commerce system improves my performance in shopping	1	2	3	4	5	6	7
Using the m-commerce system increases my productivity in shopping	1	2	3	4	5	6	7
Using the m-commerce system enhances my effectiveness in shopping	1	2	3	4	5	6	7
Overall, m-commerce system is useful	1	2	3	4	5	6	7
My interaction with the m-commerce system is clear and understandable.	1	2	3	4	5	6	7
It is easy for me to become skillful at using the m-commerce system.	1	2	3	4	5	6	7
I find the m-commerce system easy to use.	1	2	3	4	5	6	7
Learning to use the m-commerce system is easy for me.	1	2	3	4	5	6	7

	<i>Disagree</i>			<i>Agree</i>			
	1	2	3	4	5	6	7
Using the m-commerce system is a good idea	1	2	3	4	5	6	7
Using the m-commerce system is a wise idea	1	2	3	4	5	6	7
I like the idea using the m-commerce system	1	2	3	4	5	6	7
Using the m-commerce system is pleasant	1	2	3	4	5	6	7
I plan to use the m-commerce system frequently.	1	2	3	4	5	6	7
I predict I would use the m-commerce system frequently.	1	2	3	4	5	6	7
I intend to use the m-commerce system frequently.	1	2	3	4	5	6	7
I intend to spend considerable time and effort to learn to use the m-commerce system for enhancing my effectiveness.	1	2	3	4	5	6	7

Section 3 (Global Information Privacy Concern & Risk Beliefs)

DIRECTIONS: Please focus on your personal concern during your recent mobile purchasing experience. Indicate your response by circling the appropriate number next to the correct answer from 1 to 7, where 1 indicates "Completely Disagree," 4 indicates "Neither Agree nor Disagree," and 7 indicates "Completely Agree."

	<i>Disagree</i>			<i>Agree</i>			
	1	2	3	4	5	6	7
All things considered, mobile commerce would cause serious privacy problems.	1	2	3	4	5	6	7
Compared to others, I am more sensitive about the way m-commerce companies handle my personal information	1	2	3	4	5	6	7
To me, it is the most important thing to keep my privacy intact from m-commerce companies	1	2	3	4	5	6	7

I am concerned about threats to my personal privacy today.	1	2	3	4	5	6	7
In general, it would be risky to give (the information) to m-commerce companies.	1	2	3	4	5	6	7
There would be high potential for loss associated with giving (the information) to m-commerce firms.	1	2	3	4	5	6	7
There would be too much uncertainty associated with giving (the information) to m-commerce firms	1	2	3	4	5	6	7
Providing m-commerce firms with (the information) would involve many unexpected problems	1	2	3	4	5	6	7

Section 4 (Trust & MCSE)

DIRECTIONS: Please focus on your personal beliefs during your recent mobile purchasing experience. Indicate your response by circling the appropriate number next to the correct answer from 1 to 7, where 1 indicates "Completely Disagree," 4 indicates "Neither Agree nor Disagree," and 7 indicates "Completely Agree."

	<i>Disagree</i>					<i>Agree</i>	
	1	2	3	4	5	6	7
M-commerce companies would be trustworthy in handling my information.	1	2	3	4	5	6	7
I trust that m-commerce companies would keep my best interests in mind when dealing with (the information).	1	2	3	4	5	6	7
M-commerce companies are in general predictable and consistent regarding the usage of (the information).	1	2	3	4	5	6	7
M-commerce companies are always honest with customers when it comes to using (the information) that I would provide.	1	2	3	4	5	6	7
I feel confident understanding terms relating to m-commerce systems	1	2	3	4	5	6	7
I feel confident describing functions of m-commerce systems.	1	2	3	4	5	6	7
I feel confident trouble shooting m-commerce problems	1	2	3	4	5	6	7
I feel confident explaining why a task will not run on my mobile device	1	2	3	4	5	6	7

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Design and Delivery of A Massive Online Open Cours (MOOC):

Why Do It? How to Do It Best?

and

What are the Implications of Their Growth and Further Development?

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Massive Open Online Courses (MOOCs) are recent developments in the technology-assisted global classrooms, and have grown substantially over the last few years. The *New York Times* declared 2012 “the Year of the MOOC,” recounting the 370,000 students enrolled in the Harvard+MIT [edX](#) startup and the more than 1.7 million enrolled in courses offered at [Coursera](#) by prestigious universities such as Stanford (New York Times, 2012). “I like to call this [2012] the year of the disruption,” said Anant Agarwal, president of [edX](#), according to the same *New York Times* article.

Disruption? Is the development and growth of MOOCs a disruption to the learning experience and the teaching practice or is it a simple progression, an evolution, if you will, in education?

The 17-campus University of North Carolina (UNC) System --the oldest public university in the nation, with the Fall 2012 enrollment of 221,010 undergraduate and graduate students (NC Facts, 2013) is interested in developing MOOCs. The UNC’s recently-prepared 2013-2018 strategic plan declares: “It is vital that the University be proactive in shaping the relationship between traditional models of education and new methods of instruction. Students today have a far wider array of choices in pursuing higher education, and many of these emerging options place a greater value on speed, convenience, and flexibility,” (NC Facts, 2013).

The proposed panel discussion will address issues related to design and delivery of MOOCs as well as implications of further growth in MOOC offerings and enrollment. This is achieved by carefully answering components of three research questions: (1) *why do it?* (2) *How to do it*

best? and (3) *What will it do (to the traditional teaching pedagogy and learning experience), e.g. what are the implication and impact of MOOCs' growth?*

The discussants are the three co-principle investigators on a UNC grant that will study the feasibility of delivering a MOOC. In the proposed panel discussion, we will discuss MOOCs in academia, in the wider culture, and with creating a multi-university collaborative course. We will also cover the specifics of our grant proposal and lessons learned.

Pedagogical Considerations in Delivering a Successful MOOC

The following five goals frame our thinking on specific pedagogic and structural components of a MOOC and will be included in the discussion:

1. Meaningful – To enable meaningful learning, we will provide content that stimulates understanding of core concepts and their relationship to the world¹.
2. Engaging – We will keep the course engaging to limit attrition by providing feedback for completion and/or inactivity, communities of interest, and public recognition for accomplishments.
3. Measurable – Both students and instructors will have access to measurable progress on usage of learning objects and technology, as well as success in understanding course concepts.
4. Accessible – The content and structure of the course is designed to be accessible to matriculated UNC students, non-traditional students, global participants, UNC alumni, and individuals interested in applying to UNC schools.
5. Scalable – To achieve massive scale, the course is designed for thousands of students through the use of automated systems. Instructors will have three points of contact throughout the course – 1) creating content, 2) managing operations, and 3) assessing the results. None of these three hinder scalability.

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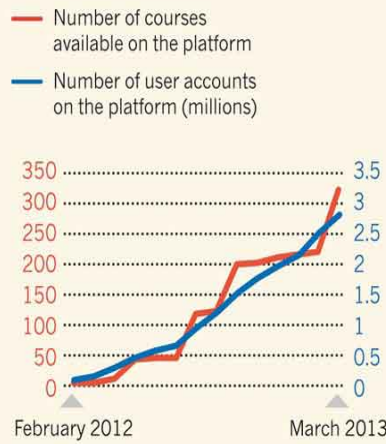
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Appendix 1

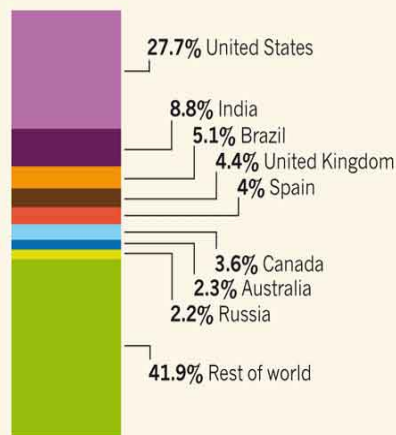
MOOCs rising

Over little more than a year, Coursera in Mountain View, California – the largest of three companies developing and hosting massive open online courses (MOOCs) – has introduced 328 different courses from 62 universities in 17 countries (left). The platform's 2.9 million registered users come from more than 220 countries (centre). And courses span subjects as diverse as pre-calculus, equine nutrition and introductory jazz improvisation (right).

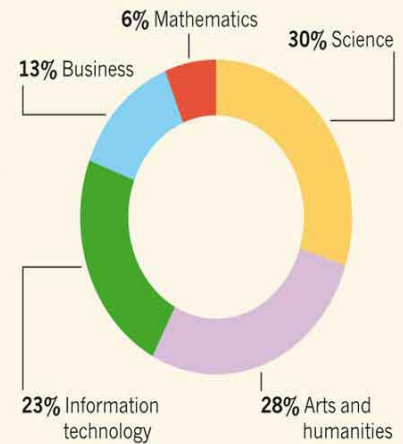
Supply and demand



Student origins



Courses offered



Source: *Nature*, March 13, 2013, Online Learning: Campus 2.0, Retrieved July 7, 2013

Managerial Accounting - Do Students Need a Hardware Department or a Tool Kit?
Sheila Foster

The typical managerial accounting text can be overwhelming with its multitude of rules, formulas, techniques, ratios, and formats. Is it possible to reduce this load by equipping students with a well-stocked tool kit, helping them to critically employ those tools, and teaching them to creatively substitute one tool for another? In preparing students for a world where managers are not always be able to secure the amount and type of information they desire, can we help students become better able to use available data in unique ways to optimize decision-making instead of relying on memorized sets of rules and formulas? The tendency has been to present such a plethora of rules that, leaving the classroom, students often feel weighed down. Focusing on process costing, both weighted average and FIFO, this presentation looks at how to slim down that weight by helping students critically and creatively make better decisions with fewer, but more adaptive, tools in their tool kits.

Quality Control Standards in the U.S. Military:

How has the focus on quality control transformed the U.S. Air Force?

Jonathan W. Polston, Mahesh S. Raisinghani, and Amit Arora

Abstract

This report displays how the United States military has exhausted numerous man-hours focusing on quality control to maneuver around difficult obstacles. This manuscript relates tactics and thought processes to the textbook *Managing Quality*, written by Thomas Foster. The topics in this report explain a variety of different approaches the military has initiated to proactively manage quality. Apart from the difficulties (budget cuts, mindsets, and mission uniqueness) there have been many advancements in quality management, such as: the 20/2020 vision, activity management plans, sustainable infrastructure assessments, professional military education improvements, increased quality of life standards, and implementation of the six sigma approach. The report will reflect how the Air Force has room to grow, but by following quality management and six sigma techniques is tracking to become an efficient and effective organization. In the military, quality does not only result in productivity, efficiency and profit. Quality excellence translates into saving lives.

Introduction

Over the past two decades, the United States military has faced tremendous adversity and has been forced to operate within guidelines and restrictions never experienced before. The military has faced numerous cuts in manpower and funding while being asked to perform at a level of excellence. In essence, the military has been asked to do more with less. In order to continue operating at the highest level, the military was forced to relook at current operating procedures. The military decided there must be a much higher focus placed on the quality of their work. New standards must be put in place, infrastructure and footprint must be reduced and risk must be managed, not completely avoided. These standards and goals needed to be specific because it is proven that specific, and sometimes challenging, goals lead to higher performance than generalized goals (Engleberg & Wynn, 2013, p. 33). The military understood that quality performance begins with the personnel turning the wrenches and making decisions. Therefore, proper education was provided to enhance understanding of quality and leadership. The military did not create the solution of quality management, but instead adopted procedures currently being utilized in the civilian sector. There are a few distinct anomalies between the two elements, military and civilian firms, but overall the similarities far outweigh the differences. The military still has a long road ahead, but as can be seen, there have been many advances towards becoming an elite fighting force striving for excellence in quality control management. Thomas Foster (2013), author of "Managing Quality: Integrating the Supply Chain," named many leading contributors to quality such as Ishikawa, Feigenbaum and Taguchi, but the one theorist the military truly models would be Philip Crosby (pp. 30-42). The following few sections will paint a clearer picture as to why.

A Focus on Quality

The Department of Defense (DoD) has been focused on quality improvement for two decades. In 1994, the Office of the Secretary of Defense authorized the use of ISO 9000 and the American National Standards Institute/American Society of Quality Control, ANSI/ASQC Q90 series of quality standards (Lorber & Richter, 1994, p. ES-2). Today's environment is vastly different, but we continue to focus on quality and resolve some of the same issues as 20 years ago. Secretary of Defense, Chuck Hagel, has expressed his concerns with current fiscal year complications and stressed the importance of exceptional quality management within the military (Garamone, 2013). Drastic changes have been made in operations to resolve current climate problems. There have been distinct changes to the military's strategy and core values as far as decision making processes and how to perform day to day operations. Leadership, from the President of the United States down to field grade commanders, has made it apparent that quality improvement is critical to the military's success and survival, which Foster states is imperative to incorporating change (2013, p. 45).

A Cut In Budget

In February 2012, DoD sent forward a request to Congress for fiscal year 2013 to reduce spending by more than \$487 billion over the next 10 years which confirms with the Budget Control Act of 2011 (Sharp, 2012, p. 975). This cut does not include expected furloughs which are expected to absorb \$37 billion in 2013 and affect over 700,000 civilian employees. If furloughs continue to be acted upon over the next decade there could be an additional \$500 billion dollars pulled from DoD operations. However, the President of the United States has made it clear that with these cuts the United States military will become leaner, but is expected to remain superior over all other nations (Sharp, 2012, p. 976). In order to manage these cuts, the

Secretary of Defense has stated that DoD will restructure or terminate weapons programs and reduce the number of large military construction projects. One issue with these plans is that a reduction in funding towards construction projects will result in much higher risk and potential mission failure. As projects continue to be delayed due to funding constraints, facilities and infrastructure continue to degrade and worsen. Over time, if maintenance, repair, and sustainment are not performed then horizontal and vertical structures will require major overhauls which will lead to costs being exponentially higher.

20/20 by 2020 Vision

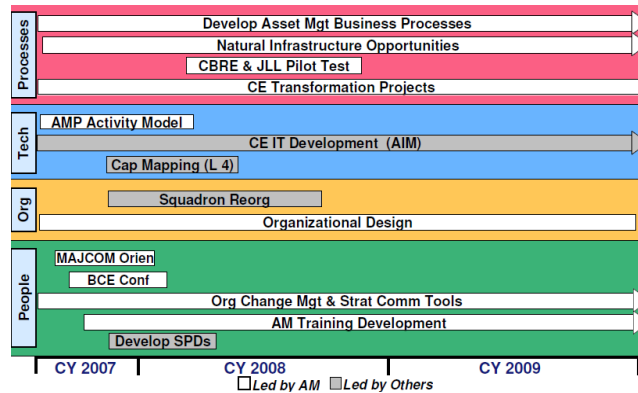
The first step in Philip Crosby's Quality Theory is, "make it clear that management is committed to quality" (Foster, 2013, p. 39). This step is applicable due to the overall goal and vision of the 20/20 by 2020 plan. The Secretary of the Air Force (SAF) conducted quality product idea generation to search for potential ways the Air Force could adapt to the ever changing climate in the military while being asked to do more with less. The 20/20 by 2020 goal is to, "offset a 20 percent reduction in funds made available for installation support by achieving efficiencies and reducing by 20 percent the Air Force physical plant that requires funding by the year 2020" (Ferguson, 2009, p. 14). This was initially viewed as a drastic and impossible maneuver. The military force is normally seen as improving and rapidly growing to face new world challenges and threats. Cutting back, managing funds, and demolishing DoD facilities was foreign to many commanders in the field and seen as a major investment of both time and money. The SAF made it clear that the strategic view of the Air Force was not to be dealt with overnight, but instead was a long-term plan. In addition, as Foster (2013) in *Managing Quality* states, there are two different categories of cost: costs due to poor quality and costs associated with improving quality (p. 93). The actions in line with the 20/20 by 2020 goal would be

reducing the costs associated with poor quality and putting additional resources and reinvesting in facilities and infrastructure that would improve quality measures over the next 10 years.

Improved Standards

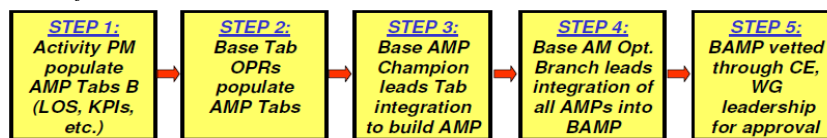
The 20/20 by 2020 vision is only one of many actions the military has taken to improve quality. Philip Crosby states, “determine how to measure where current and potential quality problems lie” and “evaluate the cost of quality and explain its use as a management tool” (Foster, 2013, p. 39). The Air Force Comprehensive Activity Management Plan (AFCAMP) was introduced to the Air Force in 2008. The idea and strategies were adopted from successful private firms (Wolfe). The AFCAMP has gone through much iteration in its time from concept to commencement. Foster (2013), mentions utilizing process maps to display how a project or business is intended to function, thus one must understand a process before they can improve it (p. 240). As identified in Figures 2 and 3, the Air Force has laid out clear direction and processes to follow. These actions are continually reviewed and modified to better improve the AFCAMP process.

Figure 1. Asset Management Strategic Journey



Moore, B. (2008). *AF Asset and Activity Management*. Retrieved from www.phma.com/osd/Asset-Mgt-Transitions.pdf.

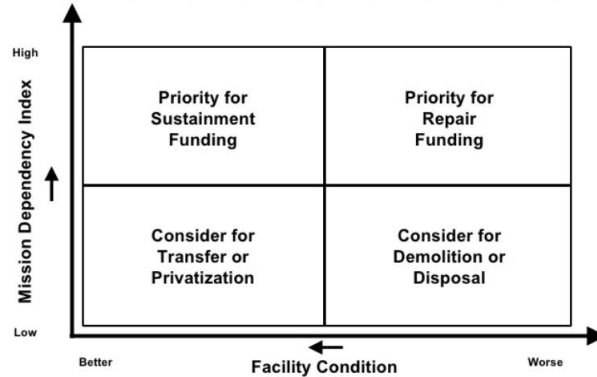
Figure 2. Overview of CE AFCAMP Process



Moore, B. (2008). *AF Asset and Activity Management*. Retrieved from www.phma.com/osd/Asset-Mgt-Transitions.pdf.

The focus of the AFCAMP is to prioritize construction projects based on mission dependency and risk compared with facility condition (See Figure 3).

Figure 3. Investment Plan Concept



Moore, B. (2008). *AF Asset and Activity Management*. Retrieved from www.phma.com/osd/Asset-Mgt-Transitions.pdf.

The AFCAMP follows a Plan Quality which is “the process of identifying quality requirements and/or standards for the project and product, and document how the project will demonstrate compliance” (PMI, 2008, p. 192). The process consolidates projects across the Air Force and ranks them while also taking into account the recommendation of the commander in the field who has firsthand knowledge of the overall importance of each project. Lastly, the AFCAMP collects any issues or concerns which are experienced in the field. These issues are also consolidated for Higher Headquarters to view and pull out important findings or issues that are similar across numerous installations. A good comparison of the AFCAMP process would be the Quality Function Deployment as described by Foster. In both processes you will find key similarities such as: 1) a list of customer requirements 2) a list of technical design elements 3) relationships and correlations between requirements and data 4) competitive assessments 5) prioritization and evaluation (Foster, 2013, p. 165). The AFCAMP process answers both of Crosby’s steps above as it identifies quality problems and by prioritizing projects also displays a clear picture as to the cost required by the Air Force to ensure facilities and infrastructure are maintained and sustained to prevent mission failure.

In addition, the Air Force has instituted the Sustainable Infrastructure Assessment (SIA) Program which performs an all-encompassing infrastructure audit at each and every installation. As stated by Foster (2013), “audit processes provide a means for top management to improve leadership in the area of quality management” (p. 418). The purpose of an SIA is to collect influential data and prioritize requirements in order to provide senior leaders the situational awareness and ability to make more informed decisions. As a result of the SIAs, the Air Force is productively establishing a credible backlog of project funding and identifying ready to award mission and installation critical projects (Moman, 2013). The SIAs provide helpful insight on how to better improve current practices from an outside contractor perspective. The SIAs review space utilization, facility conditions, and energy and water metrics. This type of audit would be comparable to what Foster (2013) describes as an operational audit in that the specific objective is to improve operations of audited functions (pg. 414).

Furthermore, Air Force quality standards continue to improve due to actions not only to ensure Leadership in Energy & Environmental Design (LEED) qualifications are met on new construction and repair projects, but also by identifying what areas of infrastructure can be modified to become more energy efficient in the future. In Foster’s *Managing Quality*, he states, “a quality environment or infrastructure must be created that supports quality management efforts” (2013, pg. 46). Kathleen Ferguson, Deputy Assistant Secretary of the Air Force Installations, says that projects within the Air Force are now targeting the creation of functional, maintainable, and high performance facilities. She goes on to state, under Executive Order 13423 and Energy Independence and Security Act of 2007 “the Air Force employs Federal Leadership in High Performance and Sustainable Building Guiding principles to reduce total cost of ownership and improve energy efficiency and water conservation to provide safe, healthy, and

productivity-enhancing facility environments” (Ferguson, 2009, pp. 10-14). The energy efforts within the Air Force are closely related to the design for maintainability (DFM) concept briefed by Foster (2013, p. 175). Infrastructure and systems are now being created and installed in such a way that they can be easily replaced, repaired or removed with standard tools and so that they can be safely maintained.

Lastly, the Air Force has taken more of a service management approach in effort to better assist customer needs and requests. Foster (2013) describes the Service Transaction Analysis (STA) approach as a technique utilized by managers to analyze service processes (p. 205). The Air Force uses similar tactics. In the past few years, with a large cut to manning and funding, there have been many surveys utilized to gather information to better illustrate how the effects are hindering performance. Many squadrons or branches that service other units have created surveys to better assess their abilities to meet the requests of their customers. As stated by Foster (2013), understanding the customer is key to quality management (p. 45). Units that service large populations, such as the medical groups, have found that surveys have returned results such as uninviting accommodations, poor customer interaction, and unsuitable scheduling procedures. By utilizing feedback, similar to the STA, these units have been able to remedy their actions and procedures to better benefit themselves and more importantly their customers.

Current Quality Initiatives

To improve quality management leadership must focus on training and developing employees, adhere to customer’s needs, and adopt a quality philosophy (Foster, 2013, p. 45). The United States Air Force has put an extreme amount of focus on training and education for their airmen to include Professional Military Education (PME), sexual assault prevention, and use of drugs and alcohol. In addition, Quality of Life (QoL) and Good Idea programs have been

established to better improve quality throughout the Air Force. Air Force leadership understands that they must place focus on their employees, from top tier management to the lowest ranking airman.

Professional Military Education

Philip Crosby states that employees must be trained to actively manage quality improvement and raise quality awareness (Foster, 2013, p. 39). The Air Force spends millions of dollars a year sending military and civilian employees of all ages and grade to school in order to improve education. PME is the collaboration of complimentary distance learning and resident curriculums to develop and advance the quality and effectiveness of an individual's education (Groh & Myers, 2010). At a minimum, Air Force employees (military and civilian) are expected to complete four PME sessions throughout their career as they promote: Air and Space Basic Course (1-2 years of service), Squadron Officer School (4-7 years of service), Air Command and Staff College (10-13 years of service), and Air War College (15-18 years of service). The purpose of the continuing education is to ensure every individual is prepared and trained to perform the duties expected of them at their current grade. The most important part of training is that leadership at the school house has adopted the Six Sigma approach. One of the fundamental principles of the Six Sigma process is to incorporate employees, customers and all shareholders into the improvement process (Yeung, 2013, p. 524). Overtime, each course has been improved based on ideas generated by the overall population and ones who are truly invested in the idea of "education is power." By the Air Force investing in their employees it can be assured that the quality of management throughout the industry will remain at a high level.

Avoid the Negative

The Air Force has also placed a high focus on removing negative aspects from the day to day life of the employee. Within a single year, there are many hours of mandatory training for each employee to attend related to the prevention of sexual assault, suicide, and the use of alcohol or drugs. The Air Force fully understands that these areas of focus play a large role in decreasing the level of quality for individual production, whether at work or at home. For this reason the USAF has chosen to heavily educate their employees and provide adequate programs to better improve quality and work performance. For example, since the conception of the Air Force Suicide Prevention Program in 1997, suicide rates in the AF have significantly decreased and show signs of improvement (lower rates) each year (Bajorska, Caine, Campise, Knox, Lavigne, Pflanz, & Talcott , 2010). Crosby states in his 14 steps of quality that quality awareness and personal concern should be raised for all employees and action should be taken to correct identified problems (Foster, 2013, p. 39). The Air Force has proved time and time again that their concentration is on the airmen and they have taken many preemptive steps to mitigate future issues.

Enhancing Quality of Life

The Air Force has a reputation of having the best quality of life (QoL) program across all branches of service. This is due to the fact that QoL is among the Air Force's top three priorities (US Air Force, 2006). In addition to the QoL program, which assists airmen with such benefits as quality housing, workplaces, childcare, recreation, and meals, the Air Force has also created the Good Idea program. This program allows for airmen of all grades to elevate issues they are facing to senior leadership. Leadership then discusses all issues with key personnel to come up with a plan of action on how to rectify the area of concern. These actions follow Crosby's quality

steps as he states employees should be encouraged to address any problems they see that are preventing them from performing or achieving their goals. Crosby continues to state that leadership must develop quality councils to deliberate and decide upon quality improvements on a regular basis (Foster, 2013, p. 39). These actions truly display the Air Force's goal and vision of ensuring all airmen are provided quality care.

Future Improvement

Issues to Resolve

Foster (2013) states that the government is lagging behind the private sector in the adoption of quality (p. 209). This may be true, but before one perceives the government as being behind or poorly managed they must be reminded that the government is ancient and requires an exponential amount of planning and work in order to migrate towards what the private sector would deem as a quality corporation. For example, the Air Force, the youngest military branch, has been in existence since 1947; thus there are many operations, mindsets, and initiatives that have been adopted that must be altered overtime to create new quality management goals. There are simply many veteran employees that are more comfortable operating using past templates and do not wish to change or adapt. This behavior, described by Foster (2013) as capricious labor, causes many problems and large delays in improving quality (p. 211). However, the Air Force has been making many advancements to improve its quality assurance. In 2012 an ISO 9001: 2008 Quality Assurance Assessment was conducted and discovered problems such as improper documentation and inadequate training programs (Inspector General). This is not the only quality assessment to date, but the fact that all findings or issues were accepted by leadership and eventually resolved shows management's concern and drive to improve quality throughout the organization.

Another issue that will continue to hinder the government from producing the highest quality performance is the uniqueness of their mission. Due to suppliers not fully understanding requirements and operations the military will always require a buffer to better assist in mitigating confusion or delay (Foster, 2013, p. 225). The military with its unique culture utilizes the expertise of the United States Army Corp of Engineers (USACE) as a primary source of linkage between themselves and the supplier who resides in the civilian sector. This additional layer of management can add to issues such as cost of projects, communication problems, project delay, etc. However, USACE is an integral part of production for the military and a source that cannot be removed; thus, this is an area where perfect quality performance with maximum gain will not be achievable.

Going Forward

The use of such tools as benchmarking and gap analysis are easily seen in the performance of projects the Air Force has with suppliers like Segue Technologies who provides the Air Force with support software to manage all personal information regarding active duty, guard and reserve personnel (Solutions Focus). The Air Force utilizes benchmarking to ensure the proper ability and performance applications are provided while gap analysis is used to compare what was expected in the product vs. what the Air Force actually received. As is evident, these tools can be vital to ensuring the quality in systems and software is achieved. However, these tools can and should also be utilized internally to manage and build quality.

Benchmarking, the sharing of information between companies so that both can improve, is crucial for DoD advancement in the quality arena (Foster, 2013, p. 137). The Air Force is at the forefront of many new directives for quality, but should continuously work alongside the Navy, Army, Marine Corp, Air National Guard and Reserves to ensure lessons learned and goals

are cross managed and compared for better understanding of a way forward. There is no reason for one branch to attempt and solve a problem alone. All branches of service are searching for the same result, a military based on quality.

In addition, a tool such as SERVQUAL, utilized to assess services quality, can provide leadership with customer perceptions and expectations (Foster, 2013, p. 194). Gap analysis can then be performed to visually identify differences. The internal use of SERVQUAL and gap analysis in the Air Force can help ensure customers, in this case the airmen, are either provided with a solution or guidance as to why gaps may exist. The idea is to close each gap and decrease the difference between what is expected and what is provided to the customer. For example, if an airman feels they should be provided product A leadership can either simply provide product A or explain to the airman as to why product A is unavailable and then provide alternative solutions. At a minimum, the airman would have a better understanding and feel as if he/she is not being ignored; thus their feelings are heard and are important.

Six Sigma in the Military

Research has identified the importance of properly understanding how to start a project or task and linking the initiative to strategic goals and measureable objectives (Antony, Kumar, & Tiwari, 2011, p. 5464). Earlier it was mentioned how Six Sigma was utilized to enhance or improve school curriculum. Six Sigma is also used in the military on the frontline. As military men and women were being deployed outside the wire in hostile environments it was quickly determined that a vehicle that could withstand ambush and attack from improvised explosive devices was essential to keep troops safe. The military was given the task to quickly devise a solution which would eventually be referred to as the mine resistant ambush protected (MRAP) vehicle. The military utilized the lean six sigma approach to devise a plan and produce this

product. By utilizing the lean six sigma approach the military was able to clearly lay out a plan, assess and analyze the design, resolve gaps or flaws, and produce production lines in a neat and standardized format (Management Services, 2011, p. 37). With the team being led by a master black belt with a team of black and green belts (trained process improvement personnel) the MRAP vehicles were produced at a much quicker pace than expected. The result of this superior effort and use of the lean six sigma approach was that roadside bomb attacks and fatalities were decreased by almost 90% in less than a year (Management Services, 2011, p. 38). It is reported that with the continuous effort for the military to provide efficient and effective products, the six sigma approach is a highly valued asset to continue and help management find improvements and new processes to produce high-performance outcomes (Aaberg, & Thompson, 2011). Foster (2013) adds by stating that leadership should ensure that strategic plans are in place to achieve quality goals for the long-term vs. the short-term (2013, p. 88). Figure 4 displays a clear picture as to why planning for long-term is beneficial and more productive than short-term.

Figure 4. Change associated with Six Sigma.

Background	Before SS	Current SS	Future SS
Outlook	Immediate situation (management by fire fighting)	Short- to medium-term achievements (management by analytics)	Long-term (knowledge-based management)
Focus/aim	Acceptable product	Good or optimal process	Designed-in excellence
People	Seen as liability (need to be told "Do things right the first time!")	Seen as an asset when trained	Source of creativity and innovation
Analysis	Experience-based	Statistical analysis of internal data	Using both internal and external data
Training	Ad hoc and viewed as a luxury	Conscious investment approved by the top	Routine requirement
Quality	Cost burden in business	Expected return on investment	Pre-requisite for competitiveness
Behavior	Reactive	Proactive	Pre-emptive
Problem-solving	Addressing emerged problems	Revealing and dealing with root causes of problems	Eliminating or preventing problems

Goh, T. N. (2012). Six sigma at a crossroads. *Current Issues of Business and Law* 7(1), 17-26. doi: 10.5200/1822-9530.2012.02

Implications for Research

Limitations for the current study would revolve around the military being such a large corporation. There are many moving parts and functions, no one unit is like another. This makes

establishing an overall conclusion on the ability or achievement of quality management nearly impossible. A study of the different units throughout the Air Force or military, which would have a limitation placed on time and manpower, would be the best way to move forward and produce a more accurate assessment. In the future, one direction that could be taken to better results would be to issue or locate real world feedback or surveys that have been collected from Air Force personnel that provide detailed information as to how they feel quality management has improved overtime.

Implications for Management

Leadership needs to understand that quality management is an everlasting and evolving task. The utilization of quality management and the six sigma approach have proven extremely beneficial in past projects, thus should continue to be practiced on future endeavors. There is sufficient evidence that performing tasks without the use of quality management or six sigma exponentially increases the likelihood of project delay and/or project failure.

Conclusion

The Air Force is making great strides to addressing and improving quality management and performance. A cut in budget, although painful and detrimental to our workforce, has truly aided the military in turning the corner on quality management. With the many improvements such as the 20/20 by 2020 vision, AFCAMP process, PME, QoL enhancement, and achievements in technology and processes the military has truly engrossed themselves in quality and the six sigma approach, in addition to following in line with Philip Crosby's 14 steps to quality. There is still much room to grow, but over the past couple of decades this multi-billion dollar industry has evolved into a much more effective and efficient corporation.

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WHAT DETERMINES GOLD PRICES?

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ABSTRACT

This paper investigates the determinants of the real dollar price of gold on a quarterly basis over the post Bretton-Woods era. The principle findings of the research include: (1) the real price of gold is negatively related to movements in real stock prices; (2) the real price of gold is negatively related to the exchange value of the US dollar; (3) the real price of gold is positively related to real world GDP; and (4) real gold and silver prices move together.

INTRODUCTION

Over time gold has been accepted as a universal means of exchange because of its indestructibility, beauty, and rarity compared to other common metals. Under the international gold standard in the 19th century, coins and other fiat monies were made formally redeemable for gold. Gold maintained its importance with the growth of international trade and the development of financial markets, foreign currency holding. Although the gold standard was abolished in 1933, gold maintains an important role among investors, speculators, analysts and others. It also continues to play an important role in international financial markets.

This paper aims to present and analyze the determinants of the real price of gold over forty years, utilizing quarterly data. The purpose is to provide an empirical analysis on the historical price movements of gold and which economic factors have important influences on the price of gold.

LITERATURE REVIEW

There are a number of factors that can affect the price of gold. Salant [11] established gold as a function of the interest rate. Salant argues that the return on gold should be similar to that of interest bearing instruments to compensate holders of gold for the opportunity cost of not holding those other instruments.

Keyfitz [5], Sjaastad and Scacciavillani [13], and Capie, Mills, and Wood [1] all conclude that fluctuations in exchange rates have significant effects on gold prices. The Sjaastad and Scacciavillani study is based on the same assumptions used by Keyfitz, that global markets clear and the law of one price holds. Sjaastad and Scacciavillani find that, for the period 1982-1990, European demand for gold was dominant and thus exchange movements in European currency rates vis-à-vis the US dollar were important determinants gold prices when measured in dollars per ounce. Capie, Mills, and Wood examine the relationship between gold, and exchange rates of various currencies against the dollar and how well gold has performed as a hedge, with respect to exchange rate fluctuations. Here as in other studies we measure gold prices in terms of the dollar, and thus the exchange rate of the dollar against other currencies is important in determining the price of gold.

Selvanathan and Selvanathan [12] estimate, with annual data, that gold production (for Western Australia) is a lagged function of sustained increases in the price of gold. Over the long-run, Faugère and Erlach [2] find that the world production of gold has kept pace with world population growth, so that per capita production of gold has remained relatively constant. The Faugère and Erlach findings include that real gold prices are related to the US stock market, exchange rates, and world real GDP per capita. Their work is based on a model of *Required Yield Theory*.

Starr and Tran [14] examine the physical demand for gold across countries. Among other results, they find that quantities of gold demanded differ across nations on a per capita basis and the determinants of gold demand differ among developed versus developing nations.

Levin and Wright [6] research the short-run and long-run determinants of the price of gold. Their focus is on gold as an inflation hedge. Utilizing cointegration techniques, they find short-run effects for US inflation, US inflation volatility, the exchange value of the US dollar, gold lease rates, and credit default risk.

THE GENERAL MODEL, DATA, EMPIRICAL SPECIFICATION

General Model

As stated in the introduction, this project focuses on real gold prices on a quarterly basis over the course of forty years. We identify numerous possible influences on real gold prices and test them as explanatory variables in an elementary econometric model. We acknowledge some of the possible shortcomings of our estimation techniques. Below we describe the data and methods employed in the estimations.

Following prior research, we posit that the real price of gold measured in US dollars will be negatively related to some measure of US stock markets as gold represents, for many investors, a “safe haven,” or perhaps merely an alternative to stock market investing. We anticipate that real gold prices are positively related to investments in commodities, such as other precious metals, agricultural goods, oil, or even industrial metals. Here we consider both gold and silver as similar alternative investments to stock markets—thus we anticipate that gold and silver prices will move together in a positive relationship. We also consider two potential international influences. First, as in other studies (see [1], [5], [13] as examples), the “effective” exchange value of the US dollar is likely to be of importance in the real dollar price of gold. This expectation is grounded in the theory of one price. That is, if the dollar strengthens relative to other currencies, unless the entire effect on gold prices is absorbed by changes in gold prices in the rest of the world, the price of gold in dollar terms will fall to some extent. As a second international influence, we include in the estimations the International Monetary Fund (IMF) series for world real GDP.

Data

Time series data collected for this analysis consists of quarterly measures from 1973 to 2012. The start date is chosen to coincide approximately with the abandonment of the Bretton-Woods exchange rate system, also known as the gold exchange system.

Except as noted the data were collected from the *International Financial Statistics (IFS)* database from the International Monetary Fund. The gold price is quoted in US dollar per troy ounce. Silver prices are likewise measured in US dollars. The GDP measure is real world GDP. The GDP deflator is the US GDP deflator, collected from the Federal Reserve Bank of St. Louis database (*FRED*), and that index is used in this paper to compute real prices for gold and silver. Share prices are represented by the US S&P 500 index, also deflated by the US GDP deflator. The measure of the exchange rate is *IFS* effective exchange value of the US dollar. Also collected for the project, but not used in the estimations reported below were measures of gold production, oil prices, the LIBOR rate, and an index of financial stress. Estimations were attempted with these measures without statistical success as indicated below.

Empirical Specification

The general model for estimation may be presented as

$$\text{Gold price} = \beta_0 + \beta_1 (\text{GDP}) + \beta_2 (\text{Silver price}) + \beta_3 (\text{Share price}) + \beta_4 (\text{Dollar Xrate}) + \varepsilon \quad (1)$$

Where the variables are measured as:

Gold price = the natural log of real gold prices, measured in US dollars, deflated by the GDP price deflator

GDP = the natural log of Real GDP for the world

Silver price = the natural log of real silver prices

Share price = the natural log of real share prices (S&P 500)

Dollar Xrate = natural log of the effective exchange rate of the US dollar

The “double log” form is chosen because the variables are anticipated to be related to time and to each other in terms of percentage changes, or elasticities. The slope estimates in (1) are estimates of the elasticity of gold prices with respect the individual explanatory variables.

GRAPHICAL AND STATISTICAL RESULTS

Graphical Results

In figures 1-3, the visual evidence of three of relationships is presented. As above the variables are in natural log form, and are normalized to 1 prior to the log transformation. For example, let $gold_t$ = the real price of gold at the first observation in the data set, and $gold_{t+n}$ = any later price n periods (quarters) ahead. Then the series in log form is $\ln\left(\frac{gold_{t+n}}{gold_t}\right)$. The individual series, then, all begin at zero and the changes in the series represent percentage changes.

Figure 1 shows the unsurprising relationship between gold and silver prices, generally moving in the same direction with some periods of significant divergence.

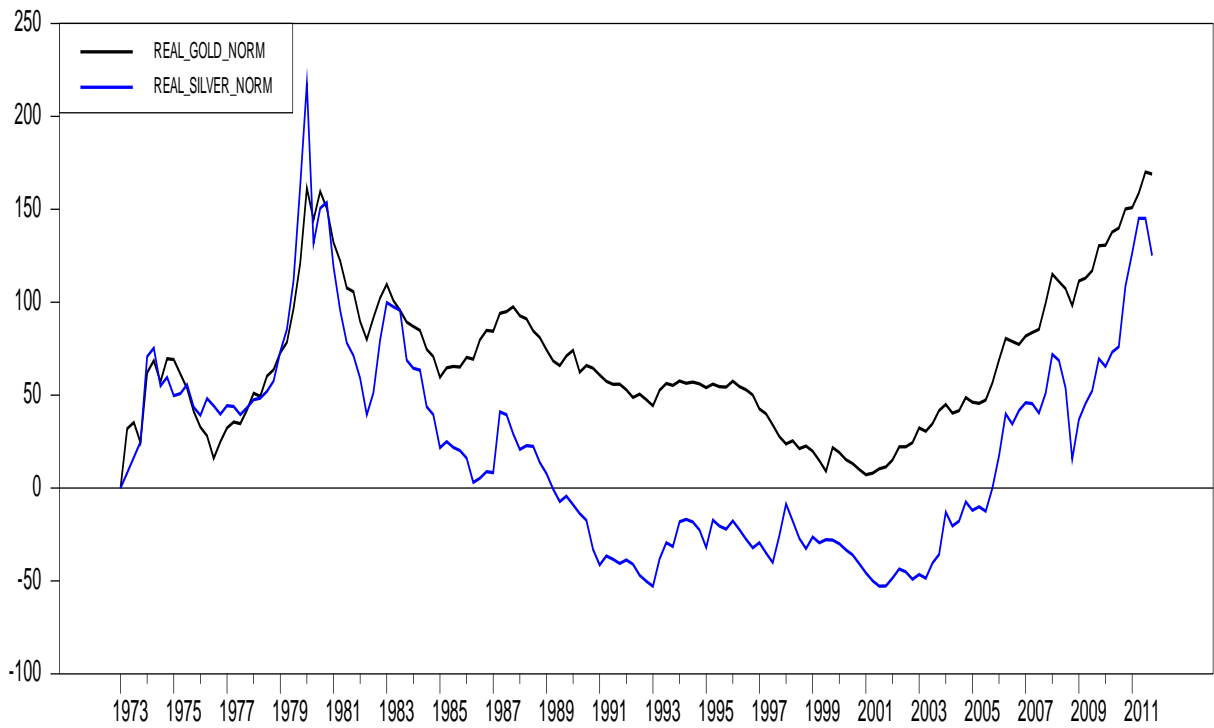


Figure 1: Quarterly Gold and Silver Prices, 1973-2011

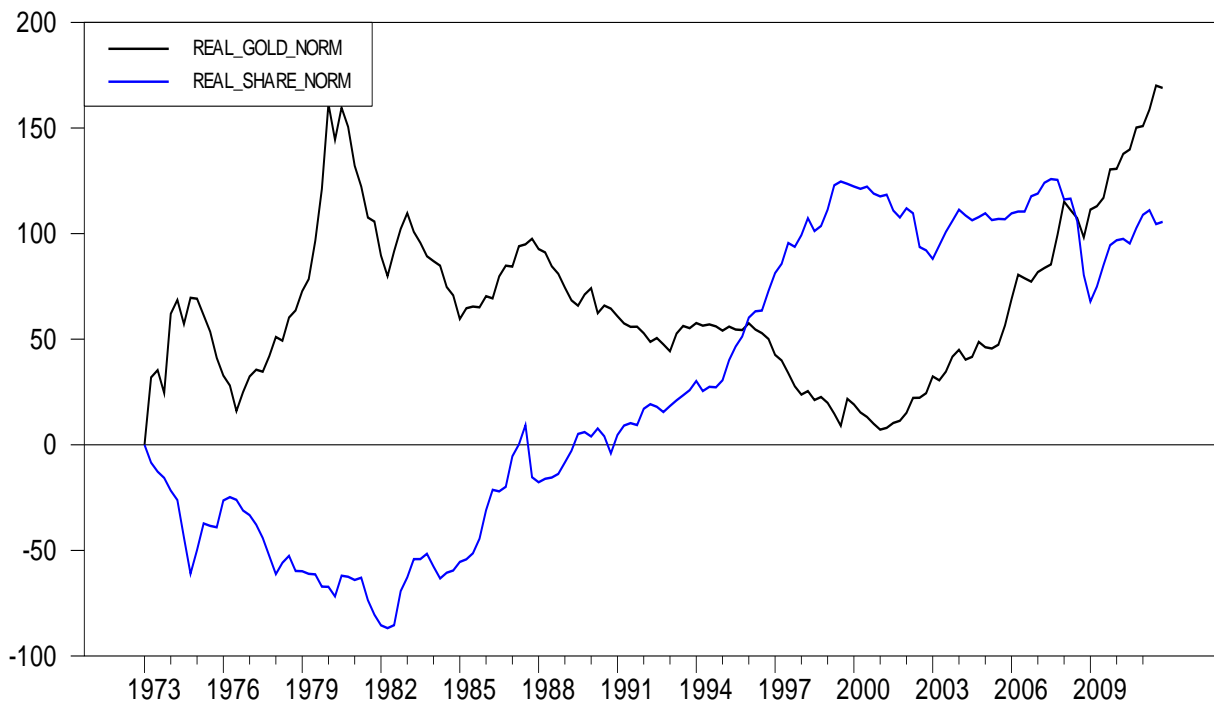


Figure 2: Quarterly Gold and Share Prices, 1973-2011

Figure 2 shows the visual evidence of a strong negative relationship between gold prices and share prices, the latter here represented by the S&P 500 index of the US. Incidentally, the negative relationship continues strongly at the time of the writing—over the last 52 weeks, the S&P index has risen by almost 30% while gold prices have fallen by 26%.

Figure 3 shows also a negative relationship between the exchange value of the dollar and the real price of gold.

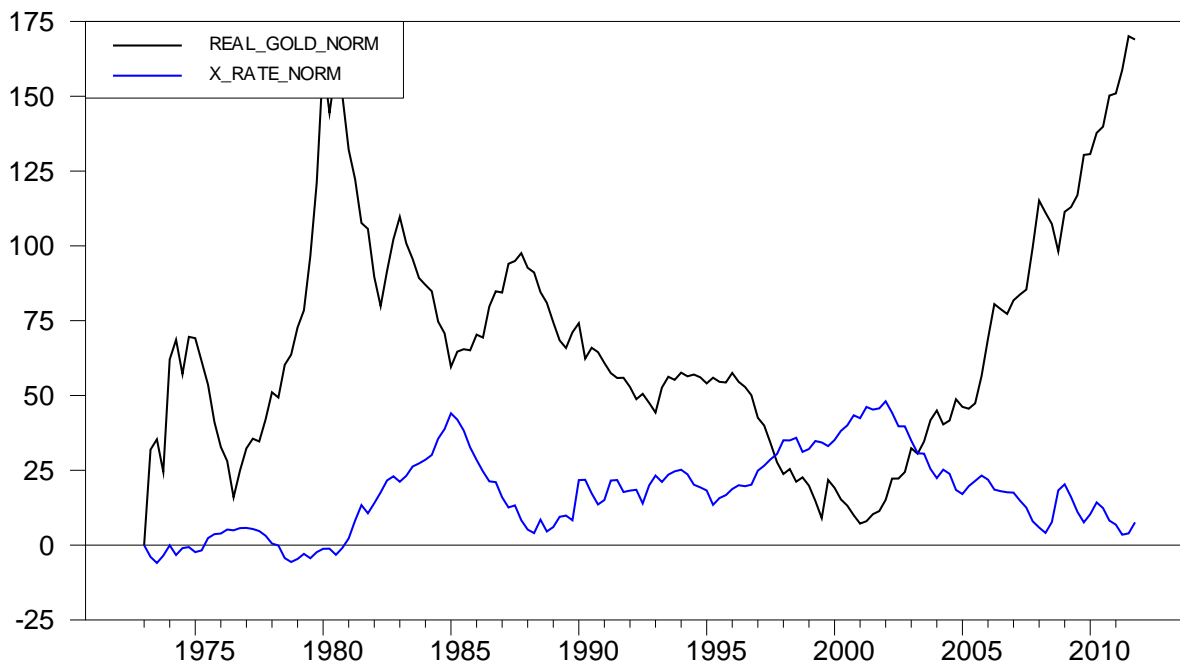


Figure 3: Quarterly Gold Prices and the Value of the Dollar, 1973-2011

Estimations

Table 1 present the results of regression of the empirical specification from equation 1. The coefficient estimates are in bold with the t-scores in parentheses below.

The first column lists the variables and summary statistics and the second column presents the estimated model based on the Generalized Least Squares (GLS) method of Hildreth-Lu that “corrects” for first-order autocorrelation. Ordinary least squares estimates in the presence of autocorrelation are unbiased and consistent, but they are inefficient. Generally, the variances of the coefficients are under-estimated and thus the t-scores are inflated. The Durbin-Watson statistic for OLS (see $DW = .2682$ for the third column) indicates the presence of first-order (positive) autocorrelation. The GLS method of Hildreth-Lu, utilizes quasi-differences based on the estimate of ρ . Assuming the GLS method is appropriate, the estimates are all statistically significant and have the anticipated signs. The estimates for share prices and the exchange rate are of particular interest. The coefficient for share prices suggests that a 1% rise in share prices results in a three-tenths of 1% fall in gold prices—other things equal. The coefficient for the

exchange value of the dollar suggests that a 1% rise in the exchange value is associated with about six-tenths of 1% decline in the real price of gold. The fit of the equation is very good ($\bar{R}^2 = .9787$).

Table I: Regression Results

Variable/ Summary Statistics	GLS (Hildreth-Lu)	OLS (Newey-West)
Constant	2.106	0.2455
GDP Index	0.9473* (4.76)	1.430* (13.71)
Silver	0.4357* (14.40)	0.4149* (13.85)
Share Prices	-0.3063* (-4.67)	-0.5484* (-12.50)
Exchange Rate	-0.5766* (-4.09)	-0.5015* (-4.23)
\bar{R}^2	0.9787	0.9098
rho	0.9097	
Durbin-Watson	1.61	.2682
see	0.0549	0.1140

* indicates statistical significance at $\alpha < .01$

Since OLS is unbiased in the presence of first-order autocorrelation, but the variances of the coefficients are usually underestimated, it is common (even preferred currently according to most econometricians) to report estimates with Newey-West corrected errors. Those estimates are in the last column of Table I.

Notice the similarity of the estimates between the GLS and OLS estimates. The estimated coefficients differ across the two methods, but not substantially in a statistical sense. Based on the OLS estimates, the elasticity for the GDP index is somewhat greater and the same is true for the coefficient for share prices. The coefficients for silver and the exchange rate are very similar across the two methods of estimation. A “Hausman” test for detecting differences in coefficient estimates fails to reject the null hypothesis for coefficient equality across the two methods ($\chi^2 = 4.13$, p-value = 0.53). These results indicate that the coefficient estimates are stable (robust) across the two methods of estimation.

Possible Shortcomings

One potentially important consideration is the absence of gold production in the equation. We managed to find gold production on an annual basis and were able to produce a quarterly measure of production. In no estimation were we able to find a statistically significant negative effect of gold production on gold prices. Several factors may help explain such a result. First, Selvanathan and Selvanathan [12] find that gold production is a lagged function of sustained increases in gold prices, thus current production might have little effect on gold prices. Second, Faugère and Erlach [2] find that gold production *per capita* has been basically constant over time.

Finally and perhaps related, it is likely than demand dominates changes in the price of gold, given any level of supply over the time frame of this study.

The direction of causality, with particular reference to silver prices, can certainly be questioned. That is, causation likely runs both from gold to silver as well as the reverse. We consider silver to be a proxy for all other commodities that might also be held, rather than gold when investors flee stocks. As such we are less interested in the coefficient estimate for silver than we are in avoiding left-out variable bias, with no other commodity option in the equation. We did experiment with two-stage least squares, with instruments for silver without significant success.

Finally, any such time-series investigation is subject to the Granger-Newbold critique of possible spurious regressions. That discussion is beyond the scope of this paper.

Other Experiments

We also tested for seasonality with a set of seasonal dummy variables. The null hypothesis of no seasonality could not be rejected. We conclude that gold prices are not subject to seasonal (quarterly) variation. We tested other potential explanatory variables suggested by other research. We found no statistical role for LIBOR rates, measures of financial stress, oil prices, or gold production (as stated above).

CONCLUSIONS

What can be taken from the exercises in the project? We believe several important observations are warranted. First, the finding here are consistent with theories relating stock prices to the price of gold as competing alternative investments. Generally stock market increases are associated with significant declines in real gold prices. That elasticity is estimated to be between .31 and .55. We believe the general direction of causation is from the stock market to gold prices, though the actual relationship is likely more complicated. For example, the stock market may rise in anticipation of, say, GDP growth, and the rise in the market depresses gold prices as investors sell gold and buy stocks.

We also conclude that the real gold price measured in dollars is affected by the exchange value of the dollar. That effect is grounded in the law of one price, and the statistical and visual evidence (see Figure 3) is compelling. We also conclude that some measure of other commodity prices, perhaps an index, belongs in an equation for estimating the price of gold. Indexes of this sort exist, but would need to be purged of the gold component. That may be a subject for a future research project.

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DID POLITICAL ORIENTATION AND ECONOMIC SELF-INTEREST DETERMINE THE OUTCOME OF CALIFORNIA PROPOSITION 37?

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ABSTRACT

Genetically modified foods have been a part of the food chain in the United States for more than a decade while incurring little of the controversy exhibited in European countries. Paralleling this divergence in consumer attitudes are differences in national policies regarding labeling of GM foods. While the countries of the European Union and others have adopted a policy of mandatory labeling of GM content the United States has followed a policy of voluntary disclosure. California Proposition 37 called for the implementation of mandatory labeling of GM foods within the state and has major implications regarding policy in the rest of the United States. This paper examines the literature regarding national policies toward GM food labeling in the United States, Canada, Europe, Australia, Japan and other economies and is followed by a discussion of the advantages and disadvantages of GM labeling policies that has been developed in this research stream. The results of the recent election in California are presented and two hypotheses are posed. First, did political orientation in the form of support for environmentalism and consumer rights issues influence support for Proposition 37. Secondly, did economic self-interest affect rejection of Proposition 37. A multiple regression analysis strongly suggests the impact of these independent variables on the election outcome. The implications for policy changes regarding mandatory GM food labeling in the United States are explored.

INTRODUCTION

The GM Food Labeling Debate

The process of genetic modification, defined as "any change to the heritable traits of an organism achieved by intentional manipulation" (Health Canada 2003), has been encircled by heated debate since genetically modified organisms were first introduced in the manufacture of medicinal products in the 1980s. Genetic modification of food and food products further intensified the debate surrounding genetic modification. The far-reaching impact of food and the broad need to fulfill human and livestock nutritional requirements ensure the debate will continue to attract critical interest. In turn, the controversy about the genetic modification of food has created differing views regarding labeling policies for genetically modified (GM) foods. This debate regarding GM food labeling policy together with low public understanding and consumer awareness has brought about a divide over GM food labeling policies between proponents and opponents of GM foods, including governments, individual companies and activist groups (Ho, Vermeer, and Zhao 2006).

Underlying the divide in the GM food labeling debate is the fact that the primary objective of GM labeling is to provide consumer information, not food safety (Gruere and Rao 2007). The rationales supporting the provision of consumer information differ depending on the type of regulation adopted. Significant debate has addressed whether GM food labeling supports the principle of consumer autonomy (McKay, White & Veeman 2007), which is usually associated with product labeling (Siip and Uusitalo 2011). Labeling policies focused on the production

process are supported by the belief that purchase decisions are based, not only on product related issues, but on environmental, religious or ethical concerns (Gruere and Rao 2007).

National policies regarding GM food labeling fall largely into one of two camps: mandatory labeling of GM products or voluntary labeling of non-GM products. The most common illustration of labeling of non-GM products is the use of designations such as “natural” or “organic”. The United States and Canada have adopted a policy of voluntary labeling of non-GM products while the European Union, Japan, Russia, and Australia have endorsed the mandatory labeling of GM products (Gruere, Carter, and Farzin 2009). The arguments in favor of mandatory GM food labeling are largely centered on health-related concerns, environmental concerns, and the rights of consumers to product information. From a health perspective, GM foods spark concern over safety, altered nutritional quality and the possible creation of new viruses and toxins (Azadi and Ho 2009). The arguments against mandatory labeling of GM foods are largely based on the decrease of consumer food options, higher consumer costs, inefficiencies in the international trade of food and agricultural products, and the higher costs of regulation and compliance. Azadi and Ho (2009) emphasize that the potential benefits of GM food technology are pervasive, particularly in developing countries where hunger and crop consistency are larger issues than in developed countries.

California Proposition 37 represented one of the first and certainly one of the most substantial challenges to current United States policy regarding GM food labeling. It does represent one of the first popular elections on GM food labeling policy. The measure mandated that all processed foods which contain genetically modified ingredients sold at retail in California would be labeled. In addition, all raw fruits and vegetables with genetically modified origins would also be required to be labeled either on the packaging or the shelving where the product would be displayed. Proposition 37 did offer several prominent exceptions to the mandate. Among these were prepared foods sold at retail establishments or in restaurants, all alcoholic beverages, and any meats, poultry, and dairy foods (California Secretary of State 2012). In the November 6, 2012 election, Proposition 37 was defeated by a state-wide margin of 51.4% against and 48.6% for. Overall, 6,088,714 California voters supported the measure while 6,442,371 were opposed to Proposition 37. This paper analyses the results of the election at the county level and attempts to determine if political orientation and economic self-interest played a role in the outcome of the election.

This paper consists of four major components. The first part of the literature review examines the scope of global trends in government-mandated GM food labeling policies. The second section of this paper specifically examines the content of California Proposition 37 followed by an analysis of the recent election results. After examining the research setting, this study seeks to determine if political orientation and economic self-interest affected voting. Finally, the paper discusses the implications of Proposition 37 on United States policies on the labeling of GM foods.

LITERATURE REVIEW

Global Trends in GM Labeling Policy

The prevailing divide regarding GM food labeling policy between those countries which require mandatory labeling and those which have adopted a voluntary labeling policy can be traced back to the initial commercialization of GM food technology in the early and mid-1990s. Over the intervening years, more than 40 countries have adopted labeling requirements for GM food. These policies largely reflect the opening positions of the two contrasting parties – the United States and the European Union (Gruere, Carter, and Farzin 2009).

In the United States, the Food and Drug Administration ruled in 1992 that the emerging GM foods were “substantially equivalent” to their non-GM predecessors and thus not subject to labeling requirements or regulation (Pollan 2012). However, the underlying technology behind GM food technology was deemed to be unique and subject to patent protection. Thus, in the United States a policy developed which separated the process of GM technology from the actual product itself (Siipi and Uusitalo 2011). By way of contrast, in a 2001 ruling the Food and Drug Administration allowed for the voluntary labeling of organic and natural foods – in effect, logically combining the process and the product but only for non-GM products. Canadian policy regarding GM food labeling has evolved along similar lines, offering a marketplace where there are no mandatory requirements for the labeling of foods containing GM ingredients but where the voluntary labeling of non-GM foods is allowed (Gruere, Carter, and Farzin 2008). The net effect of this policy has resulted in a marketplace in which GM foods are widely available yet awareness on the part of the consumer that the foods that they are purchasing have been genetically modified is relatively low (Premanandh 2011).

On the other hand, the European marketplace for GM food evolved in a completely different manner. Unlike the United States, the European Union (EU) adopted a relatively cautious stance regarding the emerging GM food technology and implemented a moratorium on the production and distribution of new GM products coupled with a mandatory requirement that existing GM food products be labeled (Carlsson, Frykblom, and Lagerkvist 2007). The imposition of this EU ban on the distribution of new GM foods applied, of course, to imported products as well and served as the impetus for a challenge to the policy by the major exporters of GM based grains and crops. The United States, together with Canada and Argentina, filed a complaining action with the World Trade Organization in 2003 holding that the EU moratorium on newly developed GM products was a violation of previous free trade agreements and amounted to an illegal restraint of trade. In response, the EU then adopted a mandatory labeling policy requiring that any food product containing in excess of 0.9% GM contents be labeled as such (Carlsson, Frykblom, and Lagerkvist 2007). In addition, the EU also adopted a process governing the introduction of new GM food products in which approval must be obtained from the European Commission in consultation with the European Food Safety Authority. If approval is given, the new GM food product is then subject to confirmation by a committee of national experts and their respective environmental ministers. If this confirmation is not obtained, the matter of approval then returns to the European Commission for a decision. However, this is not an ultimate decision as each of the individual countries can then over-rule the decision of the European Commission and institute a ban on a national basis (Carlsson, Frykblom, and Lagerkvist 2007). The net effect of this set of regulatory procedures combined with the mandatory labeling policy in the European Union has resulted in the near absence of GM food products in the retail marketplace (Siipi and Uusitalo 2011).

Similarly, Russia and much of Eastern Europe have adopted mandatory GM food labeling policies that mirror those of the European Union (Gruere, Carter, and Farzin 2009). Many researchers have noted the relationship between GM food labeling policies and international trade patterns. Gruere, Carter, and Farzin (2009) reported that major producers of GM crops tend to have less stringent labeling policies more closely resembling the policies of the United States and Canada while major importers of agricultural products tend to have more stringent labeling policies. Consequently, major exporters of agricultural products to the EU have a higher probability of adopting mandatory GM food labeling practices. This can be seen in the relatively more stringent policies in countries such as South Africa, Turkey, Brazil, Australia, and New Zealand.

Countries in Asia appear to be following a similar pattern. Japan was an early adopter of mandatory GM labeling policies, largely as a result of political activism from consumer and farming groups. As of 2001, all products are required to be assessed for GM content before entering the Japanese marketplace and GM labeling is mandatory (Kim and Boyd 2006). Japan is a major food importer and its consequent trade patterns in agricultural products have resulted in GM labeling throughout much of Asia. China, Japan, Hong Kong, Indonesia, Philippines, South Korea, Taiwan, Thailand, and Vietnam have all adopted GM labeling policies whether mandatory or voluntary (Gruere, Carter, and Farzin 2009).

PROPOSITION 37 AND THE NOVEMBER 2012 ELECTION

According to the official website of the California Secretary of State, Proposition 37 would explicitly require the regulation of genetically modified foods sold at retail locations such as grocery stores but not at restaurants. The measure would require that processed foods produced entirely or in part with genetically engineered technology be labeled with the words “Partially Produced with Genetic Engineering” or “May be Partially Produced with Genetic Engineering”. Proposition 37 also required that raw foods such as fruits and vegetables with GM origins contain the label “Genetically Engineered” on the packaging or if there is no packaging the mandatory label must appear on the shelf where the item is displayed. Furthermore, for each product that is not labeled as GM, a retailer generally must be able to document why that product is exempt from labeling. The measure proposed that there are two primary ways in which a retailer could document that a product is exempt. First, by obtaining a sworn statement from the provider of the product (such as a wholesaler) indicating that the product has not been intentionally or knowingly genetically engineered. Secondly, exemption could be obtained by receiving independent certification that the product does not contain GM ingredients. Other entities throughout the food supply chain (such as farmers and food manufacturers) would also be responsible for maintaining these records (California Secretary of State 2012).

Proposition 37 did include several prominent exemptions. For example, alcoholic beverages such as wine and beer, restaurant food and other prepared foods which are intended to be eaten immediately would not have to be labeled. Animal products that were not directly produced through genetic engineering, such as beef, dairy products, and poultry, would also be exempted, regardless of whether the animal had been fed GM crops (California Secretary of State 2012).

Proposition 37 offered two modes of enforcement: regulation by the California Department of Public Health and litigation. Violations of the measure could be prosecuted by state, local, or private parties. Proposition 37 would have allowed the court to award these parties all reasonable costs incurred in investigating and prosecuting the action. In addition, the measure specified that consumers could sue for violations of the measure’s requirements under the state Consumer Legal Remedies Act, which allows consumers to sue without needing to demonstrate that any specific damage occurred as a result of the alleged violation (California Secretary of State 2012).

The election was characterized by heavy expenditures from the major food and agriculture firms. Monsanto, Kraft, Coca-Cola, Kellogg and others invested approximately \$41 million in the effort to defeat Proposition 37. Opponents of the mandatory labeling provision argued that passage of the measure would result in higher economic costs which would be passed on to consumers. The results of a study commissioned by opponents estimated that passage would result in a \$400 increase in food cost for the average household (Wall Street Journal 2012). Both the San Francisco Chronicle and the Los Angeles Times editorialized against passage of Proposition 37. In their pre-election edition the San Francisco Chronicle (2012) noted that “the main problem with Proposition 37 is that it invites citizen lawsuits as a primary means of enforcing the labeling law”. In addition, the editorial also argued that voter-passed initiatives have a significant disadvantage in that they can only be modified through the proposition process. The Los Angeles Times (2012) also found fault in the enforcement of the measure: “Most of the burden for ensuring that foods are properly labeled would fall not on the producers but on the retailers – a mandate that could make it hard for Mom-and-pop groceries to stay in business”.

Proposition 37 was defeated by a state-wide margin of 51.4% against and 48.6% for. Overall, 6,088,714 California voters supported the measure while 6,442,371 were opposed to Proposition 37. Results by county from the election are available in Table 1 below. Figure 1 below provides a county map of California.

Table 1: Proposition 37 Election Results

County	Yes Votes	No Votes	Yes Vote %	No Vote %
Alameda	338,547	234,669	59.1%	40.9%
Alpine	416	218	65.6%	34.4%
Amador	5,893	11,348	34.2%	65.8%
Butte	40,488	47,684	45.9%	54.1%
Calaveras	7,773	13,374	36.8%	63.2%
Colusa	1,681	4,206	28.6%	71.4%
Contra Costa	204,511	217,485	48.5%	51.5%
Del Norte	4,911	3,544	58.1%	41.9%
El Dorado	33,237	52,948	38.6%	61.4%
Fresno	95,617	153,640	38.4%	61.6%
Glenn	2,810	6,200	31.2%	68.8%

Humboldt	37,321	18,819	66.5%	33.5%
Imperial	20,895	16,063	56.5%	43.5%
Inyo	2,925	4,887	37.4%	62.6%
Kern	76,592	139,383	35.5%	64.5%
Kings	10,132	20,759	32.8%	67.2%
Lake	10,337	12,615	45%	55%
Lassen	4,417	6,003	42.4%	57.6%
Los Angeles	1,581,288	1,433,683	52.4%	47.6%
Madera	13,936	24,959	35.8%	64.2%
Marin	81,246	49,020	62.4%	37.6%
Mariposa	3,445	5,377	39.1%	60.9%
Mendocino	21,067	14,015	60.1%	39.9%
Merced	23,655	35,860	39.7%	60.3%
Modoc	1,200	2,729	30.5%	69.5%
Mono	2,839	2,182	56.5%	43.5%
Monterey	67,334	52,662	56.1%	43.9%
Napa	27,162	27,973	49.3%	50.7%
Nevada	24,380	26,164	48.2%	51.8%
Orange	449,779	629,501	41.7%	58.3%
Placer	61,324	105,137	36.8%	63.2%
Plumas	3,921	5,984	39.6%	60.4%
Riverside	272,387	372,538	42.2%	57.8%
Sacramento	215,370	281,626	43.3%	56.7%
San Benito	8,360	10,174	45.1%	54.9%
San Bernardino	235,632	330,329	41.6%	58.4%
San Diego	561,495	581,529	49.1%	50.9%
San Francisco	230,657	107,695	68.2%	31.8%
San Joaquin	82,948	114,451	42%	58%
San Luis Obispo	56,964	64,530	46.9%	53.1%
San Mateo	147,022	128,011	53.5%	46.5%
Santa Barbara	81,383	76,311	51.6%	48.4%
Santa Clara	326,906	293,611	52.7%	47.3%
Santa Cruz	78,477	38,636	67%	33%
Shasta	29,206	44,697	39.5%	60.5%
Sierra	724	1016	41.6%	58.4%
Siskiyou	10,042	9,416	51.6%	48.4%
Solano	69,613	78,042	47.1%	52.9%
Sonoma	112,586	96,810	53.8%	46.2%
Stanislaus	61,583	88,999	40.9%	59.1%
Sutter	9,724	19,930	32.8%	67.2%
Tehama	7,773	14,738	34.5%	65.6%
Trinity	2,701	2,959	47.7%	52.3%

Tulare	33,658	64,652	34.2%	65.8%
Tuolumne	10,191	13,874	42.3%	57.7%
Ventura	143,480	175,710	45%	55%
Yolo	31,748	40,685	43.8%	56.2%
Yuba	7,005	12,311	36.3%	63.7%
State Totals	6,088,714	6,442,371	48.6%	51.4%

Figure 1: County map of California



Inland and traditionally more conservative counties such as Napa, Solano, Sacramento, San Joaquin, Merced, Fresno, Kern, San Bernadino, and Riverside are far more reliant on agriculture and were strongly opposed to Proposition 37 (California Secretary of State 2012). Given this reliance on agriculture, the following hypothesis is presented.

H1: Did economic self-interest affect Proposition 37 election results?

The results of the November 6, 2012 election suggest that traditionally liberal and coastal counties such as Humboldt, Marin, San Francisco, Alameda, Santa Cruz, Monterey, and Los Angeles strongly supported the measure. Conceptualized as a formal hypothesis, this study seeks to determine if a political orientation centered on health-related concerns, environmental concerns, and the rights of consumers to product information led to positive attitudes toward Proposition 37.

H1: Did political orientation centered on health-related concerns, environmental concerns, and the rights of consumers to product information affect election results?

RESEARCH METHODOLOGY AND ANALYSIS

Our first hypothesis poses the question: Did economic self-interest in the form of reliance upon agriculture affect Proposition 37 election results? To answer this question, the latest available results for agricultural production on a county-by-county basis were compiled utilizing the data from the California Agricultural Statistics Review (2013). The results, expressed in \$1000 increments are stated in the second column of Table 2. Per capita agricultural production was calculated utilizing statistics from the latest census (US Census) and is displayed in the fourth column of Table 2. Per capita agricultural production was chosen as a surrogate for the economic self-interest at the county level. An analysis of correlation was then conducted between the measure of economic self-interest and county-by-county voting results on Proposition 37. The correlation coefficient is an index number constrained to fall between -1.0 and +1.0 and the strength of the association is communicated by the absolute size of the measure. In this case the correlation coefficient was found to be 0.414 indicating a substantial association. The statistical significance of the correlation coefficient was found to be highly significant at the 0.001 level. Given the results, the first hypothesis – that economic self-interest affected the election outcome – is accepted.

The second hypothesis asks whether political orientation centered on health-related concerns, environmental concerns, and the rights of consumers to product information affect election results. To test the hypothesis, the results of the 2012 Presidential elections were used as a surrogate for political orientation. In column five of Table 2, the results of the election are portrayed in terms of conservative political orientation, i.e., the percentage of the vote on a county-by-county basis for the Republican candidate, Mitt Romney. In a similar fashion to the preceding analysis, a correlation analysis was then conducted. The

results of this analysis indicated a correlation coefficient of 0.786 with a significance at the 0.000 level. Consequently, the political orientation variable was found to have a very high correlation with voting behavior on the GM labeling measure.

Table 2: Economic Self-Interest and Political Orientation

County	Agricultural Production (in \$1,000)	Population	Per Capita Agricultural Production	Conservative Political Orientation as %	Voted No % on Prop 37
Alameda	41,180	1,510,271	27.27	21.1	40.9
Alpine	5,311	1,175	4,520.00	40.4	34.4
Amador	28,511	38,091	748.50	61.3	65.8
Butte	635,707	220,000	2,889.58	53.0	54.1
Calaveras	19,637	45,578	430.84	60.2	63.2
Colusa	657,578	21,149	30,700.69	61.7	71.4
Contra Costa	92,920	1,049,025	88.58	33.6	51.5
Del Norte	41,940	28,610	1,465.92	56.8	41.9
El Dorado	31,338	181,058	173.08	60.4	61.4
Fresno	6,884,582	930,450	7399.20	50.1	61.6
Glenn	611,291	28,122	21,737.11	64.2	68.8
Humboldt	167,223	134,623	1,242.16	40.0	33.5
Imperial	1,964,087	174,528	11,253.71	34.8	43.5
Inyo	26,271	18,546	1,416.53	57.4	62.6
Kern	5,364,363	839,631	6,388.95	59.6	64.5
Kings	2,219,529	152,982	14,508.43	58.7	67.2
Lake	67,504	65,665	1,028.01	43.7	55.0
Lassen	89,539	34,895	2,565.96	71.4	57.6
Los Angeles	173,106	9,818,605	17.63	30.3	47.6
Madera	1,569,239	150,865	10,401.61	59.8	64.2
Marin	70,077	252,409	277.63	25.7	37.6
Mariposa	30,975	18,251	1,697.17	61.1	60.9
Mendocino	115,409	87,841	1,313.84	33.8	39.9
Merced	3,259,866	255,793	12,744.16	46.8	60.3
Modoc	107,009	9,686	11,047.80	72.1	69.5
Mono	53,068	14,202	3,736.66	47.2	43.5
Monterey	3,922,035	415,057	9,449.39	32.9	43.9
Napa	430,857	136,484	3,156.83	37.0	50.7
Nevada	14,924	98,764	151.11	52.3	51.8
Orange	145,896	3,010,232	48.47	54.4	58.3
Placer	62,304	348,432	178.81	61.0	63.2
Plumas	20,019	20,007	1000.60	59.9	60.4
Riverside	1,282,259	2,189,641	585.60	50.3	57.8
Sacramento	405,211	1,418,788	285.60	41.9	56.7
San Benito	263,365	55,269	4,765.15	40.8	54.9
San Bernardino	519,420	2,035,210	255.22	47.5	58.4
San Diego	1,683,740	3,095,313	543.96	47.4	50.9
San Francisco	955	805,235	1.19	16.5	31.8
San Joaquin	2,246,920	685,306	3,278.71	44.2	58.0
San Luis Obispo	736,208	269,637	2,730.37	51.2	53.1

San Mateo	134,900	718,451	186.93	27.9	46.5
Santa Barbara	1,194,379	423,895	2,817.63	42.4	48.4
Santa Clara	247,694	1,781,642	139.03	29.9	47.3
Santa Cruz	562,895	262,382	2,145.33	24.4	33.0
Shasta	89,060	177,223	502.53	66.2	60.5
Sierra	6,200	3,240	1,913.58	63.6	58.4
Siskiyou	198,214	44,900	4,414.57	59.6	48.4
Solano	291,661	413,344	705.61	36.5	52.9
Sonoma	581,081	483,878	1,200.88	28.9	46.2
Stanislaus	3,069,823	514,453	5967.16	50.0	59.1
Sutter	547,187	94,737	5,775.85	60.7	67.2
Tehama	245,672	63,463	3,871.11	65.5	65.6
Trinity	8,186	13,786	593.79	52.9	52.3
Tulare	5,629,264	442,179	12,730.74	58.7	65.8
Tuolumne	22,721	55,365	410.39	59.5	57.7
Ventura	1,841,247	823,318	2,236.37	47.7	55.0
Yolo	549,249	200,054	2,745.50	34.6	56.2
Yuba	207,984	72,155	2,882.46	60.9	63.7

A regression analysis was then conducted utilizing the two independent variables of economic self-interest and political orientation. The dependent variable was, of course, the voting outcome of the Proposition 37 election. The adjusted R Square indicates that the strength of the relationship between the independent variables and the dependent variable is 0.643, indicating that a linear relationship is present. The ANOVA F is 52.266 with a highly significant 0.000, indicating that it is justifiable to utilize a straight-line relationship to model the variables. A test of the statistical significance of the betas for the variables was then conducted. The beta for the economic self-interest variable was found to be 0.204 with a significance of 0.017 and the beta for the political orientation variable was found to be 0.727 with a significance of 0.000. The full results of the regression analysis are summarized below in Tables 3, 4, and 5.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
	.809	.655	.643	5.95092

Table 4: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3701.875	2	1850.937	52.266	.000
Residual	1947.741	55	35.413		
Total	5649.615	57			

Table 5: Coefficients

Model	B	Std. Error	Beta	T	Sig.
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(Constant)	27.181	2.936		9.259	.000
Economic	.000	.000	.204	2.464	.017
Political	.533	.061	.727	8.789	.000

CONCLUSION

California Proposition 37 was the first general election on the future of GM food labeling in the United States. An analysis of the November 2012 election results strongly suggests that political orientation and economic self-interest played a major role in the outcome of the election. While an analysis of political orientation by itself would have suggested that California Proposition 37 would have been passed, the additional effect of economic self-interest seems to have been critical in determining the defeat of the mandatory GM food labeling measure in California. Although this was the first popular election on the future of GM labeling in the United States it is doubtful that it will be the last.

The recent defeat of California Proposition 37 at the ballot box leaves a situation where three potential outcomes are possible. The first of these is the continuation of the status quo. In this scenario, there would be no mandatory GM food labeling though the voluntary labeling of non-GM food would be allowed. The second possibility encompasses additional legislative or electoral challenges at the state level to the existing paradigm of voluntary labeling. Legislatures in approximately 20 other states have proposed GM food labeling regulations though none has become law. One of the major concerns of the biotechnology industry was that passage of California Proposition 37 would result in a patchwork of regulations at the state level across the United States. Such an outcome would necessitate different labeling requirements for individual states (Wall Street Journal 2012). Since differing state labeling regulations would invariably place a burden on interstate commerce, Congress would eventually invoke its powers under Article IV of the U.S. Constitution and enact uniform labeling regulations. As ruled by the Supreme Court, the Commerce Clause regulates activities that “substantially affect interstate commerce,” and when there is a state law that impedes interstate commerce, Congress has the power to preempt state law and enact a law that is uniform across the nation (*Gibbons v. Ogden* 1942). But this process can take years to flesh out placing significant burdens on state legislatures and the state and federal court system as well as the agricultural industry. Accordingly, the third possibility is for Congress to enact labeling legislation in a proactive manner.

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Users' Behavior Comparison between Active and Inactive Newcomers in Online Knowledge Communities

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ABSTRACT

Online knowledge communities have become vital places for people to hunt for knowledge and share expertise. Most of newcomers would only participate in the online community for a very short amount of time. Very few newcomers will stay and become long-term contributors in online communities. In our study, we aim to examine the communication behaviors of newcomers in online knowledge communities. Particularly, we are interested in the behavioral differences between active newcomers and inactive newcomers. We use network-based behavioral measures to reveal users' interactions in online communities. We find that active newcomers have more mutual communication activities than inactive newcomers. In addition, inactive newcomers in both forums have more unidirectional connections than bidirectional connections. Our findings can help online community researchers and practitioners understand the factors that stimulate online knowledge-sharing participation and retain community users.

Keywords: online knowledge communities, descriptive statistics, graph-based models, user behavior

INTRODUCTION

With the rapid propagation of knowledge repositories in online knowledge communities, more and more people would like to seek and share knowledge through them (Liu, Wang, & Fan, 2011).

An online knowledge community is a virtual community comprised of individuals who share common interests and work together to expand their understanding of some knowledge domain through knowledge sharing and interactions(Lin, Fan, & Zhang, 2009). Newcomers would like to post questions or answers in online communities in order to advance their status (Teo & Johri, 2014). Many online knowledge communities (e.g., Stack overflow) have their own reputation systems to categorize the users into different levels based on their contributions. However, the existing reputation systems only passively recognize the contributions a user made in the past and do very little to actively keep the users in the community. As a result, many newcomers would make a post or two and then disappear from the community. We aim to examine how newcomers interact with online knowledge communities and to find different behavioral patterns between short-lived newcomers and those survived newcomers who become regular contributors. Knowing the differences in the behavior patterns of newcomers would help online knowledge communities identify new measures that can retain more newcomers. We now briefly provide the literature review on the behavior patterns of online community participants, followed by our research design, findings and a conclusion.

LITERATURE REVIEW

It is important to study the behavioral patterns of online community users because they can be used to distinguish different user roles in the community. The Reader-to-Leader framework classified users as readers, contributors, collaborators, and leaders based on their contribution behavior changes over time using a theoretical method (Preece & Shneiderman, 2009). Velasquez et al. complement the “reader-to-leader” framework by propounding a new type of user: latent user, which is defined as members of a site who decreased content contribution after

contributing a certain level (Velasquez, Wash, Lampe, & Bjornrud, 2013). The literature on technology communities identified seven distinct roles based on the ethnographic analysis (Madanmohan & Navelkar, 2004). Ganley et al. clustered users into four different categories based on their posting behaviors, including utility posters, team players, low profilers and story tellers (Ganley, Moser, & Groenewegen, 2012).

In addition to basic post counts, network-based measures such as reciprocity and clustering coefficient can be used to evaluate online community users' behavioral patterns (Zhang & Ackerman, 2007). A communication network can be constructed for an online community if each user is represented as a node and each reply as a link between the two involved users. Reciprocity measures the tendency to form mutual communication between two users in a directed network (Wasserman, 1994). In other words, it defines how often bi-directional communications (with the opposite directions) occur between any two users. The cluster coefficient of a user measures how well its neighbors are connected to be a clique (i.e., having communications between any two neighbors).

By understanding their behavioral patterns, we can learn how newcomers in an online knowledge community can grow into active users over time. Furthermore, we can educate newcomers to more effectively seek knowledge through discussions with other community members.

RESEARCH DESIGN

Defining Newcomers

Newcomers are classified based on the extent of their contribution. In our context, the status of a newcomer is defined as a member who just start to post a message in the community (Butler & Wang, 2012).

Behavioral Measures of Online Community Users

As to each post in both Java forums, we define a directed user graph $G = \langle U, E \rangle$, where U is a set of user nodes and E is a set of edges among U . We use $u_i \in U$ to represent each user node in the graph G . Edges in this graph (u_i, u_j) stand for the knowledge flow between two users as they participate in thread discussions. The edge of a user graph can be weighted using the number of posts user u_i replies to u_j : n_{ij} . The weight indicates the strength of knowledge diffusion along the direction of an edge (see Figure 1).

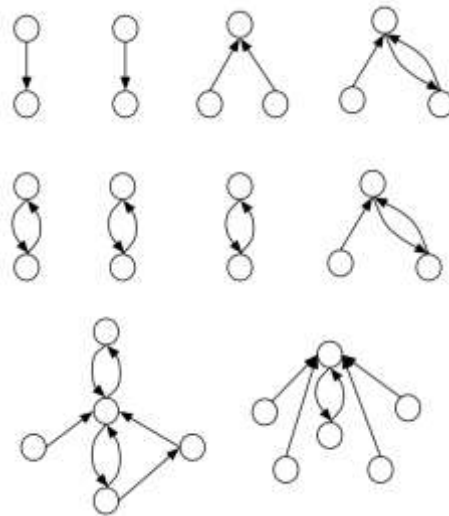


Figure 1 Sampled user graphs for Sun Java Forums

Reciprocity

Reciprocity measures the tendency to form mutual connection between vertex pairs in directed networks (Wasserman, 1994). In other words, it defines how often double links (with the opposite directions) occur between any two nodes. Traditionally, reciprocity r is defined as the ratio of the number of bi-directional edges \vec{L} to the total number of edges L in a network (Wasserman, 1994),(Newman, Forrest, & Balthrop, 2002).

$$r = \frac{\vec{L}}{L}$$

The value $r = 1$ stands for a fully bi-directional network, while $r = 0$ means that a network has no bi-directional edges at all. This metric is called reciprocity ratio. Because of some conceptual problems of r , Garlaschelli and Loffredo defined reciprocity coefficient ρ as the correlation coefficient between the entries of the adjacency matrix of a directed graph (Garlaschelli, Loffredo, Fisica, & Roma, 2004),

$$\rho = \frac{\sum_{i \neq j} (a_{ij} - \bar{a})(a_{ji} - \bar{a})}{\sum_{i \neq j} (a_{ij} - \bar{a})^2} = \frac{r - \bar{a}}{1 - \bar{a}}$$

Where $a_{ij} = 1$ if a link from i to j exists. Both of them are used in this study.

Cluster Coefficient

The local cluster coefficient of a vertex in a graph measures how well its neighbors are connected to be a clique that forms a triangle among three nodes. Consider a graph G with $i = 1, \dots, N$ vertices. Let k_i be the number of neighbors that vertex i has and n_i be the number of edges between its neighbors. The local cluster coefficient for vertex i is defined as

$$C_i = \frac{n_i}{\binom{k_i}{2}}$$

The global cluster coefficient for the whole graph is calculated as the average of the local cluster coefficient of all N vertices as follows (Watts & Strogatz, 1998),

$$\bar{C} = \frac{1}{n} \sum_{i=1}^n C_i$$

EMPIRICAL ANALYSIS AND RESULTS

Data Collection

We collected the Sun Java forum data published between May 2006 and December 2008 consisting of over 681,563 discussion messages, including 281,280 messages in 40,865

discussion threads in the “New to Java” forum and 400,283 messages in 65,749 threads in the “Java Programming” forum (see Table 1).

Table 1 Data Description & General Characteristics

	New to Java	Java Programming
# messages	281,280	400,283
# threads	40,865	65,749
# questions	108,294	160,826
# answers	172,986	239,754
answer/question	1.60	1.49

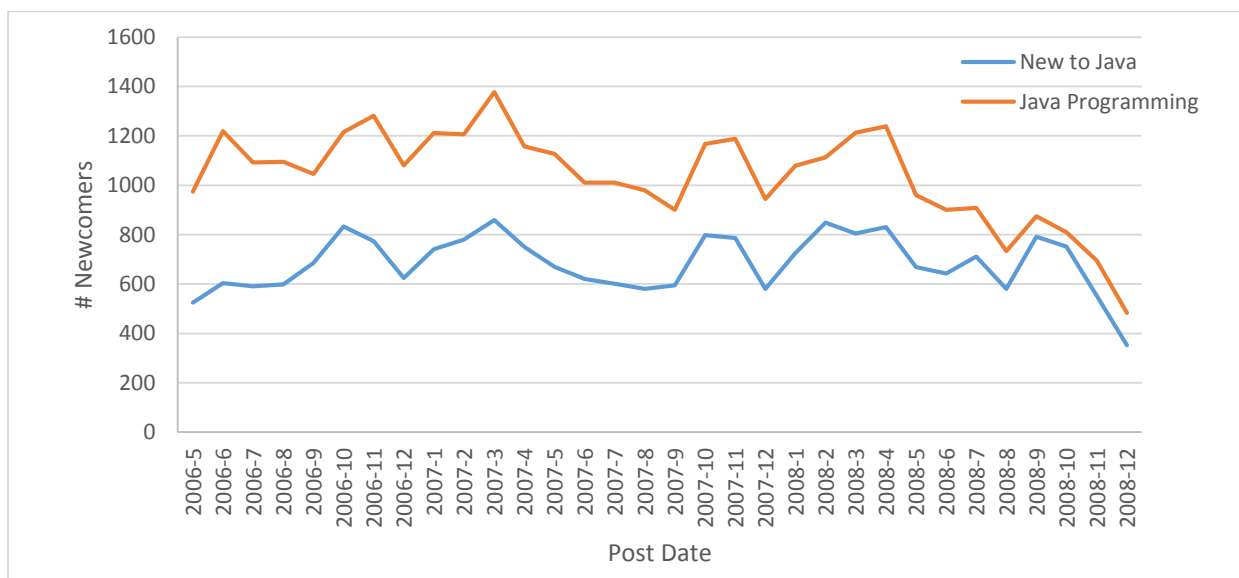


Figure 2 the monthly number of newcomers between 2006-05 and 2008-12

Based on our definition of newcomers, we calculated the monthly number of newcomers who started to contribute to the community. As Figure 2 shows, the trend of the monthly number of newcomers seems to be similar over time. In this period, the average monthly number of

newcomers was 683 in the “New to Java” forum and that in the “Java Programming” forum was 1040.

We specifically examined the newcomers who started posting in May, 2006. There are 525 newcomers in total in the “New to Java” forum and 974 newcomers in the “Java Programming” forum. Figure 3 shows the cumulative number of those newcomers who has been active for up to a number of month. We also see about 79% of newcomers (415 newcomers) was only active for up to one month in the “New to Java” forum and 80% of newcomers in the “Java Programming” forum was only active for up to three months. Based on the Pareto principle (the 80/20 rule) and the number of continuous active months, we classified our newcomers into inactive newcomers and active newcomers. Table 2 shows the statistics of active and inactive newcomers in the two forums.

Table 2 Newcomers’ statistics in two forums

	New to Java	Java Programming
# newcomers	525	974
# inactive newcomers	415	782
# active newcomers	110	192

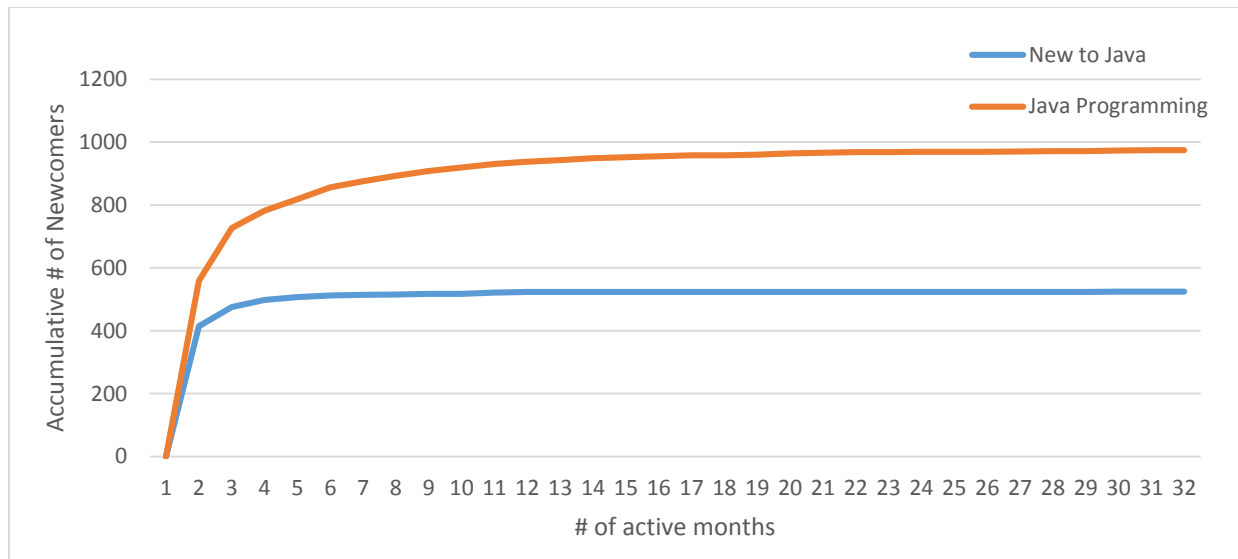


Figure 3 the active analysis of newcomers between 2006-05 and 2008-12

Table 3 shows the behavioral metric values of active and inactive newcomers in the “New to Java” forum and the “Java Programming” forum separately. For all three metrics: cluster coefficient, reciprocity coefficient and reciprocity ratio, active newcomers’ values are all larger than inactive newcomers’ corresponding values. Comparing the cluster coefficient of active newcomers to that of inactive newcomers, we can say that active newcomers with much more continuous contributions are more likely to have a common neighbor than inactive newcomers. As for the reciprocity property of the user graph, we conclude that active newcomers have more mutual communication activities than inactive newcomers. The inactive newcomers in both forums have a negative reciprocity coefficient, which means that inactive newcomers in both forums have more unidirectional connections than bidirectional connections. They only received help from others while paid very little back to the community.

Table 3 Active and Inactive newcomers' User Graph Metrics

	New to Java		Java Programming	
	Active Newcomer	Inactive Newcomer	Active Newcomer	Inactive Newcomer
Cluster coefficient	0.16	0.066	0.14	0.09
Reciprocity coefficient	0.12	-0.10	0.07	-0.14
Reciprocity ratio	0.46	0.39	0.47	0.43

CONCLUSIONS

In this study we examined the user posting activities in “New to Java” forum and “Java Programming” forum. We took advantage of statistical inference and user graph-based model to measure user activities and behavior patterns. We made the following findings. First, we conducted the Augmented Dickey Fuller tests to verify the observations that the trend of number of users in two forums is similar with the trend of the number of post messages in two forums. Second, we proposed a new method to classify newcomers as active and inactive newcomers based on the number of their continuous active months and the Pareto principle. Third, we used the user graph model to measure the interaction patterns of active newcomers or inactive newcomers. We found that active newcomers have a stronger connection network than inactive newcomers. Especially, inactive newcomers in the two forums have more one directional connection than bidirectional connections.

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TOWARD AN UNDERSTANDING OF RISK IN THE PROCESS INDUSTRY

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ABSTRACT

This paper presents an investigation into risk and its application to process industry decision making. The focus of the paper is initially aimed at measuring the perceived risk of different types of product returns in process industries, which, once begun, led to the realization that there is no “simple” measure of risk. Some of these considerations include, new product introductions, supply uncertainty, raw material variability, process yield variability, returns, and reprocessing decisions are just a few of the areas impacted. Complexity, process sequence tight-coupling, Normal Accidents Theory and High Reliability Theory will be explored for their role in enhancing or diminishing risk considerations.

Literature Review

The majority of the literature on supply chain risk management has discussed a very broad range of supply chains. Among those are consumer product manufacturers, major retail firms and a variety of other companies concerned primarily with discrete products of some kind.

The research on supply chain risk management covers a very broad range of topics which includes supply chain disruptions as a sub-category. The definition of ‘supply chain risk management’ (SCRM) has gained significant support in the literature as being: “the identification of potential sources of risk and implementation of appropriate strategies through a coordinated approach among supply chain members, to reduce supply chain vulnerability” [13][14][23]. Risk of supply chain disruptions is described by Hendricks and Singhal [9] as “an indication of a firm’s inability to match demand and supply”. Christopher and Lee [2] suggest that the increased “vulnerability of supply chains to disturbance or disruption” have the following contributing factors:

- “External events such as wars, strikes or terrorist attacks”, and
- “The impact of changes in business strategies” such as
 - ‘Lean’ business practices
 - Increased outsourcing decisions, and
 - Initiatives to reduce the supplier base [2].

Tang and Tomlin [30] discuss a variety of management initiatives which contribute to greater supply chain vulnerability including:

- Increased product variety, frequent product introductions and a greater number of sales channels/markets
- Supply base reduction, use of online procurement options (i.e. e-markets and online auctions), and
- Outsourcing of several functions including manufacturing, information services and logistics.

Under normal business conditions the initiatives can be very successful but in a turbulent environment the risk of disruption becomes a concern. These initiatives have created supply chains that are extended over long distances and are more complex which makes them more susceptible to disruptions [30].

To highlight a selection of the literature a few articles on supply chain disruptions are presented briefly. Table 1 summarizes a sample of supply chain disruptions from three frequently cited articles:

Table 1. Sample of Supply Chain Disruption Events described in Literature

Authors [Reference]	Date of Disruption	Event
Christopher & Peck [3]	September 2000	U.K. Fuel price protests
Christopher & Peck [3]	February 2001	Outbreak of Foot & Mouth disease in U.K. cattle
Christopher & Peck [3]	September 2001	U.S. Terrorist Attacks
Sheffi [26]	March 2000	Philips lightning strike and fire in New Mexico plant
Lee [19]	March 2000	Philips lightning strike and fire in New Mexico plant
Lee [19]	1999	Taiwan earthquake delayed computer component shipments
Lee [19]	2001	9/11 Terrorist Attacks in New York City and Washington, D.C.
Lee [19]	2002	Dockworkers (Longshoremens) strike at LA/Long Beach Ports
Lee [19]	2003	SARS outbreak in Asia

These examples are major events with far-reaching effects in a variety of industries. But from the examples we can conclude that not all industries have been thoroughly investigated.

An earlier publication stated that “supply chain wide risk management ... is not yet recognised as a key element in business continuity planning” [13]. That statement was accurate in 2003 but substantial progress has been made in many industries. The sector that has received very limited attention is process industries. In this paper we will highlight the limited examples that do address process industries in the research. We also hope to contribute to the development of a more robust research stream on the topic of process industry supply chain risk. New factors need to be considered and there may also be a need for an expanded definition of supply chain risk in the process industry context.

Identifying Research about Process Industries

Two articles were identified which provided partial lists of empirical research studies so we begin with a list of those articles and extend the list with relevant articles identified through additional searches. Rao and Goldsby [24] evaluate the literature as they develop a proposed typology for SCRM. They list twelve (12) articles which they identify as being empirical. Table 2 (see the Appendix) lists the articles identified in the Rao and Goldsby [24] article.

Sodhi, Son and Tang [29] identify a lack of empirical research on SCRM as one of three research gaps. The gaps they identify are: “(1) a definition gap – there is no clear consensus on the definition of SCRM”; “(2) a process gap – there is lack of research on an important aspect of the risk management process, namely, the response to supply chain risk incidents; and (3) a methodology gap – there is a shortage of empirical research in the area of SCRM” [29]. In Table 3 (see the Appendix) we list the research identified by Sodhi, Son and Tang [29] which is divided into two categories – quantitative empirical and qualitative empirical.

Sodhi, Son and Tang [29] also identified “Qualitative” empirical research which has not been included here. Note that there is a significant overlap between the two lists of empirical research. It is also important to recognize that the vast majority of the research does not address process industries.

From the broader literature we now present some of the terminology that is commonly used in conjunction with supply chain risk management. This may also be viewed as the primary framework for supply chain risk analysis.

Probability and Impact

The basic definition of risk can be stated as ‘Risk = Probability of a Loss times the Impact of that Loss’ [21]. This definition has also been transformed into a commonly used description as - “probability and impact” and is commonly presented in the form of a 2x2 matrix. Bhattacharya,

Geraghty, and Young [1] use the “low probability-high impact” (LPHI) designation throughout their paper and they focus primarily on events that fit the LPHI quadrant. The organization for their perspective can be depicted in a 2x2 matrix as follows in Table 4:

Table 4: Probability and Impact Matrix

	Low Impact	High Impact
High Probability of occurrence	HPLI	HPHI
Low Probability of occurrence	LPLI	LPHI

In general, the LPHI quadrant has received the largest share of attention by researchers. Examples of authors addressing this quadrant include:

- Bhattacharya, Geraghty & Young [1] (use the LPHI designation as the primary framework)
- Christopher & Lee [2] (SARS outbreak; California dock strike)
- Knemeyer, Zinn, & Eroglu [17]
- Kleindorfer & Saad [16]
- Sheffi & Rice [27] (terrorism attacks; earthquakes; bankruptcy; and blizzard)

Sheffi and Rice [27] utilize a similar perspective but use slightly different terminology. Sheffi & Rice [27] use the following 2x2 matrix to label their view of supply chain vulnerability as shown in Table 5 and examples in each of the four quadrants can be seen in Table 6:

Table 5: Probability and Consequences Matrix

	Light Consequences	Severe Consequences
High Disruption Probability		High Vulnerability
Low Disruption Probability	Low Vulnerability	

Table 6: Examples for Probability and Consequences Matrix

	Light Consequences	Severe Consequences
High Disruption Probability	Sheffi & Rice (2005) suggest “single port closure and transportation link disruption” as examples in this quadrant.	Sheffi & Rice (2005) suggest “loss of key supplier, labor unrest, economic recession, and visible quality problems” as examples in this quadrant.
Low Disruption Probability	Sheffi & Rice (2005) suggest “computer virus, wind damage, flood and workplace violence” as examples in this quadrant.	Sheffi & Rice (2005) suggest “terrorism, earthquakes, supplier bankruptcy, & blizzard” as examples in this quadrant.

Process Industry Considerations

The most widely known event in process industries is the Union Carbide incident in Bhopal, India which occurred in 1984 [30]. A variety of factors including lack of proper maintenance and lack of proper safety measures contributed to a toxic gas leak which resulted in long-lasting effects in the surrounding community [30]. The materials used in the chemical and petroleum industries are frequently characterized by high toxicity, high flammability and potential explosiveness. Clearly, in the major process industries for chemical products and petroleum products, the potential impact to the environment, the community, the citizens and the employees is huge if a catastrophic event does occur.

From the articles discussed above, only Kleindorfer and Saad [16] deal with process industries explicitly by investigating supply chain disruptions in the U.S. chemical industry. One article added in this current paper does not appear in the above lists because it was published in a journal that is not typically associated with supply chain topics. The article by Crowther, Haines and Taub [5] from *Risk Analysis* presents ‘lessons learned’ from Hurricane Katrina and how those lessons can guide future decisions in the petroleum process industry. While the article presents post-event learnings, the real objective is to advocate measures to be taken for better preparedness for future events [5].

For further foundation, Shah [25] offers some general observations about supply chains for process industries. “A distinguishing feature of process industry supply chains is that supply chain performance is very strongly affected by the flexibility and responsiveness of the production process” [25]. “We believe ‘process design for supply chain responsiveness’ is an important area that has not receive[d] {sic} much attention so far” [25].

Understanding Process Industries

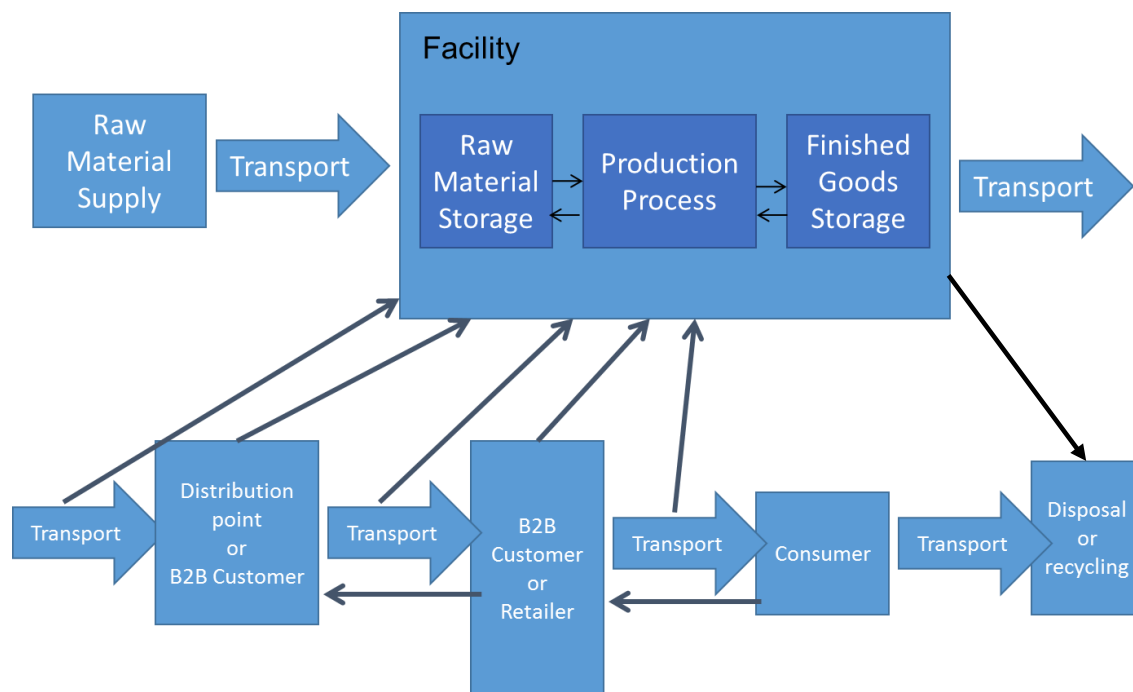
Process manufacturing is typically differentiated from discrete manufacturing in the use of liquids, gases, powders, and other free-flowing raw materials. Finished products may remain free-flowing or may be made discrete as in the case of baked goods or such products as polystyrene products. Additionally, process industries may use or produce large quantities of hazardous materials. These characteristics result in interesting implications for supply chain risk.

Hazardous waste disposal is regulated under the U.S. Resource Conservation and Recovery Act (RCRA) [6]. Under RCRA, hazardous wastes are managed by the US Environmental Protection Agency (EPA) throughout their lifecycle. Also, the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) requires hazardous waste generators to be responsible for any costs associated with cleaning up contamination caused by any company that handles their waste [7].

The Process Industry Supply Chain

Figure 1 depicts a simple process industry supply chain from raw material supply through to final disposal or recycling, including possible returns flows throughout the chain. For simplicity, returns flows from transport are shown returning back to the production facility, but it is also possible that returns might flow back to any previous point in the chain. While supply disruption risk is generally considered from the perspective of upstream suppliers, French and LaForge [8] reveal that a common re-use option for returns in process industries is use in the production process through blending off into the same or similar new products. It is thus important to consider all returns flows as supply to the production process.

Figure 1: Process Industry Supply Chain



In identifying possible sources of risk in the supply chain, transport phases are an important consideration and all returns flows must be included. The free-flowing nature of many process industry raw materials and products is a key characteristic that differentiates supply chain risk in these industries from discrete products.

During all transport phases, both internal (within the facility) and external, the possibility of container damage introduces several potential risks: material loss and volatility or evaporation not only impact supply availability, but add the potential for a HAZMAT incident (introducing legal risks and cleanup cost) and the possibility for contamination that could make the material unusable. Contamination could also occur during container transfer. Unknown storage conditions (temperature or moisture levels) could potentially damage the product. Quality degradation over time is also a possibility. All of these risks increase over longer transport distances.

Within the production facility, risks in the raw material storage and finished goods storage area are similar. Container damage and quality degradation over time are possible. Also, improper storage could lead to evaporation or damage and obsolescence and shelf-life must also be considered. In the case of raw materials, these types of events result in supply disruption while for finished goods, these issues result in returns that must be re-used or disposed.

In the production process, material loss or contamination during transfer and uncertain yield are potential supply risks. The possibility of employee exposure to hazardous materials introduces possible legal and cost concerns. Re-use of returned products and materials from all sources adds additional uncertainties that increase risks. Product condition is unknown due to potential contamination in opened or damaged containers and uncertain storage conditions during transport and storage out of control of the facility.

Addressing Risk in Process Industries

To indicate the severity of disruptions in the chemical industry we refer to the research by Kleindorfer and Saad [16]. Their research on U.S. chemical industry events amounted to a total of 1,945 chemical-release accidents between 1995 and 1999 from the total population of 15,219 facilities [16]. The financial impact totaled more than \$1 billion for business interruption and other indirect costs [16].

Kleindorfer and Saad [16] and Kleindorfer [15] list the following as the main drivers of “Disruption Risk Management” in the context of their research about the U.S. Chemical industry:

- Corporate image
- Regulatory compliance
- Liability
- Community relations
- Employee health & safety
- Consumer relations
- Cost reduction
- Product improvement

Associated with those drivers, the authors propose a model for “Risk Analysis and the Extended Supply Chain”. The model depicts a process for identifying risk, developing ways to reduce risk, incorporating risk reduction measures into the product design process and repeating this sequence on a continual basis [16].

Process industries are subject to scrutiny under the federal regulations regarding clean air, clean water, and proper handling, use and disposal of hazardous materials. Complying with these regulations is recognized as good business practice. It is foolish to do otherwise. Many of the

other drivers listed by Kleindorfer and Saad [16] and Kleindorfer [15] might be viewed as being partially or wholly driven by “Regulatory compliance”. From the regulatory requirements, Kleindorfer and Saad [16] outline a Risk Management Plan (RMP) which should contain the following at a minimum:

1. A documented “Risk Management Plan, [which is] a report capturing certain details about the facility’s accident prevention program, emergency response program, and hazard assessment along with administrative information about the facility.”
2. “A hazard assessment to determine the consequences of a specified worst-case scenario...”
3. “An accidental release prevention program...”
4. “An emergency response program designed to protect human health and the environment...”

The main intent in this paper is to add some of the concepts from normal accidents theory and high reliability theory. From that perspective, Cooke and Rohleder [4] explain that:

“accidents are a normal consequence of interactive complexity and close coupling of an organizational system. The measure of interactive complexity is the number of ways in which components of the system can interact. ... Typically, interactive complexity increases with the technology incorporated into the system. ... Close coupling represents tightness in the process, which is influenced by such things as component redundancy, resource buffers/slack, and process flexibility. The idea behind normal accident theory is that some of the system responses to change are unforeseen, are causes of incidents, and can potentially lead to catastrophes.”

High reliability theory (HRT) is one counter-measure to normal accidents theory (NAT). Many advocates of HRT acknowledge that accidents do occur but major disruptive incidents can be avoided if an organization implements specific business processes. In particular, the organization should create an awareness of the potential incidents and develop a “mindfulness” among their employees [32][4]. Cooke and Rohleder [4] propose an “incident learning system” (in the line of organizational learning) as an explicit approach to develop the “mindfulness” and awareness that are needed for HRT.

As described by Cooke and Rohleder [4]:

“Thus the incident learning system provides a risk control process for the business. Its components include identification and response, reporting, investigation, identifying causal structure, making recommendations, communicating and recalling incident learning, and implementing corrective actions. Effective work processes for all of these components must be in place for the system as a whole to operate well.”

An organization implementing such measures is striving to become a “high reliability organization” or HRO [18][22]. In the HRO literature, several authors also emphasize “organizational learning” as a very important key [18][22].

Marais, Dulac and Leveson [22] go further to suggest that new approaches are needed which go beyond previous examples of NAT and HRT. The authors recommend a “systems” approach which includes a very deep understanding of the system constraints and system interactions [22]. They offer the following elements related to their recommended approach:

“...preventing accidents requires:

- Identifying the system safety constraints necessary to prevent accidents;
- Designing the system to enforce the constraints, including understanding how the safety constraints could be violated and building in protections against these dysfunctional (unsafe) behaviors;
- Determining how changes in the processes over time, due to internal or external pressures and influences, could increase risk and building in protection to identify when the system is changing or adapting in a way that increases risk to an unacceptable level. The results of this activity can be used to define metrics and various forms of performance auditing to detect when risk is increasing” [22].

From this perspective, system design and the specific system features such as redundancy become very important means for preventing accidents. As discussed in the second item above, safeguards against improper employee behavior need to be explicitly addressed as well. Monitoring the process over the long term is another important safeguard that is suggested.

Conclusions

This paper is an initial attempt to explicitly address supply chain risk in the context of process industries. Given the lack of published research on this topic, there is a need to fill this gap in the research.

In this paper we presented a sample of the empirical research on supply chain disruptions and discussed the apparent lack of process industry examples in that research. Only one prominent article by Kleindorfer and Saad [16] has explicitly addressed process industry supply chain risks and supply chain disruptions. From their research we extract the recommendation to develop a formal “risk management plan” for process industry companies.

From other research contexts, we also introduce normal accidents theory (NAT) and high reliability theory (HRT). These have not been used in connection with process industry supply chain risk management in the past. Further investigation of process industries with NAT and HRT as a framework appears to be a worthwhile endeavor for future research.

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APPENDIX

Table 2. Articles Identified by Rao and Goldsby (2009)

Author(s) (Year)	Type of Empirical Study	Brief Description
Blackhurst et al. (2005)	Qualitative	Visibility and capacity management
Craighead et al. (2007)	Qualitative	Propositions relating SC Disruptions to SC Design
Finch (2004)	Secondary	Networking with smaller firms contributed to SC Risk
Hendricks & Singhal (2003)	Secondary	SC Glitches result in negative stock impact and loss of shareholder value
Hendricks & Singhal (2005a)	Secondary	Slow recovery in stock value after SC glitches
Johnson (2001)	Qualitative	Lessons to manage risk based on actual toy industry events
Jüttner et al. (2003)	Qualitative	Identify four segments for future research
Kleindorfer & Saad (2005)	Secondary	Analyzes data from U.S. Chemical Industry and SC disruptions
Manuj & Mentzer (2008a)	Qualitative	Evaluates SCRM strategies using grounded theory
Perry (2007)	Qualitative	Framework for natural disaster recovery based on interviews with logistics managers
Zsidisin et al. (2004)	Qualitative	Purchasing organizations can assess supply risk through supplier quality issues
Zsidisin et al. (2000)	Qualitative	Purchasing organizations and creation of contingency plans

Table 3. Articles Identified as ‘Quantitative’ Empirical by Sodhi, Son and Tang (2011)

Author(s) (Year)	Type of Empirical Study
Hendricks & Singhal (2003)	Quantitative
Hendricks & Singhal (2005a)	Quantitative
Hendricks & Singhal (2005b)	Quantitative
Kleindorfer & Saad (2005)	Quantitative
Wagner & Bode (2008)	Quantitative
Braunscheidel & Suresh (2009)	Quantitative
Jiang et al. (2009)	Quantitative
Ellis et al. (2010)	Quantitative

Examining the Corporate Usage of Social Media: A Competitive Action Perspective

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Abstract:

This paper examines firms' competitive actions and their patterns on social media platforms. Our study builds on literature streams of strategic management and social media related research. To assess firms' competitive actions on social media, we develop a complete set of competitive action categories that can be used for analyzing corporate behavior in social media and perform an empirical study using the complete corporate posts on social media. Results show that firms using social media mainly on five sections and the usage patterns towards Facebook and twitter are different by years. This study provides unique insights on how firms using social media to compete in the industry.

Keywords: Social media, competitive action, strategic management

1. Introduction

Social media is a virtual platform where people can interact with each other in creating, sharing, discussing, and exchanging information and ideas (Ahlqvist, Back & Heinonen, 2008). As the development of mobile and Web-based technologies, social media have grown explosively in the last decade. The growth was mainly manifested in the following two aspects. On one hand, social media has a variety of forms, e.g., blogs and microblogs (Twitter), collaborative projects (Wikipedia), content communities (YouTube), social networking sites (Facebook, Pinterest, etc.), virtual game worlds (World of Warcraft), and virtual social worlds (Second Life) (Kaplan & Haenlein, 2010). On the other hand, there is an explosion of user participation in these social media sites. For example, the number of Facebook users accelerated to 1.11 billion as of March 2013 (Facebook, 2013).

Social media have shaped firms' online behaviors by allowing them to engage in many new activities, such as conducting social activities on the Internet, creating and joining virtual

communities, and organizing political activities (Chui et al., 2012). Social media is different from traditional media in that it allows users to interactively communicate and share information, compared to traditional media's one-way communication. When exposed to this new environment, firms tend to adapt their competitive actions to meet the changes (Culnan et al., 2010; Chui et al., 2012; Gallagher & Ransbotham, 2010; Piller et al., 2012). Firms are motivated to engage in social media related activities because social media create new opportunities for firms to improve their internal operations and to collaborate in new ways with their customers, business partners and suppliers (Culnan et al., 2010). First, through social media, firms can connect and communicate with customers closely for improved corporate image and customer loyalty. Second, firms can better understand customers' demands in order to improve their services and products. Third, firms can provide customer services through social media that is inaccessible through traditional media. Moreover, firms can conduct sales promotions through social media with almost no cost. The promotional information can be accessed by millions of users within minutes, compared to the relatively high costs incurred in TV and magazine advertisements.

In general, social media provide many opportunities for firms to leverage for competitive advantage. Firms are forced into the usage of social media lest they would be out of the loop with the customers and fall behind from their peers in social media competition. With so many people indulged in social media, lots of them access information only through Internet without watching TV or reading newspaper. There is a strong need for firms to tap into social media and use it wisely to gain competitive advantage.

Our literature review reveals that there is not much research done on examining the corporate usage of social media from a competitive action perspective. There is only a handful of research studies that are related to corporate usage of social media (Culnan et al., 2010, Gallagher & Ransbotham, 2010; Mangold & Faulds, 2009; Piller et al., 2012). Recent research on social media examined how companies use Twitter and other social media to gain business values by analyzing the content of websites (Culnan et al., 2010). Some provided theoretical frameworks of social media analysis (Gallagher & Ransbotham, 2010; Mangold & Faulds, 2009). None of them provided a detailed analysis on contents posted by large-scale companies from a competitive action perspective. It is important to examine the corporate usage of social media for gaining competitive advantage because the social platform has a potentially huge economic value in as much as \$900 billion to \$1.3 trillion (Chui et al., 2012). The objective of our study is thus to answer the following research questions:

1. *What are the competitive actions undertaken by firms through social media platforms?*
2. *What are the patterns of competitive actions undertaken by focal firms through social media?*
3. *What suggestions can we provide for the firms to gain competitive advantage through effective usage of social media?*

To discern and assess competitive actions and their patterns, we code competitive actions of focal firms' posts on Facebook and Twitter, two of the most popular social media platforms used by firms, and analyze those posts using the structural content analysis method. After analyzing the content of firm social media posts, this study provides evidence on how firms use social media to enhance their competitive status. A temporal analysis also reveals the patterns of competitive actions undertaken by focal firms in the last four years.

Our study builds upon extensive prior research on strategic management (Chen, 1996; Gnyawali, He & Madhavan, 2006 and Gnyawali, Fan & Penner, 2010) and research on social media (Culnan, et al., 2010, Gallagher & Ransbotham, 2010; Mangold & Faulds, 2009; Piller et al., 2012). We contribute to the literature in two aspects. First, to the best of our knowledge, this is the first empirical study of firms' competitive actions using the complete corporate posts on social media. Traditional strategic management research (Chen, 1996; Gnyawali, He & Madhavan, 2006, and Gnyawali, Fan & Penner, 2010) studies corporate behaviors mainly using news media as the main channel. There is almost no literature on competitive action studies using social media postings. Second, we develop a complete set of competitive action categories that can be used for analyzing corporate behavior in social media.

The remaining of the paper is organized as follows. In Section 2, we review the conceptual background and corporate competitive actions. We present our research methodology in Section 3. In Section 4, we describe data and coding scheme used in our empirical study and report our findings. We conclude the paper with limitations and suggestions for the future research in Section 5.

2. Conceptual Background

2.1 Competitive Actions

Our study is focused on firm competitive actions on the social media platform. Competitive actions are important because they are the essence of firms' competitive behavior and they represent firm's self-positioning in the competitive environment (Caves, 1984; Smith et al., 2001). Competitive actions refer to firms' purposeful and observable moves to improve their competitive status against their competitors in the industry (Young et al., 1996; Gnyawali, He & Madhavan, 2006; Smith et al., 2001; Gnyawali, Fan & Penner, 2010). A competitor is a firm that offers similar products and targets similar customers within the same industry (Chen, 1996). Two aspects of competitive actions, namely competitive activity and competitive variety (Gnyawali, He & Madhavan, 2006), need to be emphasized. Competitive activity refers to the total number of competitive actions undertaken by a firm and reflects the scale of competitive actions (Young et al., 1996; Gnyawali, He & Madhavan, 2006; Smith et al., 2001). Competitive variety refers to

the diversity of competitive actions that reflect the range of competitive actions (Gnyawali, He & Madhavan, 2006).

Prior research shows that a firm with more competitive activities (scale of competitive actions) tends to improve its competitive advantage and increase its market share and profitability (Young et al., 1996). Also, a firm with more competitive variety is more difficult to predict by its competitors, thus reducing the likelihood of competitor response and increasing competitive strength (Gnyawali, He & Madhavan, 2006).

2.2 Major Categories of Competitive Actions

To measure a firm's competitive actions, there are three mainstream competitive actions frameworks developed by Gnyawali, Fan and Penner (2010), Chui et al., (2012) and Culnan et al (2010), respectively.

Gnyawali, Fan and Penner (2010) summarized a complete and detailed list of competitive actions to examine social networking firms' competitive actions. The major categories included *Alliance, Business model, Legal and lobbying, Management and human resources, Marketing and advertising, Platform co-development, Product innovation, Public relations, Technology development and others*. Compare to others, this framework is the most integrated.

Culnan et al (2010) was focused on how companies use social media to gain business value. Activities they mentioned in support of creating values consist of *Branding, Sales, Customer service & support and Product development*. This is a refined framework that stresses the most value-added competitive actions.

Chui et al (2012) had a broader vision that was focused on potential value creation within and across industries using social technologies. The study shows large potential of creating values with five functions, including *Product development, Operations and distribution, Marketing and sales, Customer Service and Business support*.

3. Research Methodology

To explore the competitive activities that firms undertake on social media platforms, we conducted an exploratory study on firms' social media posting.

3.1 Data Collection

We chose the cosmetic industry as a sample industry for our study because of its strong presence in social media. Among all social media platforms, we chose Facebook and Twitter, two of the most prevalent social media platforms among others. To gather data, we began with the top 5 cosmetics brands in 2013 including Bobbi Brown, Estee Lauder, Mac, Maybelline and Revlon.

We first visited each brand's official website and found their Facebook and Twitter accounts on their websites. In total we collected 5 Facebook accounts and 6 Twitter accounts for the top 5 cosmetic firms.

Then we manually collected all existing company posts on Facebook made between the account's inception time and the end of 2012. Information collected for each post includes post content and a posting date. However, for Twitter data, there is a limitation of 3,200 posts that can be retrieved from each account. Due to this constraint, we were only able to collect all posts made by Revlon's and Bobbie Brown's CS (consumer service) twitter accounts since 2010. For other companies, we could only collect their twitter posts since 2012. In total, we collected 8,820 records, 3,851 records for Facebook and 4,969 records for Twitter.

3.2 Coding Scheme of Competitive Actions

To measure firms' competitive actions, we adapted the competitive actions framework developed by Gnyawali, Fan and Penner (2010). Considering the differences of competitive actions between firms on a social media platform and social networking firms, we also included competitive action categories from Chui et al. (2012) and Culnan et al (2010). The main changes we made are presented as follows.

First, we restructured the subcategories so that the new subcategories are either easier for our coding purposes or more relevant to the social media context. For example, the original subcategories under the *Legal and Lobbying* category include *Political/bureaucratic lobbying*, *Lawsuits against competitor*, *Lawsuits against others*, *Lawsuits against company*, *Filing of patent infringements* and *other legal/lobbying actions*. We simplified those subcategories to *Legal activities* and *Lobbying activities*, which were adequate for capturing firms' disclosure about their legal and lobbying activities in social media.

Second, we removed the competitive action category of *Technology Development*, which is defined as the creation, acquisition or invention of technology used to improve firm's technological infrastructure. We considered it redundant given the subcategory *administrative efficiency enhancement* under the *Management* category, which refers to moves and actions aimed at enhancing administrative efficiency.

Third, we added a new category *Customer service*. Prior research indicated social media can significantly improve customer service (Chui et al., 2012) and create additional values (Culnan et al., 2010) accordingly. Therefore, we added this category to capture firms' competitive behavior.

Last, we added a *Customer engagement* subcategory under the *Marketing and advertising* category. Report (Chui et al., 2012) showed two thirds of the value creation opportunities afforded by social technologies stems from improving communication and collaboration. With increasing convenience of communications between customers and firms on social media

platforms, customer engagement marketing became more important and was increasingly emphasized. (Culnan et al., 2010; Chui et al., 2012; Verhoef et al., 2010)

In sum, our coding scheme for firms' competitive actions on social media includes 10 major categories and 28 subcategories. Table 1 lists the 10 major categories and their definitions. Table 2 shows the subcategories under each major category. Appendix A has the detailed subcategories explanations and examples.

Using the coding scheme defined in Table 1, one business major graduate student manually coded each post in our collected data. Then we let another business major graduate students coded 6504 posts from the entire collection. Both students were familiar with the domain. Afterwards, we calculated Cohen's kappa score that is 0.627, which supports that two independent coding are substantial agreement (Landis & Koch, 1977). Below results are based on the first graduate student's coding.

Table 1: Competitive action categories and definitions

Category	Definitions
Alliances	Activities focused on collaboration between two or more firms through sharing resources, both within and outside the industry, to improve the competitive position (Gnyawali, Fan & Penner, 2010; Hitt et al., 2000).
Business model	Activities focused on altering operation & organization structure and the way firms generating revenue, including acquisitions & mergers, outsourcing and others (Gnyawali, Fan & Penner, 2010; Osterwalder et al., 2010).
Legal and lobbying	Activities focused on improving firm's legal and political environment, either as an offensive or defensive action (Gnyawali, Fan & Penner, 2010).
Management and human resources	Activities focused on corporate management and human resources to improve internal management efficiency (Gnyawali, Fan & Penner, 2010; Culnan, McHugh & Zubillaga, 2010).
Marketing and advertising	Activities focused on communicating with customer for the purpose of selling the product or service (Gnyawali, Fan & Penner, 2010).
Platform co-development	Activities focused on cooperation with other parties to improve and develop the technology of the firm (Gnyawali, Fan & Penner, 2010)
Product innovation	Activities focused on innovation and improvement on a particular product or service, including inventions, development, improvements, entering new markets, increased emphasis on products and withdrawal of products (Gnyawali, Fan & Penner, 2010; Culnan, McHugh & Zubillaga, 2010)
Public relations	Activities focused on managing the information dissemination to the public at the purpose of altering the firm's image (Gnyawali, Fan & Penner, 2010)
Customer service	Activities focused on answering customer questions, solving product related problem and maintenance information (Culnan, McHugh & Zubillaga, 2010).
Other activity	Other Activities not mentioned above

Table 2: Competitive actions subcategories

Category	Sub-Category	Category	Sub-Category
Alliance	A-1 Competitor alliance	Marketing and advertising	E-1 Advertisement
	A-2 Cross industry alliance		E-2 Sales promotion
	A-3 Other alliance		E-3 Consumer engagement
Business model	B-1 Acquisitions and mergers		E-4 Major endorsements
	B-2 Change business model(include outsourcing)		E-5 Other marketing
	B-3 Other business model	Platform co-development	F Platform co-development
Legal and lobbying	C-1 Legal activities	Product innovation	G-1 New product development
	C-2 Lobbying activities		G-2 Existing product/Service improvement
Management and human resources	D-1 HR recruiting selection	Public relations	G-3 Withdrawal of product and service
	D-2 HR training and development		G-4 Other product innovation
	D-3 Management-administrative efficiency		H-1 Positive public relations
	D-4 Management – structural changes		H-2 Negative public relations
	D-5 Other HR & management		H-3 Other public relations
Customer service	I Customer service	Other activity	J Other activity

4. Result

4.1 Firms' Competitive Actions in Social Media

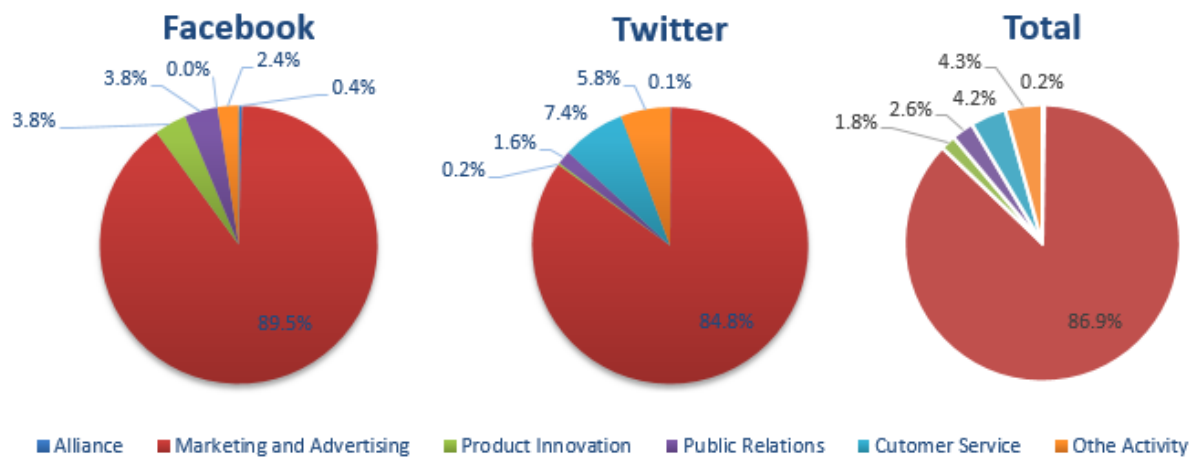
Overall, firms' competitive activities on Facebook and Twitter focused on 5 competitive actions, including *Alliance*, *Marketing and advertising*, *Product innovation*, *Public relations*, *Customer service*. From Table 3 and Figure 1, the marketing and advertising actions were unsurprisingly dominant (86.87%) in their (as B2C companies) competitive actions. Customer service related posts account for 4.2% of total posts, which came almost exclusively from Twitter. Public relations related posts account for 2.59% of total posts, including 3.84% of total Facebook posts, and 1.62% of total Twitter posts. Product innovation and alliance had the lowest percentage in terms of total number of posts.

Table 3: Overall number of posts and the percentages to total posts

	Facebook		Twitter		Total	
	Num. of Posts	% to TTL	Num. of Posts	% to TTL	Num. of Posts	% to TTL
Alliance	16	0.42%	5	0.10%	21	0.24%
Marketing and Advertising	3446	89.48%	4216	84.85%	7662	86.87%
Product Innovation	146	3.79%	11	0.22%	157	1.78%
Public Relations	148	3.84%	80	1.61%	228	2.59%
Customer Service	1	0.03%	369	7.43%	370	4.20%
Other Activity	94	2.44%	288	5.80%	382	4.33%
Total	3851		4969		8820	

TTL: total

Figure 1: Percentage of posts breakdown by competitive actions categories



Next we examined the subcategories under each of the 5 competitive action categories. Appendix B provides sample firm posts for each subcategory.

Alliance related posts exclusively came from the *Cross industry alliance* subcategory. There were only 21 alliance related posts that is comparatively negligible for over 8820 samples.

The **Marketing and advertising** competitive actions on social media platform were predominated by consumer engagement related posts, which account for 81.06% of all marketing and advertising posts. Posts related to major endorsement, advertisement, and sales promotion account for 8.03%, 4.54% and 3.77% of all marketing and advertising posts, respectively. From Table 4, we can also observe that firms use Twitter more for consumer engagement related activities, and use Facebook more for activities related to advertisement, sales promotion, and major endorsement. Table 4 below shows the detailed subcategory analysis of marketing and advertising activities on social media.

Table4: Marketing and advertising number of posts and the percentages to total

	Facebook		Twitter		Total	
	Num. of Posts	% to TTL	Num. of Posts	% to TTL	Num. of Posts	% to TTL
Advertisement	282	8.18%	66	1.57%	348	4.54%
Sales Promotion	211	6.12%	78	1.85%	289	3.77%
Consumer Engagement	2518	73.07%	3693	87.59%	6211	81.06%
Major Endorsement	343	9.95%	272	6.45%	615	8.03%
Other type of marketing	92	2.67%	107	2.54%	199	2.60%
Total	3446		4216		7662	

TTL: total

The *Product Innovation* competitive actions on social media platform were mainly about new product development where 98.73% posts fall in this subcategory. Table 5 shows the details about the posts that belong to each of the product innovation subcategories.

Table5: Product innovations number of posts and the percentages to total

	Facebook		Twitter		Total	
	Num. of Posts	% to TTL	Num. of Posts	% to TTL	Num. of Posts	% to TTL
New Product Development	145	99.32%	10	90.91%	155	98.73%
Existing Product/Service improvement	1	0.68%	1	9.09%	2	1.27%
Total	146		11		157	

TTL: total

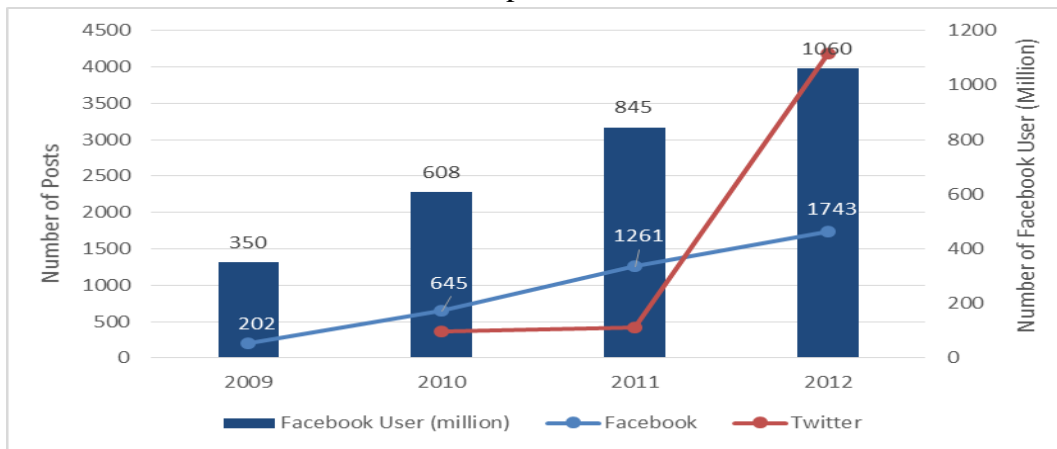
The *Public Relations* competitive actions were all focused on positive public relations. We believe that is caused by the social media's "Megaphone" effect (Bloch & Lemish, 2003; Gallagher & Ransbotham, 2010). To optimize firms' social media competitive strategy, firms normally do not broadcast its negative information on social media.

The *Customer Service* competitive actions mainly appeared on Twitter. Specifically, Bobbi Brown has a customer service Twitter account that helps customers or potential customers choose right products and provides product related support. Comparatively, there is only one customer service related post on Facebook.

4.2 The Trend of Competitive Actions

Figure 2 depicts the number of Facebook and Twitter posts and total number of all active users from 2009 to 2012. Obviously, the number of Facebook posts increased steadily, along with the increasing number of active users on Facebook over the last 4 years. However, we did not observe a similar trend in our Twitter data because of the limitation of retrieving up to 3,200 posts per Twitter account. The Twitter data are incomplete.

Figure 2: Number of Facebook and Twitter posts and total number of Facebook active users.



Note: Source of Facebook active users (Facebook, 2013)

Figure 3 shows the number of Facebook posts in each major competitive action category over the last 4 years. Figure 4 shows the percentage of Facebook Posts breakdown by competitive actions categories. The pattern is obvious that competitive actions became more diverse in the last 4 years. Specifically, the percentage of *Marketing and advertising* posts decreased from 93% in 2009 to 88% in 2012, while the percentage of *Product innovation* posts increased from 0.5% in 2009 to 5.1% in 2012.

Figure 3: Facebook posts breakdown by categories

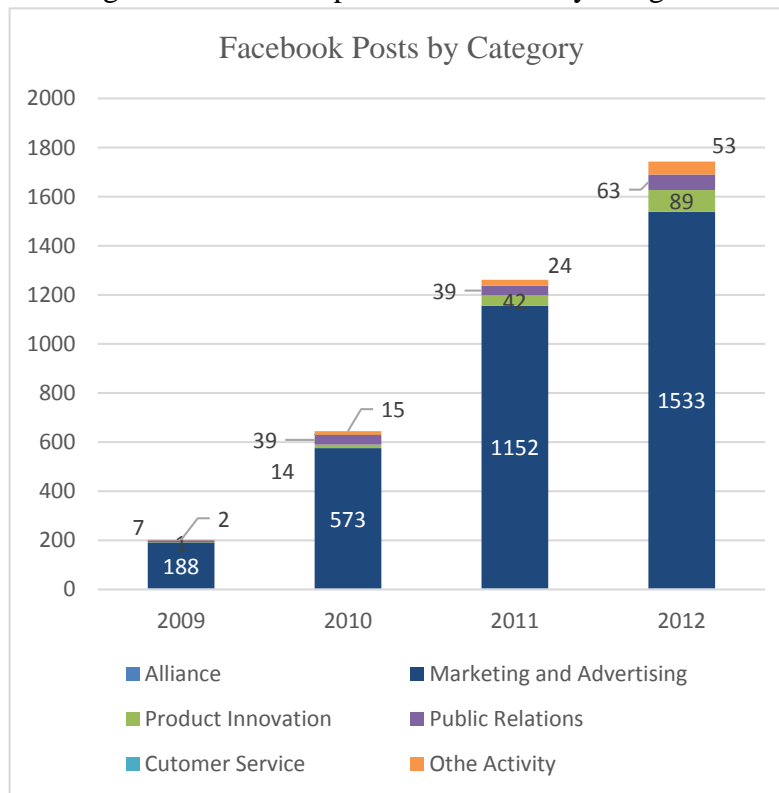


Figure 4: Percentage of Facebook posts breakdown by competitive actions categories

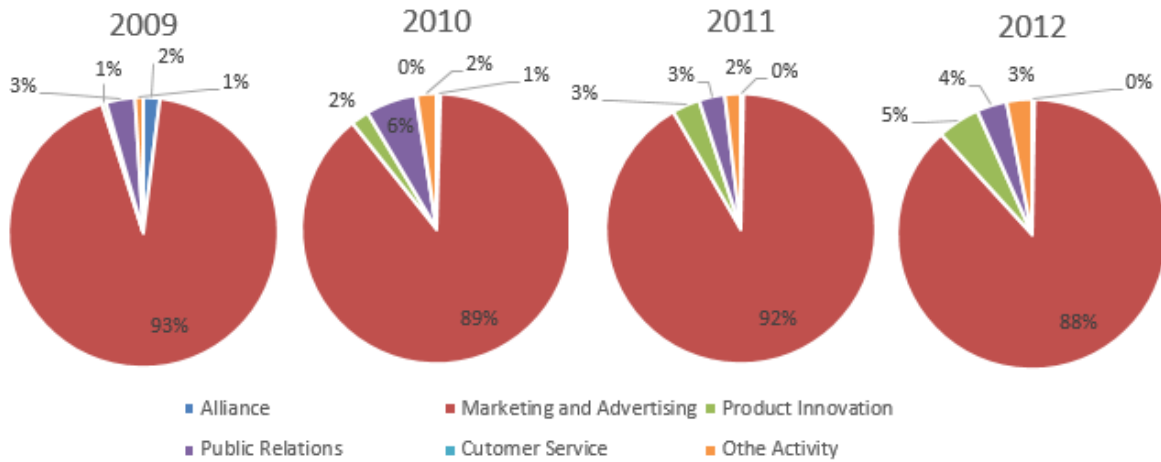
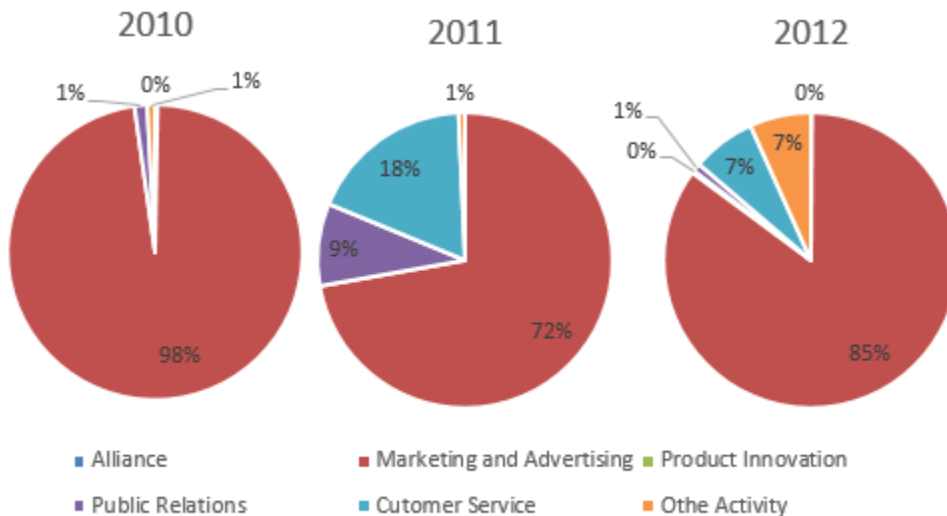


Figure 5 shows the percentage of Twitter posts breakdown by competitive actions categories. When interpreting the data, we need to be aware that Twitter data are incomplete. Data shows high variety in 2011 because Bobbie Brown launched Twitter customer service account in 2011 and the other companies' data are much less than in 2012.

Figure 5: Percentage of Twitter posts breakdown by competitive actions categories



5. Conclusions and Discussions

In this study we examined firms' competitive action activities on Facebook and Twitter. We developed a coding scheme based on previous competitive action literature in marketing and strategic management. An exploratory study on the top 5 cosmetics firms' social media activities show that the firms' competitive activities were steadily increasing and became diverse in the last 4 years. We can make the following observations

First, our findings show that the competitive actions undertaken by firms on social media platforms are insufficient. Considering that there are 10 major categories and 28 subcategories in total, we only observed firms' activities in 6 major categories and 11 subcategories. The reason might be that the firms have a conservative attitude regarding social media. Even with the huge potential of added values from social media, there are also unexpected risks by being exposed to social media. For example, there is a risk of exposing confidential information accidentally. Once information is posted on social media, it will spread too quickly to stop it. Moreover, inappropriate employee behavior on social media might highlight shortcomings or encourage complaints (Gallaughner & Ransbotham, 2010).

Second, the selected firms were mainly focused on marketing and advertising activities, customer engagement marketing specifically, on Facebook and Twitter platform. This finding is consistent with prior research (Chui, et al., 2012; Gallaughner & Ransbotham, 2010; Verhoef et al., 2010).

Third, with the rapid increase of Facebook active users, firms are concerned about their social media strategy and have increased their Facebook competitive actions. Even though the unknown risks of social media activities, firms have great intentions to tap into social media because of high potential added values. Therefore, with the increasingly gained experiences and enhanced confidence of using social media, firms will become even more active in the future.

Fourth, firms tend to disclose good news instead of bad news through Facebook and Twitter. Since the messages on social media are open to public, communication between firms and customers acts like Megaphone (Bloch & Lemish, 2003; Gallaughner & Ransbotham, 2010). Good will turn better and bad ones get worse. Therefore, firms' competitive actions on social media are selective.

Finally, firms started to use social media as an important product innovation platform. The observation is consistent with prior work of Piller et al. (2012) and Chui et al. (2012).

Our study has the following limitations. First, we focused on 5 companies in a single industry, which limits the generalizability of our results. We will collect data for other industries and conduct more analysis. Second, we only focused on Facebook and Twitter, which might neglect firms' actions on other social media platforms. Third, our current study is qualitative in nature

and exploratory. Large scale study using empirical testing of large samples could be done in the future.

Despite above limitations, our study is the first major study of firms' competitive actions by analyzing the content of firms' social media posts. We believe this is an important step toward understanding the corporate competitive actions on social media platforms.

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Appendix A:

Table A1: Alliance subcategory

Sub-Category	Definition	Example
A1_Compervisor Alliance	Moves or actions are about creating or dissolving an alliance with competitor firms	In 2007, Reuters and Dow Jones & Company aligned their online service and database businesses that both customers can subscribe the full Reuters and Dow Jones news service which gains greater scale
A2_Cross Industry Alliance	Moves or action are about creating or dissolving an alliance with other firms from different industries	in 1997, Dow Jones & Company announced it had formed a technology and marketing alliance with the Microsoft Corporation to revive Telerate
A3_Other Alliance	Other Alliance	

Table A2: Business model subcategory

Sub-Category	Definition	Example
B-1 Acquisitions and mergers	Moves or action are about purchasing or merging with competing firm or firm in complimentary industry	Microsoft announced that it was buying the Skype for \$8.56 billion in cash
B-2 Change business model	Moves or action are about changing a service or business model. Outsourcing is included in this category	
B-3 other business model	Other Alliance	

Table A3: Legal and lobbying subcategory

Sub-Category	Definition	Example
C-1 Legal activities	Moves or action are about lawsuits against competitors, non-competitors and others.	Samsung sues Apple that Apple's iOS Notification Center infringes on an active patent in 2012
C-2 Lobbying	Moves or actions are taken to influence government and related stakeholders in favor of the firm or industry. This entails communication directed towards a government agency in an effort to influence bureaucratic decision making	Media giants, including Time Warner, Hearst Corp, National Public Radio, CBS Corp and News Corp, are putting multimillion dollar lobbying for passage of a shield law to protect journalists and their sources

Table A4: Management and Human resources subcategory

Sub-Category	Definition	Example
D-1 HR-recruiting and Selection	Moves and actions are about publishing open position (include internship) or other recruiting related information which aimed at improving the competitiveness of the firm	Firms post open positions information on Twitter account
D-2 HR-training and development	Moves and actions are about other HR related practice that aimed at improving the work force, which may address soft skills such as diversity training as well as hard skills such as product education, coding skills	Consulting company provides presentation skill training for new employee
D-3 Management-administrative efficiency enhancement	Moves and actions that are aimed at enhancing administrative efficiency.	One company decides to install new management information system and related computers which was expected to greatly improve management efficiency.
D-4 Management – structural changes	Moves and actions are about organizational structure changes, such as elimination of divisions, departments, hierarchies, to achieve organizational efficiency.	
D-5 Other HR & Management		

Table A5: Product Innovation subcategory

Sub-Category	Definition	Example
G-1 New product development	Moves and actions are about the process of bringing a new product or service to market. There are two parallel paths involved in the process: one involves the idea generation, product design and detail engineering, the other involves market research and marketing analysis	Apple launched iPad on Apr 2010. The process of figuring out its functionality, such as shooting video, taking photos, playing music and performing internet functions, etc., is new product development process.
G-2 Existing product/Service Improvement	Moves and actions are about improvements in functional characteristics, technical abilities or ease of use through adding more features or modules and improving quality. Product innovation often takes place when a product's sales are in decline, which is an obvious and commonly used method to extend the life of a product.	The new version of iPad2 to newest iPad Air is existing product improvement
G-3 Withdrawal of Product and service	Moves and actions are about withdrawing a product or service exiting from Market, selling intellectual property rights and decreased emphasizing on product.	IBM stopped personal computer business is an example of withdrawing of product and service.
G-4 Other Product Innovation		

Table A6: Marketing and Advertising subcategory

Sub-Category	Definition	Example
E-1 Advertisement	Moves or actions are about nonpersonal communication of information which are usually paid for and usually persuasive in nature about products, services or ideas by identified sponsors through the various media” (Bovee, 1992) which aimed at improving the competitiveness of the firm.	Estee Lauder has an advertisement on VOGUE magazine.
E-2 Sales Promotion	Moves and actions are about providing added value or incentives to consumers, wholesalers, retailers, or other organization customers in the purpose of stimulating immediate sales. These efforts can attempt to stimulate product interest, trial or purchase. Below information is included but not limited in this category: Coupon, Premiums, contests, rebates, sweepstakes, sales events, gift with purchase, freebie and special service.	Estee Lauder posted an information that you can receive \$380 value of minis when purchased \$45 product or more online.
E-3 Consumer engagement	Moves and actions are about the interactions with followers which involve followers to engage into some activities and aimed at building long term relationship. Below information included but not limited in this category: Tips, recipe, chat and discussion and sharing ideas	KRAFT posted recipe on its Facebook account.
E-4 Major Endorsements	Moves and actions are about the endorsement of the firm’s product by a major organization.	Schaeffler Group, world’s second biggest bearing maker, has chosen HP as their IT solution provider since 2008.
E-5 other Marketing		

Table A7: Public Relations subcategory

Sub-Category	Definition	Example
H-1 Positive Public Relations	Moves and actions are about socially responsible actions, such as corporate giving, specific positive steps to influence reputation, ethical based initiatives, and environmentally friendly actions. (Including charity activities).	Estee Lauder established the Breast Cancer Research Foundation in 1993.
H-2 Negative Public Relations	Moves and actions are about socially irresponsible actions to include ethical breaches, corruption, price collusion and environmentally unfriendly action etc.	ABC and Jimmy Kimmel promoted kids killing and racial genocide idea on the Kid table show at 16 th Oct, 2013.
H-3 Other Public Relations	Other public relations.	

Appendix B:

Table B: Competitive actions on social media and related examples

Category	Subcategory	Post Example
Alliance	A-2 Cross industry alliance	“Check out this amazing scarf, created by designer Ross Menez. The iconic image of Bobbi's first 10 lip shades.” By Bobbi Brown, Twitter, Apr.1, 2012.
Marketing and advertising	E-1 Advertisement	“New Sumptuous Two-Tone Eye-Opening Mascara gives you that beautiful, wide-eyed look we all crave. Check it out: http://bit.ly/IW5FRa View video” By Estee Lauder, Twitter, May.15, 2012.
	E-2 Sales Promotion	“Spend \$10 on Revlon face, eye or lip and get \$4 ExtraBucks Rewards! Valid Dates: February 5 - February 11 (excludes clearance items)” By Revlon, Facebook, Feb.6, 2012.
	E-3 Consumer engagement	“Which spring makeup color trend are you excited about? Bold lips in red and coral brightly colored shadows and liners in blue and purple Flushed blushes in pink and coral” By Maybelline, Facebook, Mar.31, 2007
	E-4 Major Endorsements	“Mercedes-Benz Fashion Week Campaign Sept 2011: Part 1 (5 photos) Check out the Maybelline New York models in the new campaign for Mercedes-Benz Fashion Week.'Like' the makeup look that inspires you most.” By Maybelline, Facebook, Sep.1, 2007.
Product innovation	G-1 New product development	“Quick beauty poll! What's your favorite type of eyeliner? Pencil Liquid Gel Powder” By Revlon, Facebook, Jun.15, 2011.
	G-2 Existing product/Service Improvement	“Have you heard? EsteeLauder.com is now mobile! Just visit esteeLauder.com on your mobile device to connect to a world of beauty on the go. Check it out and tell us what you think!” By Estee Lauder, Facebook, Aug.18, 2011.
Public relations	H-1 Positive public relations	“Hey, L.A.! The super-cool EIF Revlon Run/Walk for Women tee from Fruit of the Loom can be yours THIS Saturday at the expo. All proceeds benefit the cause! ” By Revlon, Facebook, May.10, 2012.
Customer service	I Customer service	“For all of you who are having a problem with the coupon, we are looking into it and we'll let you know shortly what the issue is.” By Revlon, Facebook, Sep.20, 2010

What Will Attract Consumers to purchase Luxury Diffusion Brands? The Influence of the (In)congruence of Country-of-Origin and Country-of-Manufacture

Yao Yao

Abstract

Marketing literature has focused very little on how consumers evaluate diffusion brands as potential substitutes for parent brands. Diffusion branding is a brand extension strategy which positions the brand either close to or further away from the parent brand. Purchase probabilities of the incongruence between country-of-origin (COO) image and country-of-manufacture (COM) image for luxury diffusion brands also have received limited attention in extant literature. In this study, it will investigate (1) whether a diffusion brand's (in)congruence between COO and COM image affects consumers' purchase intention; and (2) how hedonism, utilitarianism and product involvements play an important role in consumers' decision making for purchasing luxury diffusion brands. Furthermore, this paper proposes and empirically tests a conceptual framework that addresses these issues. More specifically, we examine how the incongruence of COO and COM image influences the perceptions of and preferences towards luxury diffusion brands.

Key words: Luxury Diffusion Brands; Country-of-Origin (COO); Country-of-Manufacture (COM); COO image; COM image; Purchase Intention; Hedonism; Utilitarianism; Product Involvement

Introduction

Luxury brands are not satisfied with limiting their customer base now, so they expand their product influence by creating diffusion brands. By this strategy, fashion houses can broaden their influence to target more consumers (Tilley 2001; Phau & Cheong, 2009). A diffusion brand is a step-down line extension of a luxury brand, generally with a lower price compared with the parent brand (Phau, 2010), such as Armani Exchange (A|X) (Armani), CK Jeans (Calvin Klein), Versus (Versace) and Burberry Blue Label (Burberry). The strategy of diffusion brands is aimed to stimulate consumers' purchase intentions by establishing a close connection with their luxury parent brands (Balabanis and Diamantopoulos, 2011; Phau, 2010).

Except the price difference between parent brands and diffusion brands, other concepts which also should be concerned are Country-of-Origin (COO) and Country-of-Manufacture (COM). COM is a concept identifying that where products are made in while COO is a concept identifying where products come from or are designed (specifically as Country-of-Design, COD). Generally, studies always focus on how the Country-of-Origin (COO) image affects consumers' purchase intention or likelihood (Ghazali, et al., 2008; Koschate-Fischer et al., 2012; Rezvani et al., 2012). Obviously, the COO image as a part of luxury brands' reputation will affect consumers' purchase intention or likelihood (Lin & Chen, 2006; Aiello et al., 2009; Rezvani et al., 2012). The price response function for the favorable country image is associated with higher willingness to pay values (as a method to measure purchase likelihood) than the function with the less favorable country image (Koschate-Fischer et al., 2012).

However, referring to luxury diffusion brands, the incongruence between COO and COM is more accepted. When studying about multinational production, a clear distinction exists between COM and COO (Aiello et al., 2009). With the global market and trade booming, it is

common to see products have different COO and COM in manufacturing industry, like I-phones and Nike shoes (designed in USA and made in China). But still not too much attention is paid to the effect of incongruence between COO and COM on luxury diffusion brands, compared with their parent brands when COO and COM are from the same place.

The reasons why consumers buy luxury brands are always connected with the needs of their vanity or social identity (Grubb and Grathwohl 1967; Wilcox et al., 2009). The general society attitude and factors of self-capability, such as hedonism, utilitarianism and product involvement, will also affect their decisions of purchasing.

In this paper, we will particularly focus on and investigate:

(1) Whether and how the incongruence between COO and COM image of the luxury diffusion brands affects consumers' purchase intention; and

(2) When consumers are making decisions about purchasing luxury diffusion brands, how hedonism, utilitarianism and product involvements influence that decision.

More specifically, we will examine the effect of the incongruence between COO and COM on consumers' purchase intention about luxury diffusion brands, considering hedonism, utilitarianism and product involvement as adjusting conditions.

Literature Review

Diffusion brands

The concept of diffusion brands strategy is connected with brand extension and product (brand) positioning. Brand extension is a strategy to introduce a completely different product class by using an established or well-known brand name (Guoqun et al., 2009; Bao et al., 2010; Shahrokh et al., 2012). The strategy of brand extension is very common in business, but in some

situations consumers are not always cannot aware of the relationship with the parent brands, such as Audi with Volkswagen or LANCOME with L'OREAL. Product positioning is the foundation of marketing strategy, especially for new and innovative products, which will ultimately depend on consumers' perception of the brand based on its quality, attributes, value, price, and general image (Keller, 2008; Vukasovic, 2009; Noseworthy & Trudel 2011; Akpoyomare et al., 2013). Diffusion brands can be described as the re-positioning strategy of luxury brands.

Luxury brands are considered as products that have a close relationship with high price or high quality which will always target the consumers who have a high consumption capacity. But luxury brands are not satisfied to limit their customers in this base now. They begin to expand their product influence by creating diffusion brands which target more consumers with different purchase capabilities (Tilley 2001; Phau and Cheong, 2009). This strategy is trying to stimulate consumers' purchase intentions by establishing a close connection with their luxury parent brands (Balabanis and Diamantopoulos, 2011; Phau, 2010). Similar strategies can also be seen in subsidiary brands or endorsed brands. But as the definition, the diffusion brand is specially focused on the luxury brands as their second lines (Phau, 2010).

Country-of-Origin vs. Country-of-Manufacture

Country-of-Origin (COO) refers to where the products come from or are designed while Country-of-Manufacture (COM) refers to where the products are made in (Aiello et al., 2009). A lot of studies have worked on the effect of COO image and COM image on the products or brands separately, but until now not too much attention has been paid on the incongruence between COO and COM of the certain product or brand, because before the development of globalization and multinational manufacturing, the COO and COM of products or brands were always the same.

Studies about COO or COM generally concentrate on their effect on brand image and further their effect on consumers' purchase intention (Koschate-Fischer et al., 2012; Chung et al., 2009; Rezvani et al., 2012). Studies of COO reveal that COO image will have a great effect on consumers' purchase intention, which means consumers have a higher willingness to pay for brands from a COO with a favorable country image than the brands from a COO with a less favorable image (Koschate-Fischer et al., 2012). Most studies of the relationship between COM and brand image are based on multinational (hybrid) products and are focused on the overall quality perception (Chung et al., 2009). Some studies have a result that a well-known brand name can overcome the negative COM effect when other product information is available (Heslop et al., 1987; Ulgado & Lee, 1993; Chung et al, 2009). But some studies show that in some regions, consumers do care about the COM of products and will evaluate them differently because of the different COMs with the same products or brands (Chung et al., 2009).

Actually, recent country-of-origin (COO) research has shown that consumers often are not very clear about the true origin of brands, even for some famous brands (Balabanis & Diamantopoulos, 2011). And it has become more difficult to distinguish the real COO in today's products and brands, such as Häagen-Dazs which implies a Scandinavian origin but actually is an American ice cream brand and finally belongs to a Swiss brand Nestle (Melnyk et al., 2012). Products which have a foreign brand name that makes consumers consider a particular (often developed) COO, actually are often manufactured (COM, "made in" label) in an emerging country (Melnyk et al., 2012). Approximately one quarter of consumers make purchase decisions on the basis of COO information (Miller, 2011). And it also consistently illustrates that companies strongly believe that consumers pay attention to the congruence between COO and COM when making purchase decisions (Melnyk et al., 2012).

Hedonism vs. Utilitarianism

One study (Melnik et al., 2012) defines hedonic products as products that are associated with sensory, experiential and enjoyment-related attributes while utilitarian products are products associated with functional, practical, and tangible attributes. Simply, hedonic products are a more spiritual-pursuit while utilitarian products are a more practical-pursuit.

Present studies suggest that the trade-in effect will be moderated by whether a product is used for hedonic versus utilitarian goals. The pain of purchasing a hedonic product will be larger than that of purchasing an equivalent utilitarian product, but hedonic expenditures in a reasonable range can enhance people's quality of life (Park & Mowen, 2007).

Luxury brands are more like hedonic products because consumers who buy luxury brands always want to fulfill their needs of vanity or social identity (Grubb and Grathwohl 1967; Wilcox et al., 2009). But when considering the diffusion luxury brands, it seems that the companies want to use more about the combination of hedonism and utilitarianism to target a wide number of consumers.

Product Involvement

Involvement is defined as “the subjective perception of the personal relevance of an object, activity, or situation” (Van Trijp et al., 1996; Koschate-Fischer et al., 2012). Involvement level is the degree that the time and exertion consumers spend for their purchase decision and will partly affect processes of consumers' purchase decisions (Laurent & Kapferer, 1985; Boriboon et al., 2010). Consumers will spend more time and energy to make a decision in purchasing high involvement than that in low involvement products (Richins & Bloch, 1986; Boriboon et al., 2010).

Based on the literature review, it is found that present studies seldom focus on how COM image affects consumers' purchase intentions, especially when there is incongruence between COO and COM on luxury diffusion brands. Studies always treat luxury brands as high level consumer goods (more hedonic, high price and high quality), but now luxury brands have begun to concentrate on the combination of being both hedonic and utilitarian, as diffusion brands, to target consumers with different consumption capabilities. It assumes that diffusion brands, as the re-positioning strategy of luxury parent brands, will also be judged by the consumers' familiarity with parent brands. This paper will try to contribute to the literature gap of when the above effects were gathered together, how the incongruence between COO and COM affects the brand image, and finally affects consumers' purchase intentions. This paper will give implications to global businesses about how to develop their brands with the extension strategy.

Conceptual Model and Hypotheses

The research conceptual model is an indication of the relationships between variables. In this research, (in) congruence between COO and COM, diffusion brand image and purchase intention are treated as the main chain of the relationship while hedonism, utilitarianism and purchase involvement are treated as variables which moderate this relationship. Specifically, it will design five groups of situations to present the (in) congruence between COO and COM of products. The research conceptual model has been displayed in Figure 1-1 and the specific model for (in) congruence between COO and COM has been displayed in Figure 1-2.

[Please Insert Figure 1-1 about here]

[Please Insert Figure 1-2 about here]

So depending on findings above, we will make following hypotheses:

H1a: When there is congruence between COO and COM, consumers will prefer the diffusion brand by paying attention to the COO and COM effect.

H1b: When there is incongruence between COO and COM, consumers will prefer the diffusion brand by paying attention to the COO and COM effect.

H2 a: When considering the purchase involvement, the result in H1a will not change.

H2b: When considering the purchase involvement, the result in H1b will not change.

H3a: When considering hedonism as a purchase factor, consumers will prefer the diffusion brand by paying attention to the COO and COM effect.

H3b: When considering utilitarianism as a purchase factor, consumers will prefer the diffusion brand by paying attention to the COO and COM effect.

Methodology

Survey Design

This survey package includes five groups of print advertisements while each group has two advertisements that one for parent brand and one for its diffusion brand. Each print advertisement will be followed five-part questions which separately ask information from five major concepts described in the last section, namely hedonism, utilitarianism, product involvement, purchase intention and COO and COM country image. At the very first of the survey, it also asks the basic demographic information such as gender, age etc.

Instruments

(In) congruence between COO and COM which towards *country image* was measured by four items on a seven-point bipolar semantic differential scale (Roth and Romeo, 1992), based on five groups of print advertisements.

Purchase involvement was measured by three items on a seven-point Likert-type scale (Mittal and Lee, 1988).

Hedonism and Utilitarianism was measured by two-dimensional multi-item scale (Voss, Spangenberg and Grohmann, 2003)

Purchase Intention was measured by three items on a seven-point Likert-type scale.

Participants

This survey is administrated in a historical university which is located in the southern part of Georgia, USA. As shown in Table 1, the sample was consisted of 100 participates: 68 percent African American and 55 percent males. Most participants are between 21-35 years old (21-25 years old 68%; 26-30 years old 14%; 31-35 years old 8%) and seniors (64%).

[Please Insert Table 1 about here]

Results

So far in this paper, it just simply conducts a quick look of collect data on the hedonism, utilitarianism, product involvement, purchase intention and COO and COM country images of different groups of advertisements and a comparison between the parent brand and diffusion brand of each group.

Group 1: Perfume (COO: France; COM: China) - Incongruence of COO and COM

Developed COO country image and developing COM country image

As shown in the figure 2-1, it is obvious that there is a distinguishing evaluation between females and males towards perfume brand which females generally have a high evaluation both on hedonism and utilitarianism. And not too much difference is found between the parent perfume brand and diffusion brand.

[Please Insert Figure 2-1 about here]

It also can be seen in figure 2-2 that females have a higher country image evaluation than males towards the perfume brand and a developed country image is accepted a higher evaluation than a developing country image both on the parent brand and the diffusion brand.

[Please Insert Figure 2-2 about here]

No matter on the product involvement or the purchase intention, females generally have a high evaluation on the perfume brand. Still not too much difference is found in figure 2-3 on the product involvement evaluation between the parent perfume brand and diffusion brand. However, there is a higher purchase intention on the diffusion brand both by females and males.

[Please Insert Figure 2-3 about here]

Group 2: Handbag (COO: Italy; COM: China) - Incongruence of COO and COM

Developed COO country image and developing COM country image

Similarly with group 1, generally females have a high evaluation on hedonism, utilitarianism, purchase involvement, COO and COM country images and purchase intention. However, for the handbag brand, it can be seen that no matter are females or males, they both

gave a lower hedonism evaluation and a higher utilitarianism evaluation on the diffusion brands, compared with the parent brands.

[Please Insert Figure 3-1 about here]

There is also a distinguishing higher evaluation on a developed COO country image than a developing COM country image, but not too much evaluation difference is found of product involvement and purchase intention between the parent brand and the diffusion brand.

[Please Insert Figure 3-2 about here]

[Please Insert Figure 3-3 about here]

Group 3: Laptop (COO: China; COM: China) – Congruence of COO and COM

Developing COO and COM country image

For the laptop brand, although females generally have a higher evaluation on all the factors, the difference with males' evaluation is decreasing, especially on the parent brand. Country image and product involvement evaluations stay the similar on the parent brand and diffusion brand, but there is a higher purchase intention on the parent brand both by females and males.

[Please Insert Figure 4-1 about here]

[Please Insert Figure 4-2 about here]

[Please Insert Figure 4-3 about here]

Group 4: Shoes (COO: Italy; COM: Italy) – Congruence of COO and COM

Developed COO and COM country image

For the shoes brand, it is still that females generally have a higher evaluation on all the factors. However, on the utilitarianism, males' evaluation is almost similar with females'. Both country image and product involvement evaluations don't have too much difference between the parent brand and the diffusion brand, but females have a higher purchase intention on the diffusion brand.

[Please Insert Figure 5-1 about here]

[Please Insert Figure 5-2 about here]

[Please Insert Figure 5-3 about here]

Group 5: Bottle Water (COO: France; COM: France) – Congruence of COO and COM

Developed COO and COM country image

For the bottle water brand, the evaluation differences of hedonism and utilitarianism by males and females is decreasing and even for the diffusion brands, males almost have similar evaluation.

For the parent brand, both females and males have a higher evaluation on the product involvement, but there is not too much difference of the purchase intention between the parent brand and diffusion brand. Country image evaluations also stay similar between the parent brand and diffusion brand.

[Please Insert Figure 6-1 about here]

[Please Insert Figure 6-2 about here]

[Please Insert Figure 6-3 about here]

Conclusion

This paper explores the influence of the incongruence of Country-of-Origin and Country-of-Manufacture on consumer's purchase intention for diffusion branding. More specifically, it involves hedonism, utilitarianism and product involvement as moderating factors. We found that consumers do have a different evaluation on a different country image which generally a higher evaluation on a developed country image, but it doesn't really matter their purchase intention for the products or the diffusion brands. In addition, we found that consumers will evaluate differently on the hedonism and utilitarianism between the parent brand and the diffusion brand and that will particularly affect their purchase intention.

This paper contributes to the literature by studying the relationship between incongruence between COO and COM, diffusion brand image and consumers' purchase intention. In addition, except for this main focus, this paper also explored hedonism, utilitarianism and product involvement as moderating factors.

This paper also provides practical implication to global marketing. First, the research finds that generally females will have a higher evaluation on the luxury brands and can be attracted more by the diffusion brands. Therefore, when managers are trying to use strategy to attract more consumers, it can be predicted that females-prefer products are more appropriated to adopt the diffusion brand strategy. Second, for a luxury brand which is more utilitarian such as shoes may be more accepted by using a diffusion brand strategy.

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Figure 1-1 Conceptual Model

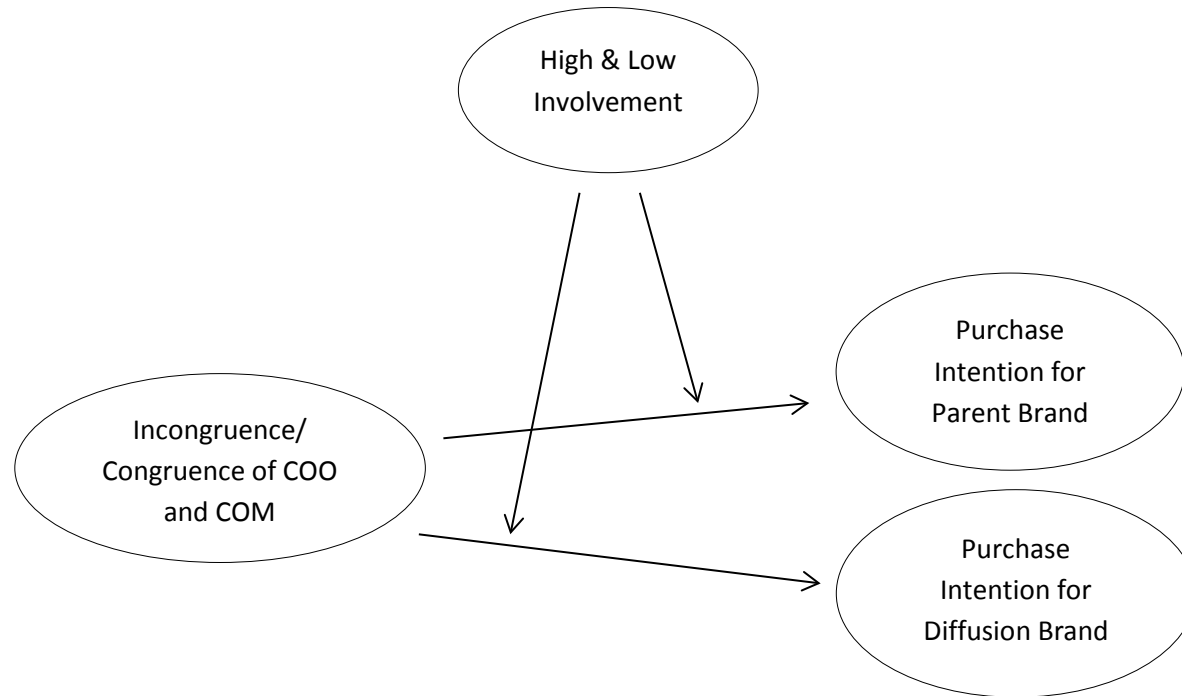


Figure 1-2 Conceptual Model for (In) congruence of COO and COM

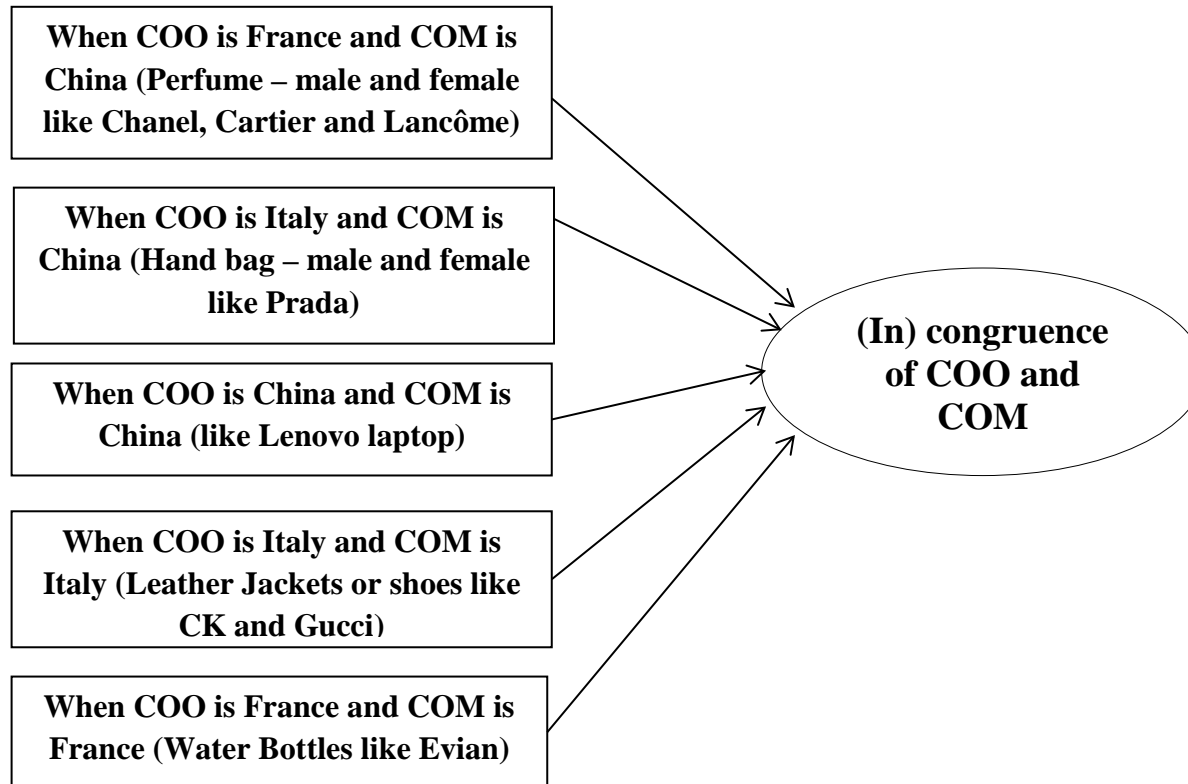


Figure 2-1

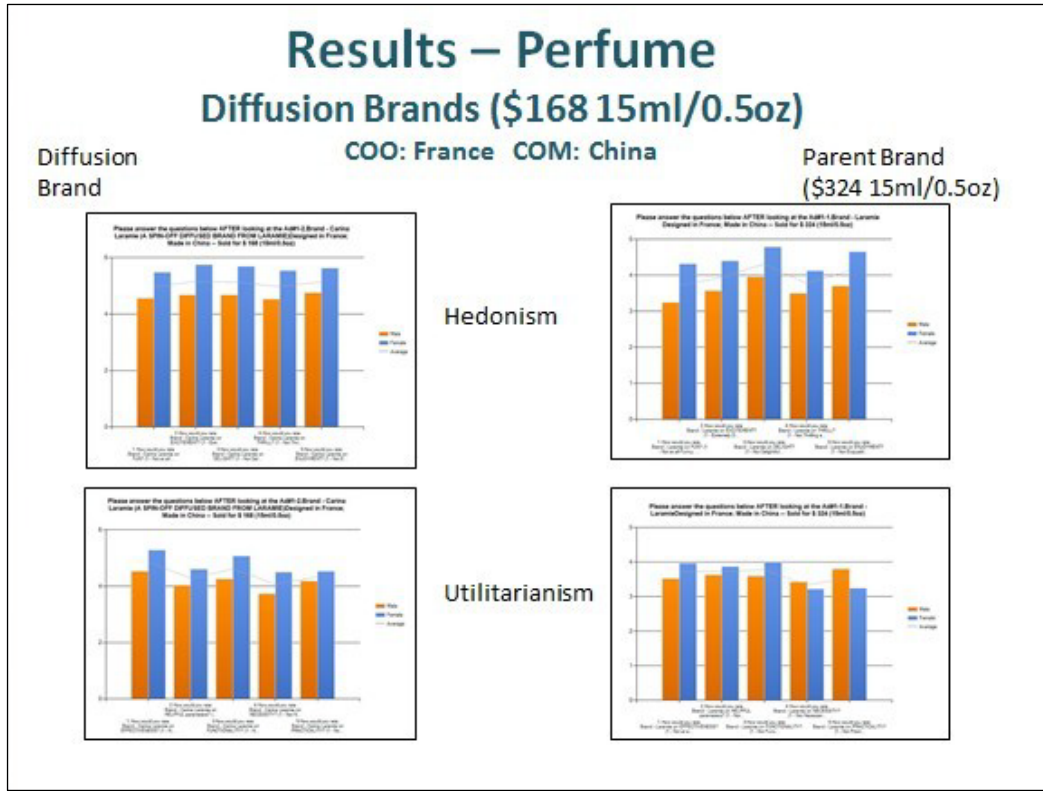


Figure 2-2

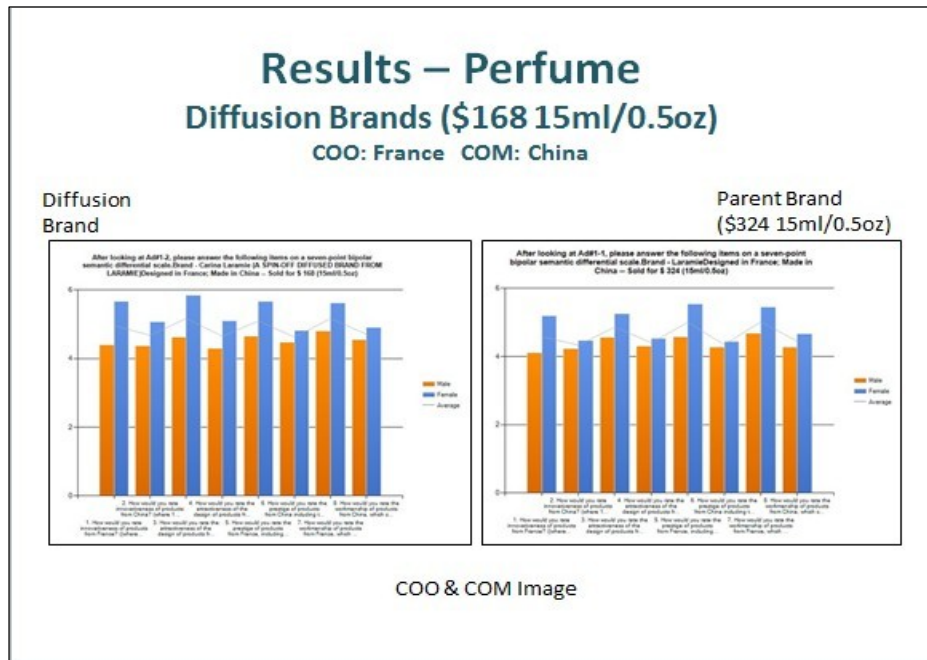


Figure 2-3

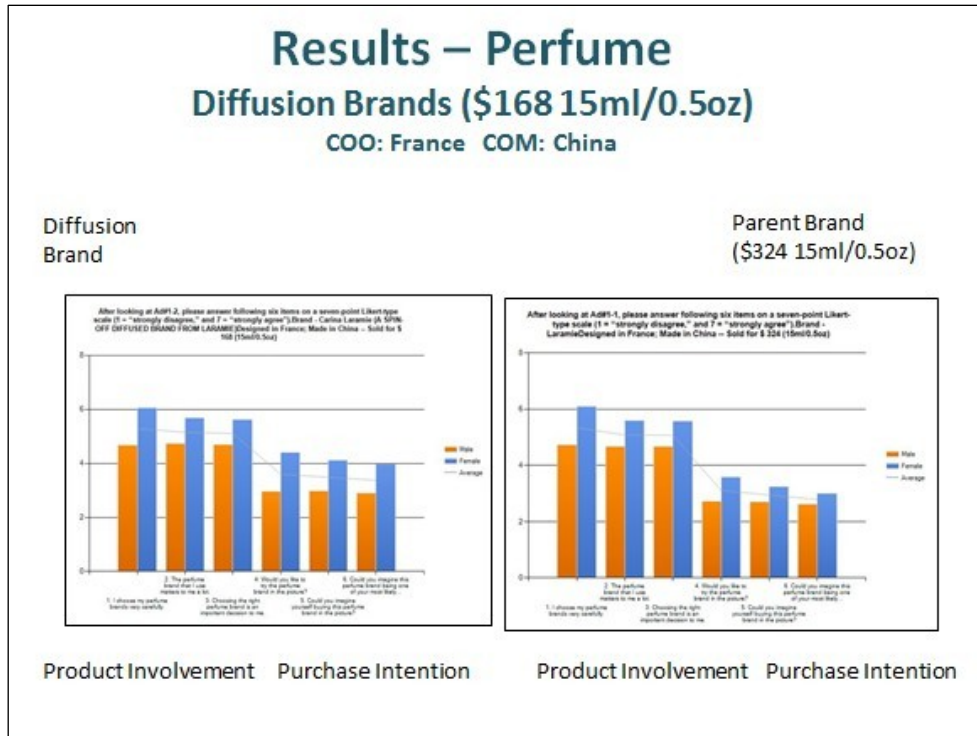


Figure 3-1

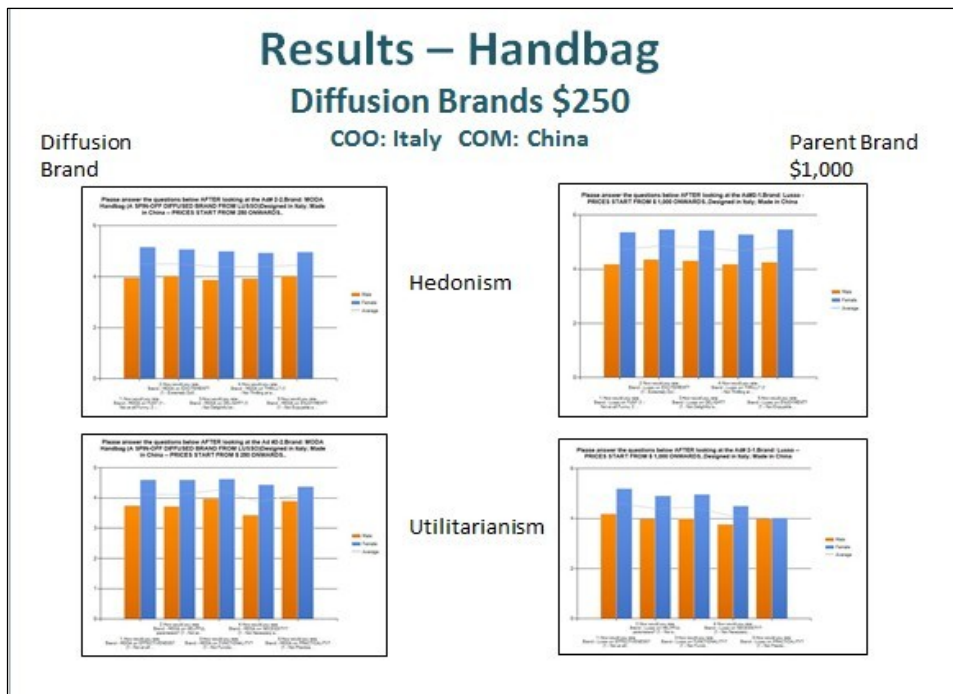


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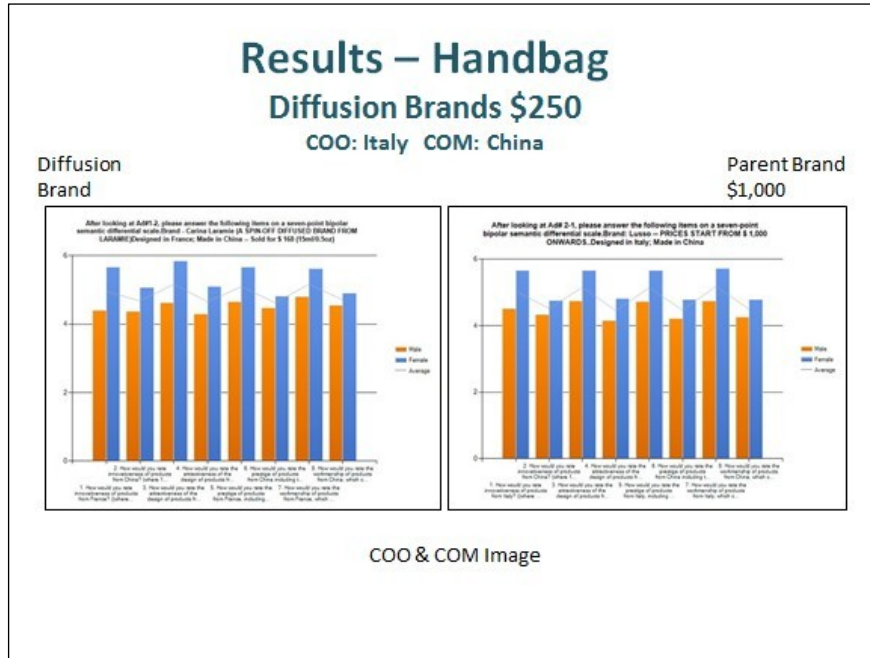


Figure 3-3



Figure 4-1

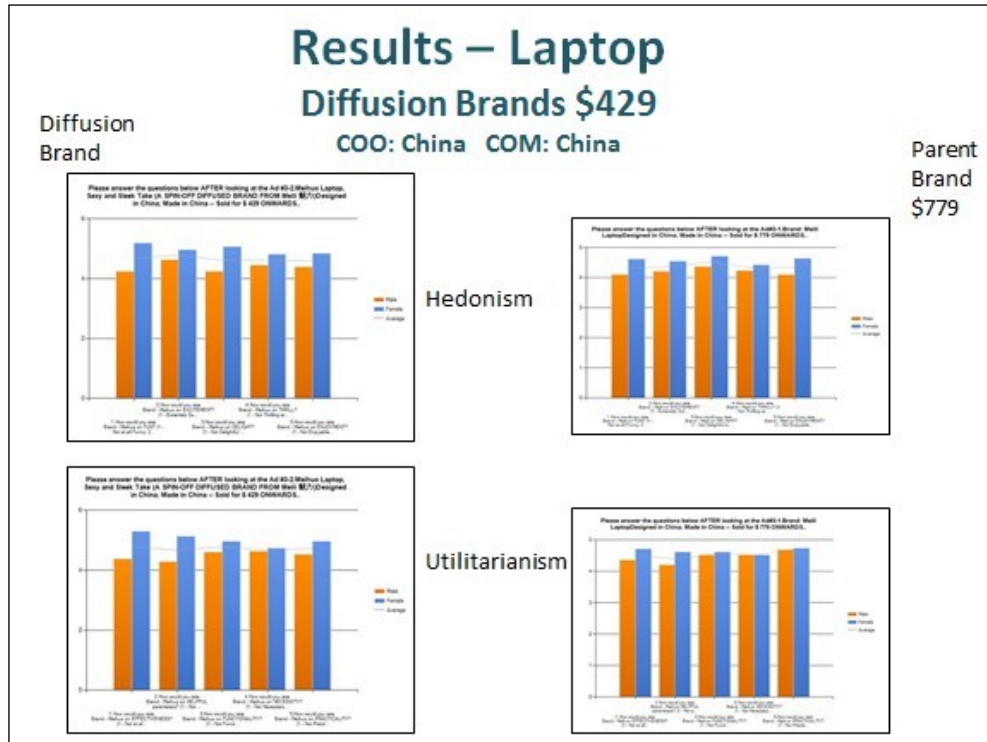


Figure 4-2

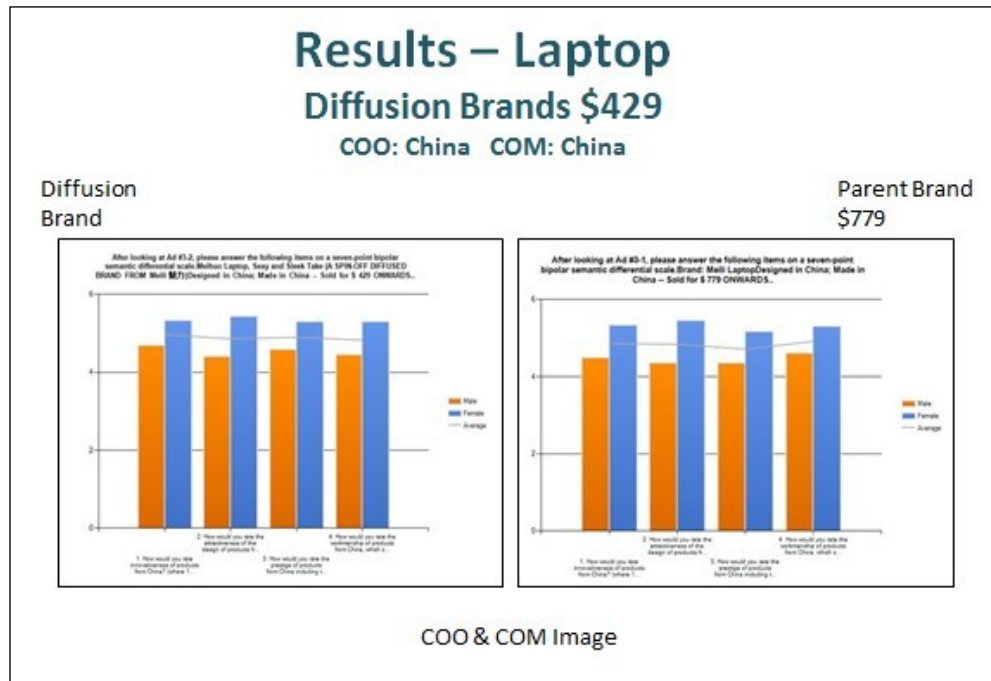


Figure 4-3



Figure 5-1

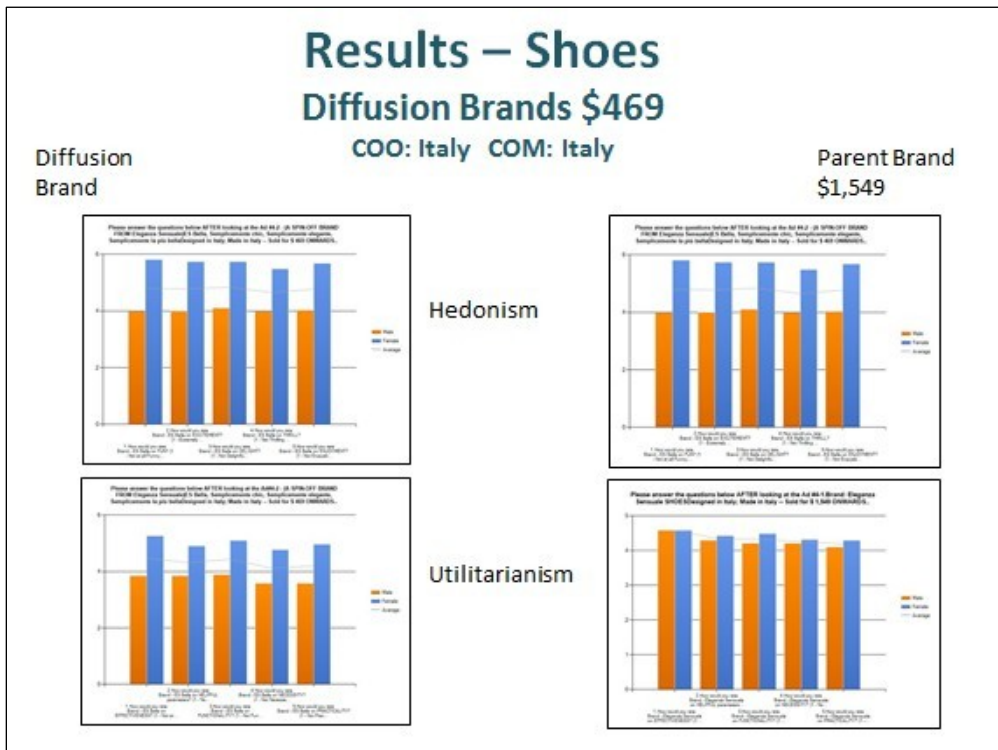


Figure 5-2

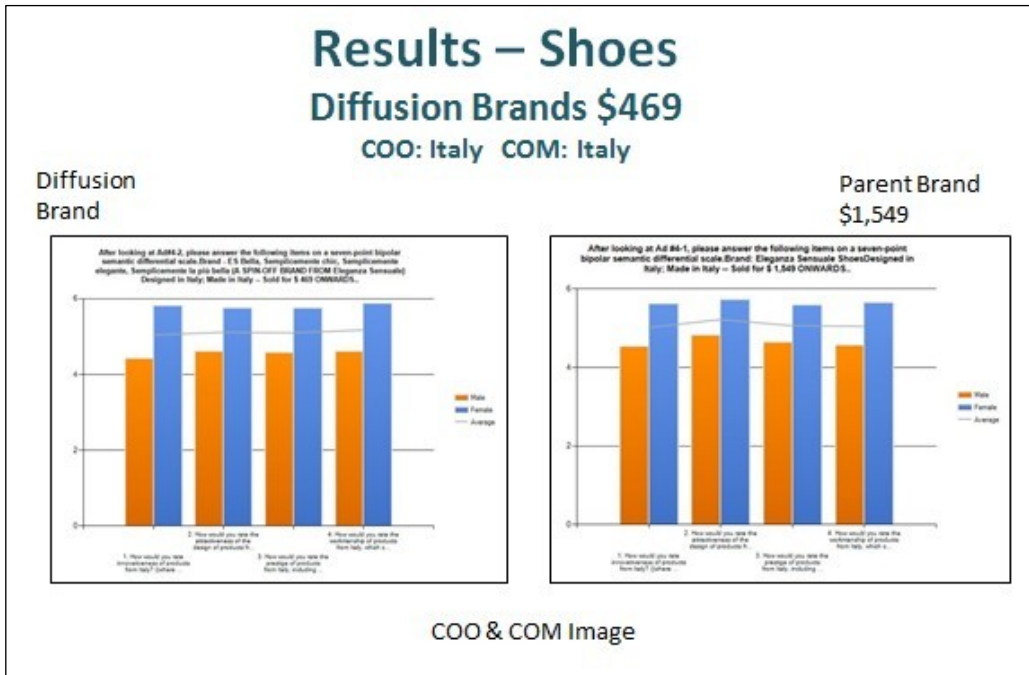


Figure 5-3

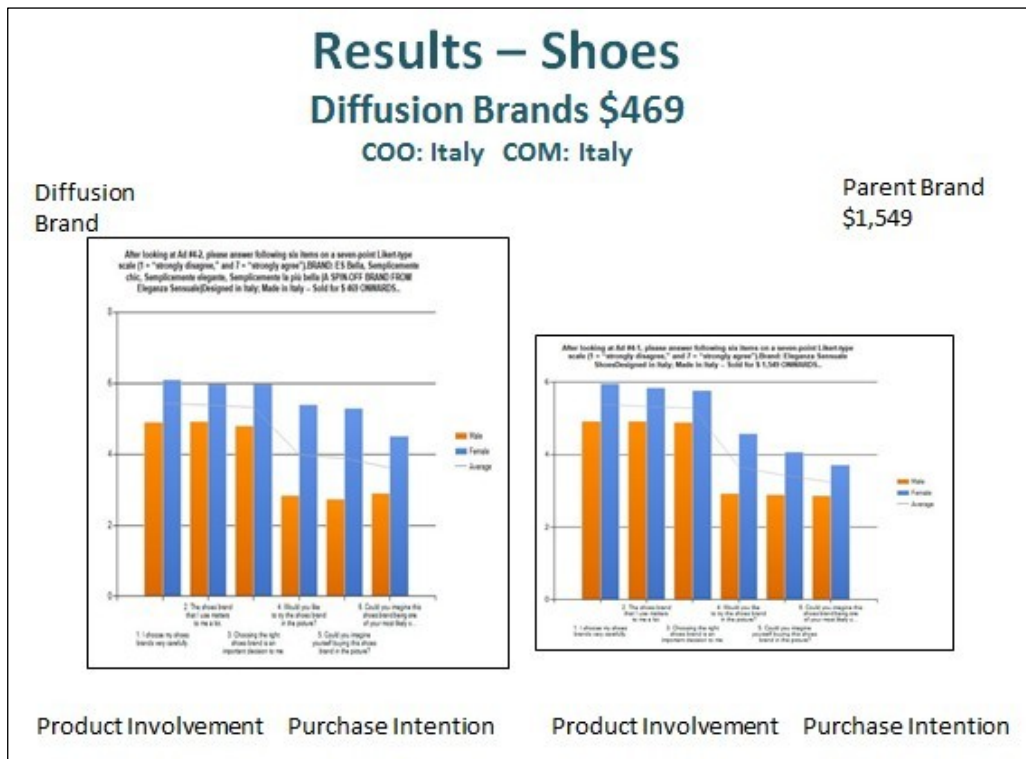


Figure 6-1

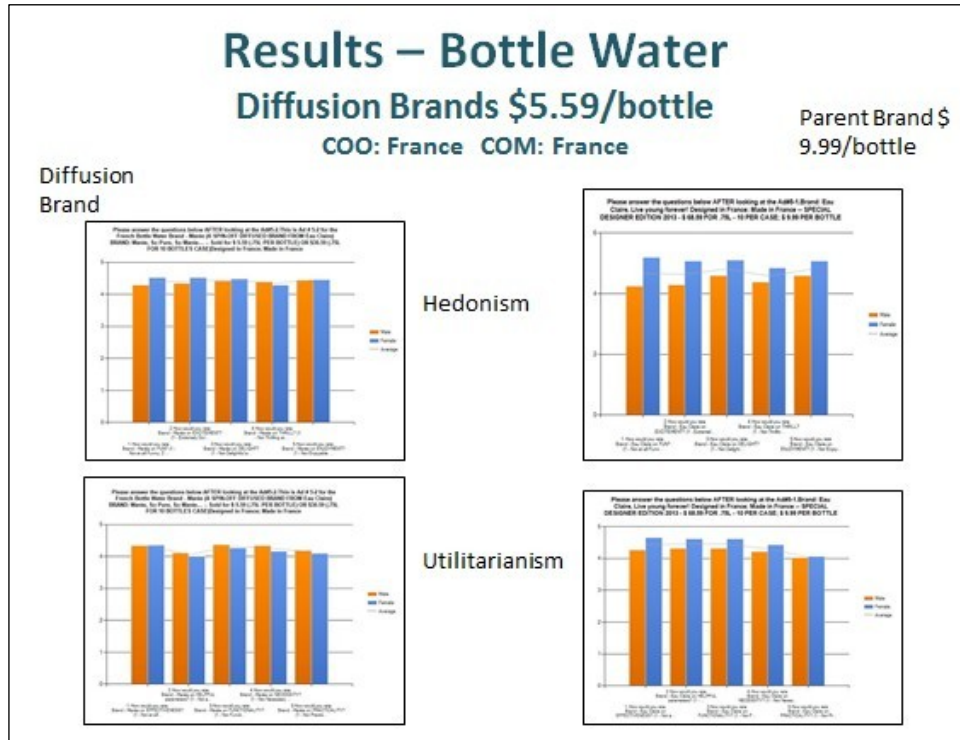


Figure 6-2

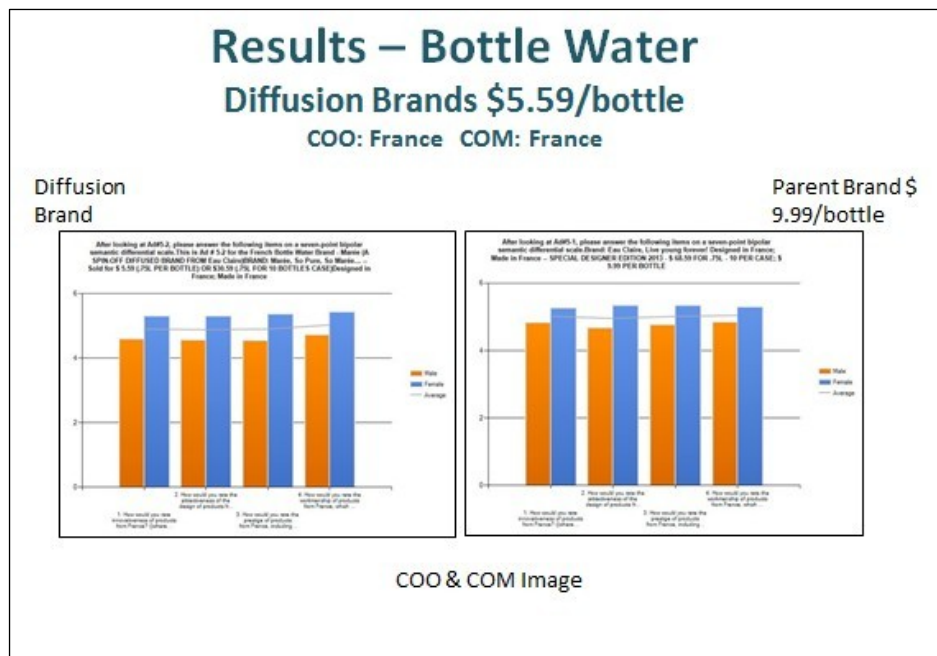
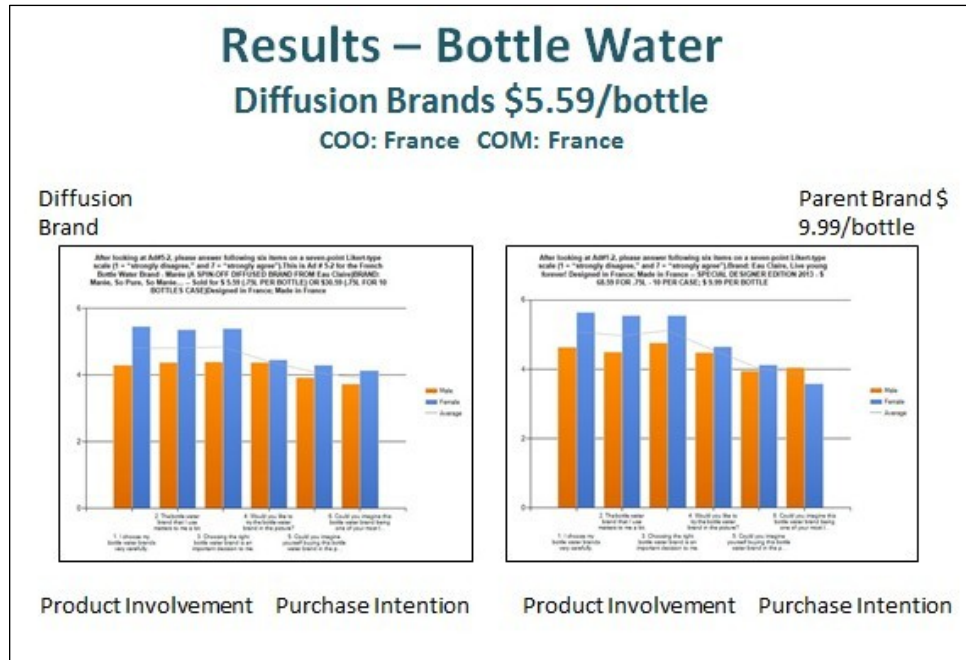


Figure 6-3



Slice-of-Life vs. Slice-of-Death Advertising Appeals

Christina King

Abstract

Various appeals are used in advertising, and the most well-known are hard sell and soft-sell. This research study investigates slice-of-life versus slice-of-death advertising appeals that have not been discussed in previous literature. Slice-of-life (SOL) advertising explores real-life situations that use lively, happy and/or joyous moments to strongly advertise the product. Slice-of-death (SOD) advertising in contrast uses extreme situations which may be deadly, noxious and/or fatal, but at the same time advertise the product by appealing to undesirable human emotions of fear, remorse and death. The study examines these two different appeals at two ends of the spectrum on young consumers and how they feel about SOL and SOD ads from the perspective of corporate social responsibility.

Keywords: slice-of-life, slice-of-death, advertising appeals, corporate social responsibility, ad irritation, ad believability, purchase intentions

Introduction

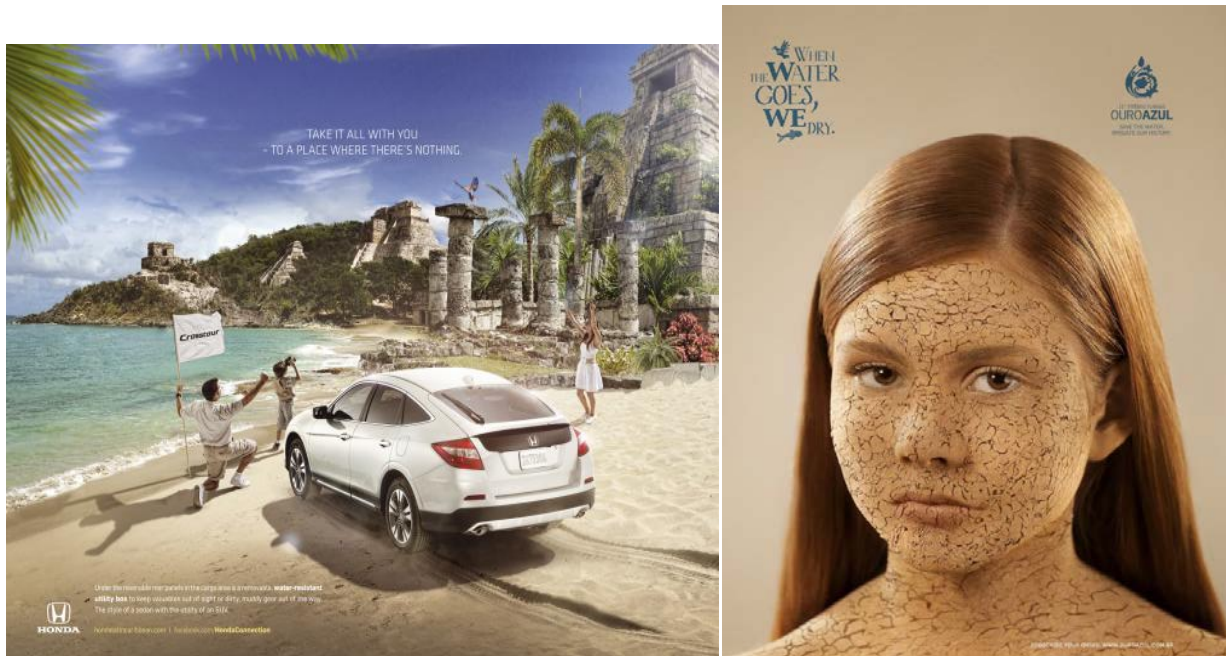
The most widely recognized types of appeals in advertising are soft-sell and hard sell. Soft-sell is an appeal that focuses on a subtle way to advertise that plays on emotions and hard-sell is a more direct approach that focuses on the products or services (Okazaki, Mueller, & Taylor 2010). There are so several other types of appeals such as rational/emotional appeals, direct/indirect appeals, informative/transformational appeals (Okazaki, Mueller & Taylor 2010), and all these appeals use different ways to convey information or an image about a product or service. Appeals play on either our emotions or thought processes in order to achieve the advertising goals of the company. Cognitive response theory relates to the thoughts and feelings that affect attitudes about a product and whether the consumer can be persuaded in regards to product or service (Okazaki, Mueller & Taylor, 2010; Petty, Ostrom, & Brock, 1981). Clearly, there are many different ways to examine advertising appeals in the advertising market.

In advertising appeals there are cultural values and are included in varying degrees in all advertising (Mueller, 1987). Even in the cultural context soft-sell and hard-sell have distinct definitions that transcend cultural values. Mueller (1987) defined soft-sell as “mood and atmosphere are conveyed through a beautiful scene of the development of an emotional story or verse”(p.53). Whereas she defined hard-sell as “Sales orientation is emphasized here, specifying brand name and product recommendations. Explicit mention may be made of competitive products”(Mueller, 1987, p.53). Soft sell is image driven and hard sell is more direct approach to advertising (Okazaki, Mueller & Taylor 2010). Both of these are different end of the spectrum for these two types of appeals.

Slice-of-life and Slice-of-death are two types of appeals and there is little research that actually examines these two appeals. These are two appeals that are on different end of the spectrum, much like soft-sell and hard-sell. Slice of life is defined as an ad that depicts a real-life situation that is positive that shows a problem were the uses of a product or service will increase the positive situation (See Figure 1). The first ad is a Slice of Life ad for Honda take from Ads of the World Website and this ad was used in the United States advertising market. This ad shows a happy family enjoying a beautiful location, and this enjoyment was enhanced by owning and driving a Honda product. Slice of death is defined as an ad that depicts a situation in which there is a negative situation that if a product or service is used that there will be dire consequences. Slice of death appeals play on the fears of individuals (See Figure 1). The second ad depicts the need to conserve water; this ad is sponsored by Ouro Azul. Slice of life and slice of death are seen frequently in corporate social responsibility ads. Corporate Social Responsibility is the way a company promotes awareness for issues. This awareness can be positive (Slice of life) or negative (Slice of Death).

Figure 1: Slice of Life and Slice of Death Ads

Source: Ads of the World



The study examines these two different appeals at two ends of the spectrum on young consumers and how they feel about Slice-of-life and Slice-of-death ads from the perspective of corporate social responsibility. Since there is little research in this area, this study contributes greatly to the literature for slice-of-life, slice-of-death and corporate social responsibility. This study looks at slice-of-life and slice-of-death with its effects on ad believability, ad irritation, attitudes toward the ad and ultimately the purchasing intention of the young consumers.

Literature Review

Slice-of-life is defined as an ad that depicts a real-life situation that is happy/joyous that shows a problem were the uses of a product or service will increases the positive situation. This type of appeal is used frequently in advertising, and is often thought of as having unrealistic real-life situations or reminds consumers of situations, such as personal hygiene issues (Belch & Belch, 2004). Advertisers prefer this type of appeal because it is an effective way to remind

consumers of a product in a way that is easy to relate to, and provide brand recognition to a positive situation (Belch & Belch 2004). This type of appeal can also be used by corporations to promote corporate social responsibility. Corporate social responsibility ads are used by corporations to promote themselves, used to build brand associations and improve their reputations (Becker-Olsen, et al, 2011). Specifically, corporate social responsibility help a company create a positive self image that consumers will associate with their brand and help protect the company's self-image (Hsu, 2012). Corporate social responsibility market strategies are in place to increase stakeholder perceived relationships (Becker-Olsen et al, 2011; Sen & Bhattacharya, 2001; Vain et al, 2007). These stakeholders are both inside (Shareholders/employees) and outside (Consumers) of the company. Corporate social responsibility is one way that corporations can be unique within target markets (Becker-Olsen et al, 2011; Drumwright 1994). Corporations that do not meet consumer's expectations in the realm of corporate social responsibility face negative repercussions (Becker-Olsen et al, 2011). Corporate social responsibility assists consumers to develop respect for companies based on their contributions (ÖZTÜRK, & Üniversitesi, 2012). Companies use slice-of-life appeals in advertising to decrease the consumers' ambivalent attitudes toward a product due to the consumer having had both negative and positive messages to a product or service (Chang, 2011) See figure 2. The first ad is a Slice of Life ad celebrating 21 years of life since the bombing of the Israeli Embassy in Buenos Aires. This ad shows eleven out of thirty great-grandchildren of Mauri Meyer Frers (victim of the attack). The Ad has the tag line "Life Kills Terrorism, 21 years later we respond with life". The second ad depicts a happy overweight male that after starting to use public transportation in the form of a new station with the tag line of "using the public transportation regularly give you a 20-min physical activity, and that is all you need to stay in

shape for the rest of your life.” This both ads are an example of a corporate social responsibility ad.

Figure 2: Slice of Life Ads

Source: Ads of the World





Slice-of-Death is a variant of Slice-of-Life in that Slice-of-Death uses negative consequences (Belch & Belch, 2004). Slice-of-death is defined as an ad that depicts extreme situations that are negative and that the uses of the product or service will have a strong adverse effect and play on emotions such as fear/remorse and even death. These types of ads work well in the corporate social responsibility marketing strategies. There are numerous Slice-of-Death ads that are used in the public health and safety segment of corporate social responsibilities (Kerr, Johnston, & Beatson 2008), such as the ads depicted in Figure 3. Slice-of-Death appeals are used in advertising to decrease the consumer's neutral attitudes toward a product, due to the consumer having both negative and positive messages about a product or service (Chang, 2011). It is worth noting that not all public health and safety ads have been effective in advertising (Gelb, & Mease, 2005; Kerr, Johnston, & Beatson 2008). Both ads are examples of corporate social responsibility ads. The first ad depicts a woman smoking and the unborn child holding the cigarette. This ad has a tag line of "when you smoke your baby smokes" and this ad was

sponsored by the Israel Cancer Association. The second ad is a public service announcement in regards to second hand smoke by the Cancer aid and Research Foundation, with a tag line of “Passive smoke kills your dearest ones first”.

Figure 3: Slice of Death Ads

Source: Ads of the World

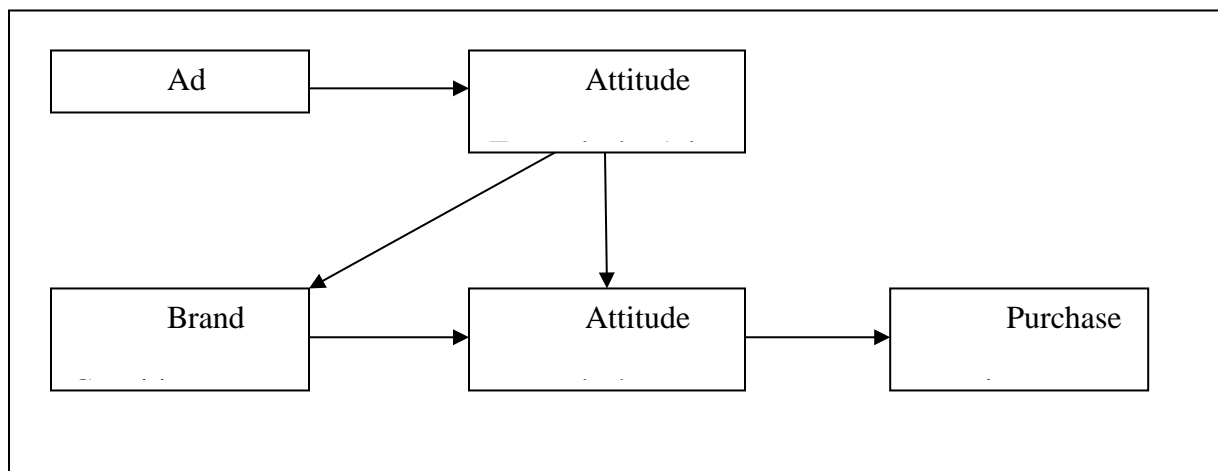


Corporate social responsibility market strategies are in place to increase stakeholder received relationships (Becker-Olsen et al, 2011; Bhattacharya, 2001; Vain et al, 2007). These stakeholders are both inside (Shareholders/employees) and outside (Consumers) of the company. Corporate social responsibility is one way that corporations can be unique within target markets (Becker-Olsen et al, 2011; Drumwright 1994). A study by Chang (2011), examines positively and negatively framed ads and their effects on ad believability, ad liking and the ultimate effect on brand attitudes. One theory is that a negatively framed ad will have a greater effect; due to consumers have a fear of loss (Chang, 2011). Whereas, ad believability is a major factor in ad

effectiveness within framing an attitudes in regards to the ads. When an ad has the desired effect on the consumer in attitude, belief and/or intention toward the ad the ad is considered believed (Atkin & Beltrimini, 2007; Maloney 1963). An advertisement that is believed always elicits a response, either positive or negative (Atkin & Beltrimini, 2007). Therefore, ad irritation could have a different effect. Ad irritation in relation to slice-of-death would be a positive effect in that this would assist the customer in having a negative emotional response to the ads. This in turn, is the purpose of the slice-of-death ads.

Feelings elicited by ads have been studied quite extensively and the Dual Mediation Hypothesis Model has had support within the literature (Geuens & Pelsmacker 1998). This model takes into account both the ad cognition, brand cognition, and how they come together to form the attitude toward the ad, which in turn mediates purchase intention. (see figure 4). Ad cognition is the thought processed in regards to the ad being presented, and brand cognition is the thought processes in regards to the brand bring advertised. Both the ad cognition and brand cognition will elicit both an emotional and a non-emotional response. Emotional and non-emotional responses can elicit different feelings that result in differences in the way ad recognition, brand recognition attitude toward ad, attitude toward brand and purchase intention are received by the consumer (Geuens & Pelsmacker 1998).

Figure 4: Dual Mediation Hypothesis Model



Conceptual Framework

This research greatly contributes to the literature for Slice of Life and Slice of Death appeals. There is a significant gap in the literature for Slice of Life and Slice of Death appeals. Although there is extensive research of other types of appeals including soft-sell versus hard-sell, there is relatively no research that deals with Slice of Life or Slice of Death appeals except in the theoretical aspects for marketing textbooks. This study also assists the literature in the aspect of Slice of life and Slice of Death as it relates to Attitudes toward ads, attitudes toward brands, and purchase intention within the young consumer groups. The young consumer groups are the group that companies are trying to appeal to with corporate social responsibility ads. Companies are trying to appeal to this group for many reasons, but they want the consumers to have a positive regard of the company (Kerr, Johnston, & Beatson 2008). This study looks at slice-of-life and slice-of-death with its effects on ad believability, ad irritation, attitudes toward the ad and ultimately the purchasing intention of the young consumers. Below is the discussion of the three variables that will be used to conceptualize Slice of Life and Slice of Death appeals for this study.

Ad Complexity

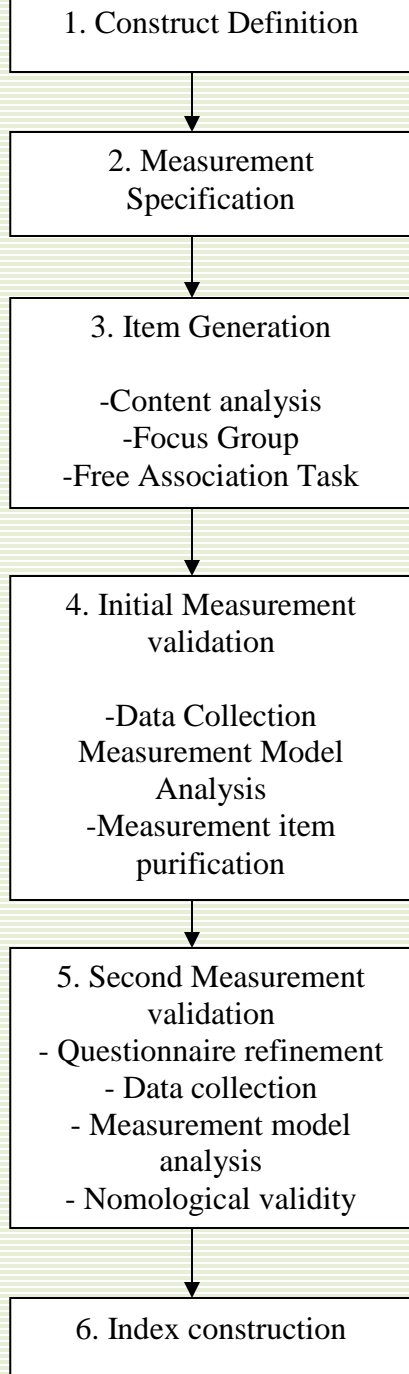
The first variable proposed to study Slice of Life and Slice of Death is Ad Complexity. Ad Complexity can be examined on two different contexts. The first being interpretation (both negative and positive) and the second being textual factors. Lowery (2008) states that ad complexity requires higher cognitive abilities, and this in turn motivates people to process these ads and increases memory for persuasion ads (Bratu et al, 2011). Ads that have a negative ad complexity are processed longer than ads that have a positive ad complexity (Grancea, 2012). Textual factors also contribute to the overall complexity of the advertisement (Bratu et al, 2011).

Ad complexity helps a person by challenging them in ability to understand the message, which in turn causes the person to pay more attention to the ad (Pieter et al, 2010). The more complex an ad is, the better for short time periods, since less complex ads (with only pictures) have less of an effect on the contextual framework of the ad (Wang et al, 2013). Therefore, Slice of Life and Slice of Death advertisements rely on complexity to capture a person's interest, and the textual factors in the ad contribute to the overall complexity increasing the perception of the ad even in a short period of time.

Ad Relevance

The second variable for measuring Slice of Life and Slice of Death is ad relevance. Cognitive response theory examines a person's thoughts and/or feelings have how these affect and/or changes attitudes toward ads and this gives the ads relevance (Okazaki, 2010: Petty, et al, 1981). Ad relevance is a way to influence the consumer in their beliefs about the ads message. In a paper by Petty (1977) the cognitive response theory mediates attitude change in persuasive communication. This adds credence to the idea that persuasive advertisements such as Slice of Life or Slice of Death taken from a Corporate Responsibility stand point will affect an attitude change in the consumer. Petty (1977) also stated that consumers that receive a persuasive communication attempt to relate that information to their already existing cognitive structure. A person's cognitive structure is ever changing and updating as new information becomes available. Ad relevance is influential in consumer's memory of the ads and ultimately their attitude towards the brand itself (Kim & Sundar, 2010). Heckler and Childers (1992) stated that the higher the relevance the more positive attitudes the consumer will have toward the ads, and that they will have a better memory toward the ad as well (Kim & Sundar, 2010). Slice of Life and Slice of Death advertising relies on relevance to change a person's attitude towards a brand.

Figure 5: Measurement Development Procedure



Ad Valence

The last variable that will be discussed as a measure for Slice of Life and Slice of Death is Ad Valence. Ad Valence is both the positive and the negative emotional reaction to an advertisement (Chang, 2001; Grancea, 2012). A study by Chang (2001) states that positive ad valence acts as a retrieval tool for positive emotions and positive memories; whereas negative ad valence has the opposite effect and the negative emotions retrieve negative emotions and memories. These ad invoked memories in relation to ad valence contribute to attitude toward the ad (Chang 2001). Corporate social responsibility uses ad valence as a way to persuade consumers, especially the negative ad valence since Slice of Death ads are meant to shock consumers and convince them to take action (Grancea, 2012). Consumer's excuse the shock that they receive because is it perceived to be morally justified (Grancea, 2012). Slice of Life and Slice of Death uses ad valence to evoke both positive and negative emotions and in the realm of corporate social responsibility.

Instrument development

Since Slice of Life and Slice of Death are concepts without a preexisting instrument to measure the constructs, this study will use the procedure set out by Okazaki et al, (2010) to

develop a measure. The procedure that will be followed is a mixture of qualitative and quantitative measures (See figure 5).

Development of Definition

The first phase of the procedure is to develop operational definitions for Slice of Life and Slice of Death as they relate to Corporate Social Responsibility. Slice of life is defined as an ad that depicts a real-life situation that is positive that shows were the uses of a product or service will increases the positive situation. Slice-of-death is defined as an ad that depicts extreme situations that are negative and that the uses of the product or service will have a strong adverse effect and play on emotions such as fear/remorse and death. The second phase is measurement specifications. This study has identified three variables that will be used to measure Slice of Life and Slice of Death: Ad Complexity, Ad Relevance and Ad Valence. Both Slice of Life and Slice of Death are examined individually as two ends of a continuum. Slice of Life and Slice of Death have unique question for each dimension measured (See Figure 6 and 7).

Figure 6: Slice of Life

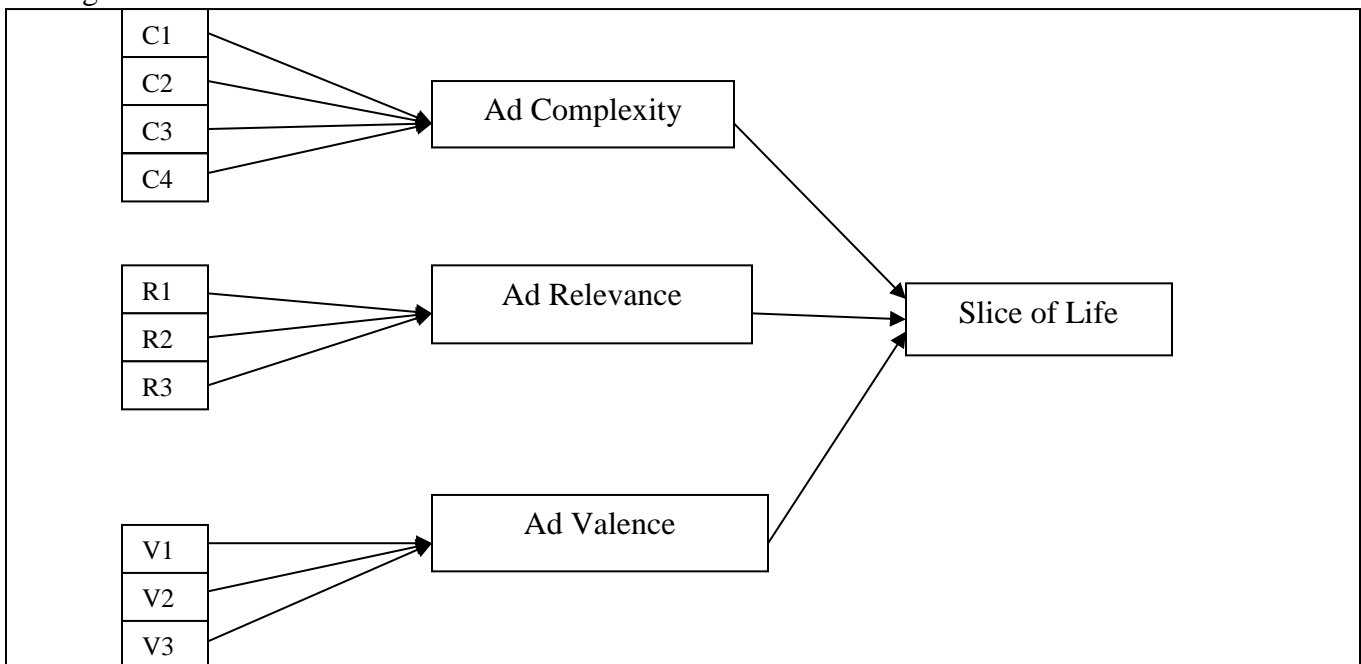
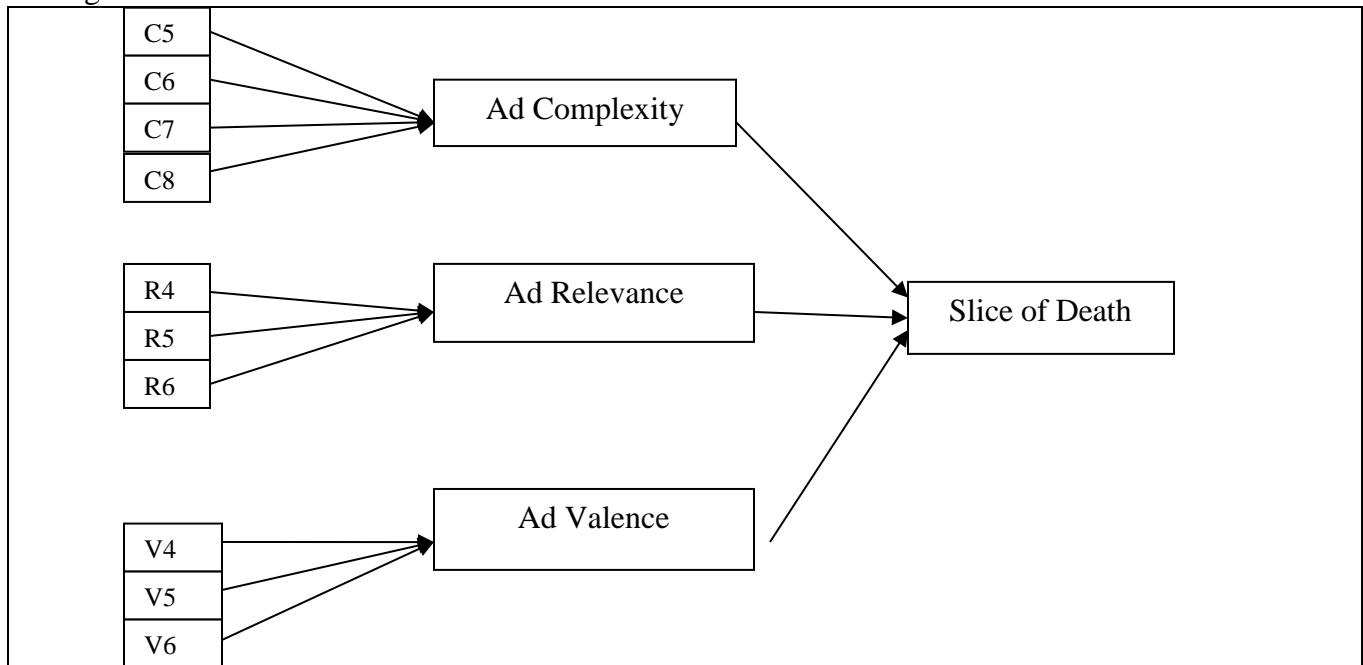


Figure 7: Slice of Death



Item Generation

The second section of the study is to develop the items for Ad Complexity, Ad Relevance, and Ad Valence to measure Slice of Life and Slice of Death Appeals. Participants were given three Slice of Life and three Slice of Death advertisements in random order and asked to list adjectives that describe the advertisements. A list of thirty adjectives were generated after removing duplicates. With the definitions for both Slice of Life and Slice of Death in mind a list of 28 statements were developed using the list of adjectives: fourteen for Slice of Life and fourteen for Slice of Death. This list was reduced even further to create a list that contains ten positive statements that measure Slice of Life and ten statements with a negative coding that measure Slice of Death. A list of the adjectives is listed below for each of the three factors that are being measured (See Figure 8). The following hypotheses were tested:

H1: Positive ad complexity, positive ad relevance and positive ad valence will predict Slice of Life.

H2: Negative ad complexity, negative ad relevance and negative ad valence will predict Slice of Death.

Figure 8: Slice of Life

Slice of Death

Proposed Dimensions	Proposed Items	Proposed Dimensions	Proposed Items
Complexity	Support	Complexity	Unsupportive
	Positive Community		Civic Duty
	Civic Duty		Negative Community
	Motivation		Action
Relevance	Relevant	Relevance	Non Relevant
	Relate		Unrelated
	Realistic		Unrealistic
Valence	Like	Valence	Unlikable
	Comfortable		Uncomfortable
	Lively		Dark

The three Slice of Life and three Slice of Death ads were then given to a focus group of 83 participants. A factor analysis was performed to determine the questions that grouped together to form the three factors that are used to test Slice of Life and Slice of Death appeals. The results indicate that for Slice of Life and Slice of Death Appeals the statements fall into three factors (See table 1). This indicates that the hypotheses were supported. The Cronbach Alpha's are within expectable levels.

Table 1: Component Matrix

	Three Factors for Slice of Life and Slice of Death		
	Ad Complexity	Ad Relevance	Ad Valence
I have a sense of community with this advertisement.	0.913		
This ad motivates me in a positive manner.	0.844		
I have a sense of civic duty from this ad.	0.919		
I am encouraged to support this cause or buy product after seeing this ad.	0.873		
I like this ad.		0.884	
I feel comfortable with this ad.		0.892	
This ad is relevant to society.		0.899	
I can relate to this ad		0.850	
This ad is dark and disturbing.			0.786
This ad is unrealistic.			0.786
Eigen Values	3.151	3.108	1.234
% of Variance	78.765	77.706	61.712
Cronbach Alpha	0.908	0.902	0.844

Extraction Method: Principle Component Analysis

Rotation Method: Varimax

Rotation Converged in 3 iterations.

Conceptual Model and Results

The next stage to the study is the understand the analysis of the overall conceptual model to examine Slice of Life and Slice of Death and its effects on ad believability, ad irritation, attitudes toward ad and ultimately the purchasing intention of young consumers (See figure 9).

The study also examines the following hypotheses:

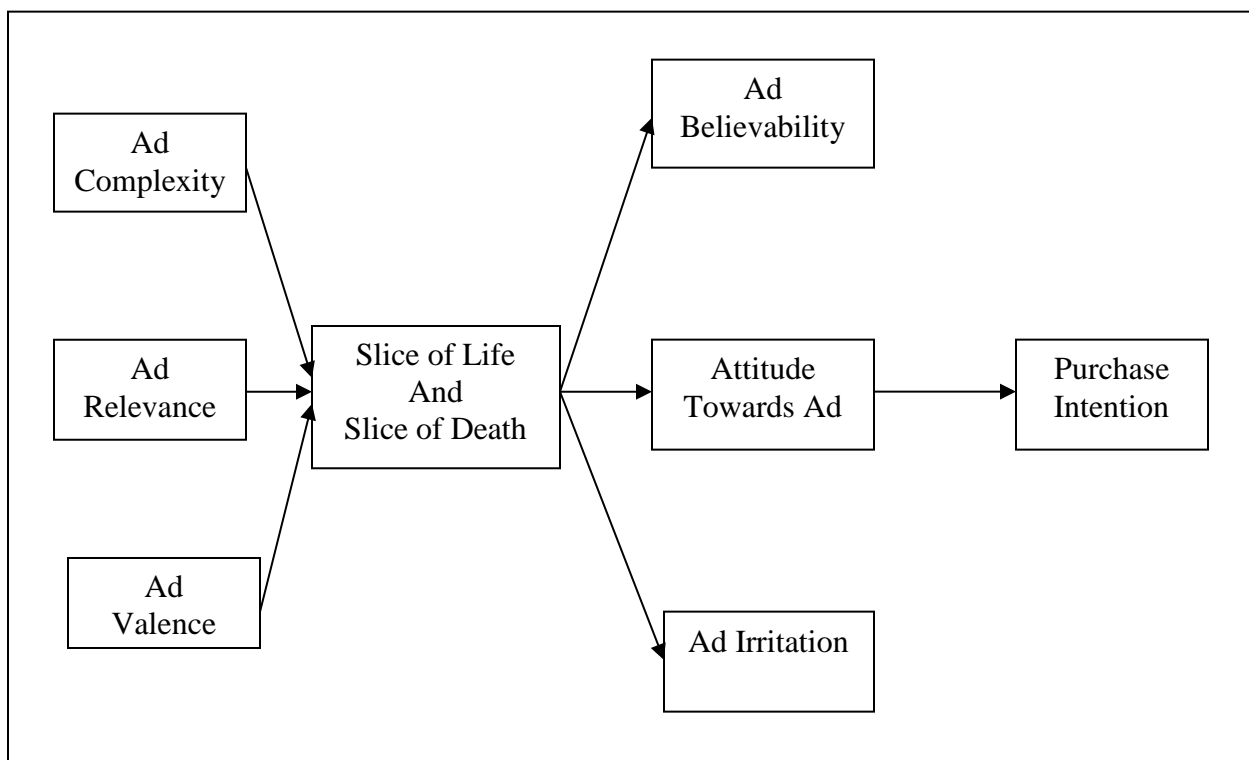
H4: Slice of Life will have a positive relationship with ad believability and ad irritation.

H5: Slice of Death will have a negative relationship with ad believability and ad irritation.

H6: Slice of Life will have a positive relationship with attitude toward brand and have a high purchase intention.

H7: Slice of Death will have a negative relationship with attitude toward ad and have a low purchase intention.

Figure 9: Conceptual Model



In order to test the model and hypotheses a sample of 81 participants from a Historically Black University that consisted of 44 males, 37 females, 65.9% between the ages of 21-25, 59% were senior, with 36.1% graduate students, and 72.3% were African Americans with 18.1% Caucasians was obtained. A correlation was performed with SPSS to test the relationship between Slice of Life, attitude toward ad, ad believability, ad irritation and purchase intention. All correlations had a significant positive correlation at a $p=0.01$ level (See table 2). The correlation was also performed for Slice of Death, attitude toward ad, ad believability, ad irritation and purchase intention. All correlations had significant negative correlation at a $p=0.01$ level (See table 3).

Table 2: Slice of Life Correlation

	Attitude toward ad	Ad Believability	Ad Irritation	Purchase intention
Slice of Life	0.670**	0.646**	0.582**	0.781**
Attitude toward Ad		0.939**	0.832**	0.620**
Ad Believability			0.884**	0.660**
Ad Irritation				0.597**

**Significant at $p=0.000$.

Table 3: Slice of Death Correlation

	Attitude toward ad	Ad Believability	Ad Irritation	Purchase intention
Slice of Death	-0.717**	-.0556**	-0.624**	-0.755**

Attitude toward Ad	0.643**	0.850**	0.645**
Ad Believability		0.669**	0.457**
Ad Irritation			0.583**

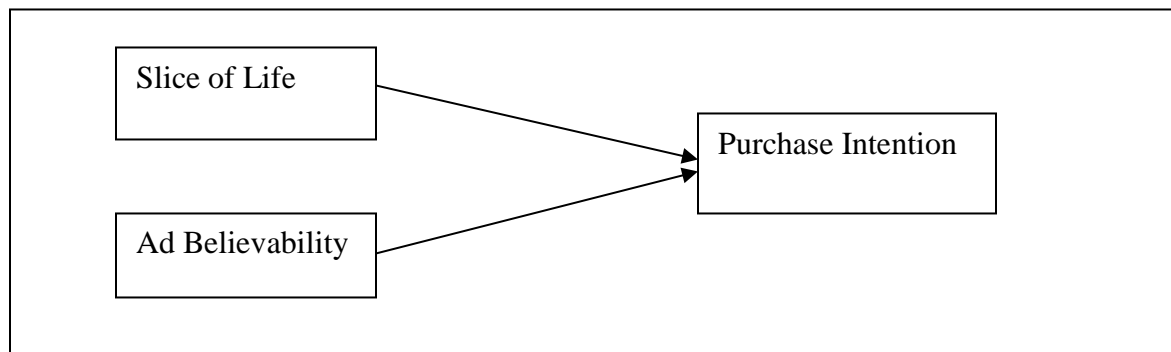
**Significant at p=0.000.

The next analysis was a multiple regression for Slice of Life, attitude toward ad, ad believability, ad irritation as independent variables and purchase intention as the dependent variable. The results indicate that the model with Slice of Life and ad believability as predictors of Purchase intention was significant ($F(2, 78) = 72.86, p=0.000$), with an R squared = 0.651 explaining 65.1% of the variability in purchase intentions (See table 4).

Table 4: Regression Analysis with Purchase Intention as Dependent Variable and Slice of Life and Ad Believability as Independent Variables.

Independent Variables	Beta	T-Value	P-Value
(Constant)		-1.952	0.054
Slice of Life	0.609	6.948	0.000*
Ad Believability	0.267	3.042	0.003*
R-Squared	0.651		

*Significant at the 0.05 level.

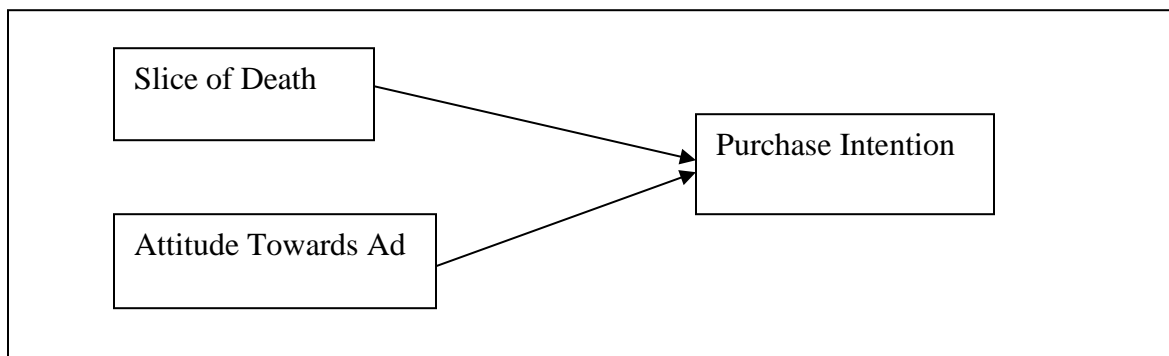


The next multiple regression for Slice of Death, attitude toward ad, ad believability, ad irritation as independent variables and purchase intention as the dependent variable was performed. The results indicate that the best model is Slice of Death and attitude towards ad as predictors of purchase intention was significant ($F(2, 78)=56.586, p=0.000$), with an R squared = 0.592 explaining 59.2% of the variation in purchase intentions (See table 5).

Table 5: Regression Analysis with Purchase Intention as Dependent Variable and Slice of Death and Attitude Towards Ad as Independent Variables.

Independent Variables	Beta	T-Value	P-Value
(Constant)		7.323	0.000*
Slice of Death	-0.630	-5.808	0.000*
Attitude Towards Ad	0.213	2.048	0.044*
R-Squared	0.592		

*Significant at the 0.05 level.



Discussion

The study examined Slice of Life and Slice of Death as two different appeals at two ends of the spectrum on young consumers and how they feel about Slice of Life and Slice of Death ads from the perspective of corporate social responsibility. This study has added to the literature in that this is the first time that Slice of Life and Slice of Death have been measured. Hypothesis one and two that Slice of Life and Slice of Death would be measured with Ad Complexity, Ad Relevance and Ad Valence was supported. This is a very important contribution to the literature as a way to now measure Slice of Life and Slice of Death. The relationships for all the factors were examined and the results were significant. For hypothesis three, the correlation for Slice of

Life was significant indicated that there is a positive relationship between Slice of Life, ad believability, attitude toward ad, ad irritation and purchase intention. This indicates that the same is true for hypothesis four; there is a negative correlation for Slice of Death indicating that there is a negative relationship between Slice of Death, ad believability, attitude toward ad, ad irritation and purchase intention. Hypothesis five that Slice of Life well have a positive attitude toward ad and have a high purchase intention was partially supported in that the best model was that Slice of Life and Ad Believability as independent variables were the best predictor of purchase intention for young consumers. Hypothesis six was support in that Slice of Death will have a negative attitude toward ad and have low purchase intention. This indicated that Slice of Death and attitude toward ad has an effect on purchase intentions of young consumers.

Limitations

There are several limitations for this study. The first is that although the study does contribute to the literature the sample size is small. A larger sample size is need for future research. Also a Structural Equation Modeling is needed to support the conceptual model that is proposed. The study was conducted at a Historically Black College which contributes the the literature, but a more diverse sample will improve the study significantly. This study would be better to measure participants from all walks for life and not just college students. This study contributed to the literature for Slice of Life and Slice of Death appeals and there is a lot of possibilities for future research.

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Detecting and Preventing Fraud in Accounting Field: Ethical Implications and Human Behavior

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ABSTRACT: This research primarily focuses on ways of preventing fraud in the field of accounting as well as detecting it. It incorporates the use of the Benford's law, the Bayesian fraud risk formula and the Fraud Triangle. In order to understand why people commit fraud the psychological and sociological aspects of human behavior need to be examined. Existing accounting procedures for fraud detection and prevention procedures need to be implemented to prevent fraud. In order to understand why people commit fraud, the research will also focus on ethical implications and ethics in the workplace Ethics plays a major role in the field of accounting, providing guidelines in the work place and affecting people's behavior. The research paper answers the following questions:

- *What compels people to commit a fraud?*
- *How can a fraud be prevented?*
- *How should existing accounting procedures be implemented in order to detect fraud?*
- *Does time play a significant role in detecting fraud?*
- *What needs to be done to influence people's behavior and change their mindset so they would not be engaging in fraudulent actions?*

KEYWORDS: accounting fraud, ethics, behavior, Fraud triangle, Benford's law, Bayesian fraud risk formula, detection, prevention, implementation

INTRODUCTION

The 2010 Report to the Nations on Occupational Fraud and Abuse, from the Association of Certified Fraud Examiners (ACFE 2010), estimated that fraud cost U.S. companies billions in 2009. Organizations lose an estimated 5% of annual revenues to fraud (ACFE, 2010). This suggests a need for researching fraud in the accounting field. In order to prevent the fraud, there are certain areas that must be examined first. Focusing on the psychological and behavioral aspects of committing fraud will lead to better understanding of the human behavior. Once the human behavior and the reasons why people commit fraud are examined then the research will focus on ways of preventing fraud as well as implementing the procedures already being used by the auditors. Finally, fraud detection will play a major role. Once the human behavior is understood, it makes it easier to find ways to detect the fraud. That will be done using the Bayesian fraud risk formula, Benford's law and the Fraud Triangle. In order to detect fraudulent actions, risk assessment must be completed first.

In the past there has been a lot of research focused on fraud in the accounting field. White collar crimes need to be prevented because of their costs for the companies engaging in the fraudulent actions. The importance of this research is to incorporate all the information readily available from the past research, implement it with new information and insight and give an overall guidance in dealing with fraud in the field of accounting. Rather than just focusing on one aspect of accounting fraud, this research will focus on all aspects and tie them together to create a broader picture. All of the studies done in the past have focused on either preventing fraud, detecting fraud, assessing potential risk, the behavioral aspect, the psychological aspect,

the Benford's law or the Fraud Triangle, while this research will inspect each by itself and also see the relationships between them and the effects they have on each other.

It is important to see how all of the aspects mentioned above affect each other and what needs to be done in the future in order to gain better knowledge of the fraud in the field of accounting. This research will serve the auditors, accounting practitioners and business managers in dealing with possible fraud and give better perspective on why do people engage in it. The purpose of this research is to explore all of the aspects that contribute to the fraud which will better the decision making process as well as prevent people from engaging in fraudulent actions.

THE LITERATURE REVIEW

As Ramamoorti and Olsen (2007) have argued: “Fraud is a human endeavor, involving deception, purposeful intent, intensity of desire, risk of apprehension, violation of trust, rationalization, etc. So, it is important to understand the psychological factors that might influence the behavior of fraud perpetrators.” The article, “*The Psychology and Sociology of Fraud: Integrating the Behavioral Sciences Component Into Fraud and Forensic Accounting Curricula*”, by Sridhar Ramamoor discusses the behavioral aspects of committing the fraud. It focuses on psychology, sociology, criminology and behavioral analysis in order to understand human behavior and minimize potential of fraud. Ramamoor explains the way these sciences are connected and how they could be used to detect fraud. As he states in the article “The rationale for drawing on behavioral science insights is evident from the intuition that one needs to ‘think like a crook to catch a crook.’” (Ramamoorti, 522). It also incorporates the use of the Fraud Triangle which could be referred to as “the means, motives and opportunity” (Ramamoorti). This

conceptual framework provides a model for better understanding why people commit fraud.

Kassem and Higson discuss the same topic in “*The New Fraud Triangle*” article. “The first side of the fraud triangle represents a pressure or motive to commit the fraudulent act, the second side represents a perceived opportunity, and the third side stands for rationalization” (Wells 2011)

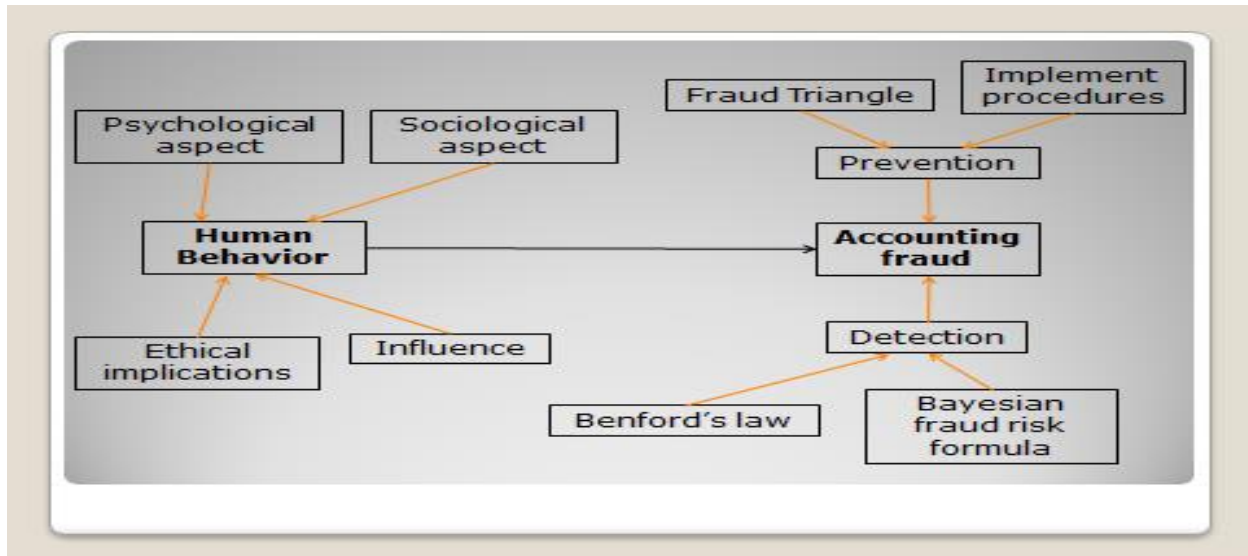
The article explains what drives people to commit fraud and how it could be prevented using the fraud triangle. “*The Evolution of Fraud Theory*” article by Dorminey, Fleming, Kranacher, and Riley, Jr. also discusses the use of the fraud triangle and the fraud diamond. It focuses on the risk assessment as well as understanding what compels people to commit fraud and how could that be prevented. Geyer introduces the Benford’s law as a statistical mean of detecting fraud in “*Detecting Fraud in Financial Sets*”. According to him, “Benford’s law is a probability distribution which is useful to analyze patterns of digits in numbers sets” (Geyer). The article explains what it is and also how to get the mathematical formula which would help detect fraud.

According to Steve Mar (2011), “Benford’s law, the 3-digit analysis led the auditors to an assortment of control and compliance failings, including instances of fraud, with original, hard evidence”. He published his research in “*Benford’s law- at the rescue*” where he showed the significance of the probability distribution and how it helps the auditors detect fraud by analyzing the first digit, the second, the third, etc. He explains Benford’s law using mathematical formula, logarithms, statistics and probability distribution. “*A synthesis of fraud theory*” by Trompeter, Carpenter, Desai, Jones, and Riley, Jr incorporates all of the ways of detecting fraud mentioned above as well as helps understand human behavior and reasons that make people undertake fraudulent actions. It discusses the Fraud Triangle and provides insight into strategies that auditors could/should use in order to detect and prevent fraud. It also discusses personality and individual differences as well as ethical implications leadership. According to Trompeter et

al, “The elements of this triangle include the act, concealment, and conversion. The Triangle of Fraud Action represents a model for detecting white-collar crimes and obtaining prosecutorial evidence. Evidence of the act, concealment, and conversion can be collected and presented during adjudication. Further, when considered in total, the Triangle of Fraud Action makes it difficult for the fraudster to argue that the act was accidental or to deny his/her role in the act. Evidence of concealment, in particular, provides a compelling argument that the act was intentional.” Richard H. Kravitz discusses morality of the accounting profession and ethical obligations of accounting practitioners in the article “*Auditor’s Responsibility for Detecting Fraud*” published in the CPA Journal in 2012. He talks about the fraud, what it is, how it is affected by the accounting profession and how ethics and morality play a huge role. Also he mentions the gaps in the GAAP (generally accepted accounting principles) which provides loopholes in the system and makes fraud easier to commit. Therefore it is important to develop the standards and principles better to minimize potential for fraud. Of course, he discusses the ways to prevent and detect fraud which are the same as the ones mentioned above and basically closes the circle. The research is based first on the human behavior, examining the psychological and sociological aspects that influence people to commit fraud. Once that is understood, next step is to evaluate the possibility of fraud and find ways to prevent it. Using mathematical formulas, algorithms, probability distribution the risk assessment can be done. After that the use of the fraud triangle, the fraud diamond and the fraud action help detect fraud and provide ways in preventing it. Once all aspects of accounting fraud are examined, challenges need to be identified and possible future research provided for better dealing the fraud. The challenges are discussed in “Challenges in detecting fraud identified” article published in Financial executive in 2010. Literature review provides a full research done in the past concerning accounting fraud but

not the relationships between different aspects of it. That is what this research is trying to do, to find correlations and relationships that make detecting and protecting fraud easier in the future and minimize possibilities of accounting fraud and its effects on other areas of business.

THEORETICAL FRAMEWORK AND HYPOTHESES



The graph above shows the conceptual framework for this research. Its main focus is to provide sufficient information to prove the relationship between the human behavior and accounting fraud. In order for that to be possible it is important to examine the psychological, sociological aspects and also other forces that influence human behavior. Once that is researched, ethical implications come into place because they play a significant role in the workplace. In order for people to make good ethical decisions they need to be ethical as well.

If that is not the case, ethical training should be provided for managers, shareholders and accounting practitioners. In order to minimize the potential for fraud, the relationship between these above mentioned need to be examined and proven that there is a relationship. People

respond to the influences around them and that is why behavioral sciences need to be consulted as well.

Once that is done, next steps are preventing fraud and detecting it. There are various ways to do so, but the ones used in this research are the fraud triangle, the fraud diamond, and benford's law. The fraud triangle and diamond serve as a framework in discovering potential for fraud and examine the forces that drive people to commit fraud. Benford's law is focused on discovering statistical and mathematical formulas that help auditors detect fraud. Since it is a probability distribution it inspects the first digits and therefore gives the frequencies of them repeating which when explored more in depth signal potential for fraud. It is important to assume the relationship between all of these external and internal forces that influence fraud in order to implement existing procedures and gain better insight. Also the loopholes in the GAAP need to be more researched because they give more potential to potential fraud. White collar crimes have been around for quite a while and therefore time and dedication are much needed as well as good, ethical procedures and rules to discontinue those practices. The expected outcome of this research is to show the positive relationship and find ways to better address it in future. The desired outcome is greater collaboration between different aspects that influence the fraud, better understanding and better knowledge that will lead in minimization of fraudulent actions in the future. The better the collaboration will result in the better outcomes and will positively affect the industry. Accounting fraud is viewed as the independent variable influenced by dependent variables such as human behavior and other aspects that influence it.

RESEARCH METHODOLOGY

The appropriate research methodology to gather relevant data for this particular data would be first to make a survey or questionnaire and to administer it to target groups in order to view which part of organizations and companies is at the most risk of committing fraud. I would assume that the group that is at the most risk would be managers and higher executives, also accounting, finance and operations departments. Once that is researched next step would be to analyze their daily behavior and apply psychology, sociology and criminology sciences to it in order to assess their behavior and possible reasons that would compel them to commit fraud. Also ethics and their morality should be assessed as well. The decisions made in the past would give answers to the ethical implications. Also if there was an ethical training provided and current code of ethics. When all of those are examined and put in software for statistics it would give answers on what aspects influence their behavior the most and the reason for it.

Given that the behavioral aspect is researched well enough and information gathered is relevant and reliable, next step would be to gather primary data from their companies related to accounting and finance departments and start analyzing it using the regression model to test for correlation and relationship between two. If the answers show that there is a positive relationship and big correlation between the data researched then the Benford's law will help determine the possibility of fraud as well as point out significant transactions that could relate to fraud.

Given the understanding of human behavior, the fraud triangle and the fraud diamond would be applied in order to find reasons why people with certain behaviors engage in fraudulent actions. Also employee compensation could play a significant role as in being the motivator. If they think they are being underpaid managers could engage in fraudulent actions just to get the money they think they deserve. There are a lot of factors that need to be examined in order to make a well informed decision and have it support this research.

Using statistics and mathematical formulas will provide better answers and help understand the factors and the outcomes better. In order for this research methodology to be successful it would take a lot of time and a lot of participants who are willing to be a part of the research. Possible limitations/problems with that would be that the participants who gave their consent to participate in the research would change their behavior and try to cover up for the past mistakes and unethical practices. This could be a potential downfall that could lead to completely misleading information and not contribute to the research purpose. If they know they are being observed, researched and asked to complete surveys they could cover up the truth and answer what they think would be the desirable answers. It would not be ethical but there would not be a way to prove they are doing it wrong or that they are doing it right.

If the human behavior could not be analyzed because of the misleading information that could prevent the research from formulating cause and effect relationships. But on the other hand, the statistical and mathematical formulas could still be used to determine the probability of fraudulent actions in the accounting processes and transactions. It would give the answers needed in order to develop better procedures and implement the existing ones in the accounting profession. Even though the whole research would not yield the desired outcomes at least one part of it would be better researched and more knowledge would be acquired and used in the future. That would present a starting point for the future researchers who would engage in researching the same issues. They would also have to find a way to deal with human behavior and understand it better in order to understand the cause and effect relationships between them.

DISCUSSION AND CONCLUSION

With regard to the previous section, the results found could make this research better and contribute to the field of accounting fraud but also could not make any significant changes if the information gathered is incomplete or misleading. If we were to make an assumption that the information is reliable and that human behavior plays a significant role in accounting fraud it would be easier to draw conclusions and find ways to investigate it even more.

The purpose of this research was to show that human behavior is influenced by their psychological and sociological characteristics and that understanding those could help prevent fraud and single out the individuals who are more likely to engage in fraudulent actions. Also the existence of ethical training and documents such as code of ethics and mission statements could help guide their decisions and influence them in a positive way. The downfall is that every person is a unique individual and would react differently to the same situations and problems.

The fraud triangle and the fraud diamond help guide the process of discovering potential fraud and show what aspects of a specific human behavior are the ones responsible for doing so. Those aspects should be examined as well in order to have a complete overview. When it comes to probability of the fraud occurring and ways to detect it, mathematical formulas, algorithms, probability trees and distributions would provide the answers needed.

The purpose of this research is to find reasons behind human behavior that influence them to make unethical decisions and engage in fraudulent actions. Also if the human behavior is studied and understood it makes it easier to engage in ways of preventing and detecting fraud once the starting points are known. It also makes it easier to narrow the target groups and focus more effectively on it. Then statistics could give the answers needed and would define the

possible relationships. All of this would lead to finding ways to change the current situations and change the future outcomes and minimize the possibility of fraud in the area of accounting.

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THE UNITED STATES ENERGY SUPPLY SYSTEM: THE INFLUENCE OF PRODUCTION, POLITICS, AND SUSTAINABILITY

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ABSTRACT

This paper serves as the first part of an investigation into the impact of federal legislation on the opportunity cost of meeting the US energy demand. The US Energy system is examined to identify the key components and drivers influencing proposals to transition from energy sourced from fossil fuels to a renewable energy based system. The influential subsystems within the US energy system, the energy production system, political system, and sustainability system create a feedback mechanism transitioning price changes from a basis in consumption to advocacy. Understanding the influences of each component is crucial to analyzing potential system-wide changes.

INTRODUCTION

Energy is the driving force of civilization and the global economy; consequently, securing its supply is foremost on our minds. Since the dawn of the industrial revolution economic growth has been tied to cheap and plentiful supplies of energy (Rapier, 2012). During the intervening 250 years, the industrial landscape has changed from wealth built upon tangible products to knowledge management services. In this same period, the predominant source of energy remained fossil fuels in the form of coal, natural gas, and petroleum. The persistence and plentifulness of fossil fuels created a worldwide structural dependency on energy and energy sources (Rapier, 2012). Today, the prodigious consumption of energy by the United States' (US) economy creates a continual social and political debate over how to meet our current and future energy needs. The positions and coalitions formed in the debate are diverse and flexible as politics, technology, and information continually alter the energy debate landscape. The preponderance of the energy debate remains focused on the economic, security, environmental, and social impacts attributable to the externalities of the US energy system. A transition from a fossil fuel based energy system to a renewable energy based system is a commonly proposed and advocated cure to the US energy system externalities. The proposed renewable energy solutions are based more on knowledge believed to be true, the Greek *doxa*, than on knowledge known to be true, the *episteme* (Hirschheim, 1985). The purpose of this research paper is to investigate the US energy system, the component entities and their interrelationships, and to further the understanding of the US energy system interactions in order to transform the *doxa* regarding a renewable base energy system into an *episteme* of the US energy system.

DEFINING THE ENERGY SYSTEM

An investigation of US energy policy should begin with an appreciation and understanding of the systems contributing to the US energy system. The US energy system exhibits the system-of-systems traits: physically distributed systems, dependency on the functionality of linkages

between distributed systems, heterogeneity, and the integration of sentient systems described by DeLaurentis and Callaway (2004). The individual systems comprising a system of systems should reflect the purpose of the system and be relevant to the phenomena observed in the system of systems (Laszlo & Krippner, 1998). Based on the system of systems traits identified by DeLaurentis and Callaway (2004) and the empirical construct of systems offered by Laszlo and Krippner (1998), the component systems in this research are defined as interconnected entities affecting the group through their relations and interactions with other entities in the group. The component systems are themselves individual systems constructed of interconnected entities and interrelationships and, when considered in the context of a system of systems, form a hierarchical order (von Bertalanffy, 1969). The boundaries of each component system are defined by the actions more or less directly related to the purpose of the system; all remaining actions not characteristic to the system's purpose are considered variables resident in the system's environment (Easton, 1957). In the context of this research the US energy system of systems is the construct formed by the interrelationships of the energy environment, the energy production system, the US political system, and the sustainability system.

THE US ENERGY FLOW

The flow of energy through the US energy system is regulated by federal legislation, supplied with resources from around the world by multi-national corporations subject to US and International laws, global societal pressures, and the volatility of the international market. In order to understand the implications of transitioning the US energy system to a renewable energy based system, the US energy flow through the US energy system is investigated to determine the interrelationships of its components. In 2011 the US energy production system provided 97.3 quadrillion Btu of energy for US consumption, of which 78.1 quadrillion Btu were sourced from domestic production and 18.2 quadrillion Btu (18.9%) from net import production (EIA, 2013). The required energy consisted of 79.9 Quadrillion Btu from fossil fuels, 8.2 quadrillion Btu from nuclear power (uranium), and 9.2 quadrillion Btu sourced from renewable energy (EIA, 2013). The flow of energy resources depicted in Figure 1 represents the movement of energy natural resources through the US energy system (EIA, 2013). The raw energy resources flowing into the US energy system, both domestic and imported, include fossil fuels, uranium, and renewable energy sources.

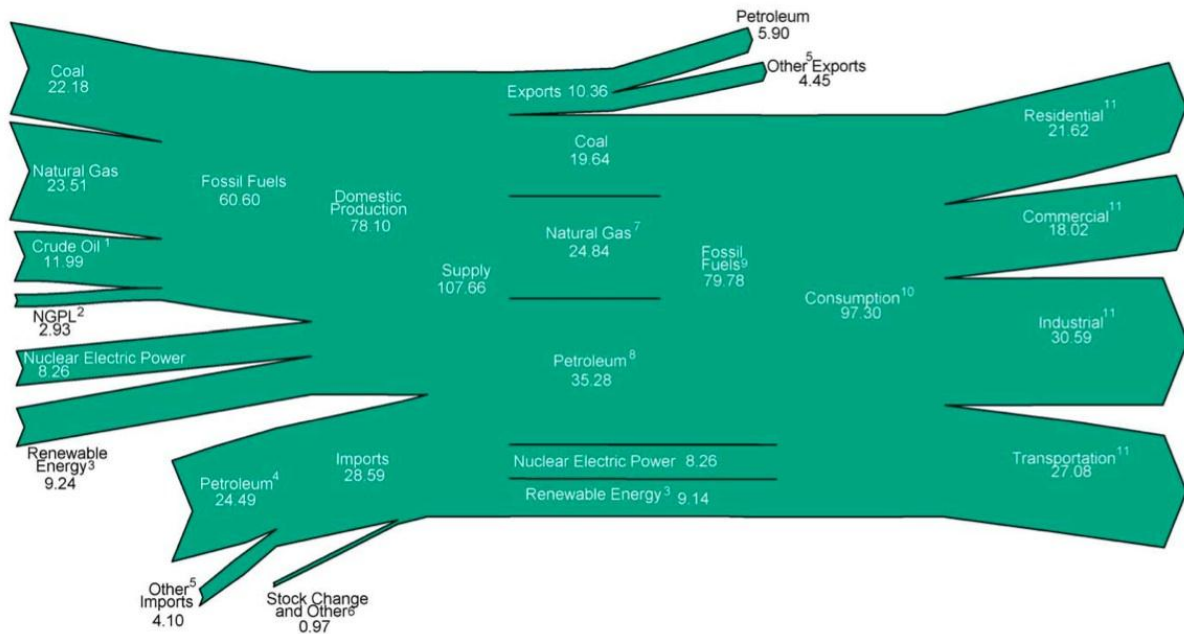


Figure 1. US Energy Flow (EIA, 2013)

Fossil Fuels

The fossil fuels powering the US energy system are coal, natural gas, and oil and petroleum products. Fossil fuels are formed by anaerobic decomposition of plant and animal biomass over millions of years through exposure to high temperatures and pressures (EIA, 2013). The fossil fuels have a high energy content due to their carbon and hydrocarbon rich composition and therefore yield a high percentage of energy return on energy invested (EROEI) in production (EIA, 2013). The high EROEI of fossil fuels is a significant reason fossil fuels comprise 86.9% of the global energy demand (BP, 2013).

Fossil fuels account for 82.1% of the US energy system's primary energy supply (EIA, 2013). The energy produced from fossil fuels is used to produce electricity and provide energy in various forms to the residential, commercial, industrial, and transportation sectors, Table 1. To meet demand, integrated and national oil companies continually seek to increase their proven reserves (Bern, 2011). The quality of oil reserves are referred to as (1P), known proven reserves, (2P) for proven and probable reserves, and (3P) proven, probable, and possible reserves (SPE Oil and Gas Reserves Committee, 2011). The reserve criterion is based on the probability of recovery in the current economic, political, and technological environment (Bern, 2011). At present, the estimated recoverable reserves of coal equals 259 billion short tons, sufficient to meet US demand for over 250 years based on current demand (EIA, 2013). The quantity of technically recoverable natural gas, 2,214 trillion cubic feet (Tcf), would sustain US demand for 86 years at the current consumption rate of 25.46 Tcf a year (Gruenspecht, 2012). As of 2012, the worldwide proven reserves of oil was 1,668.9 thousand million barrels and the US proven reserves totaled 35 thousand million barrels (BP, 2013). At the current annual global

consumption rate of 32.7 million barrels per year, the worldwide proven reserves would sustain global demand for 51 years (EIA, 2013).

	Energy Use ¹	Electricity Generation	Residential ²	Commerical ²	Industrial ²	Transportation ²	Total Energy Use
Coal	17.4	41.7%	-	0.5%	6.2%	-	18.3%
Natural Gas	26.0	24.4%	40.2%	35.7%	36.4%	2.9%	27.3%
Oil	34.7	0.6%	9.6%	7.6%	34%	92.5%	36.5%
Nuclear	8.05	21.1%	-	-	-	-	8.5%
Wind	1.36	3.6%	-	-	-	-	1.5%
Solar	0.235	0.1%	1.8%	-	-	-	0.25%
Hydro	2.69	7.0%	-	-	0.08%	-	2.8%
Geothermal	0.227	0.4%	0.37%	0.24%	-	-	0.25%
Biomass	4.32	1.1%	4.0%	1.3%	9.2%	4.3%	4.6%

Note:
 1. Energy use is listed as quadrillion Btu of energy utilized.
 2. Energy provided by electricity is not included.
 3. Source: (Lawrence Livermore National Laboratory, 2013)

The combustion of fossil fuels to generate energy creates greenhouse gas (GHG) emissions, land utilization, water consumption, and social impact externalities. The GHG emissions generated by fossil fuel use include sulfur dioxide (SO₂), contributing to acid rain and respiratory illnesses, nitrogen oxides (NO_x), contributing to smog and respiratory illnesses, and carbon dioxide (CO₂), which absorbs heat radiation in the atmosphere (EIA, 2013). The recovery of fossil fuels requires land and ocean utilization for mining and drilling operations and the transmission and distribution infrastructure to transport the raw and refined energy products (EIA, 2013). In addition, developing new recovery techniques requires strict control measures to handle, store, and treat the water used in recovery to avoid contamination of local land and water sources (EIA, 2013). The summation of these externalities creates a social advocacy concerned with the effects and impact fossil fuel use has on the environment (Brown & Sovacool, 2007).

Uranium

Nuclear power plants use nuclear fission reactions to split a nucleus in to smaller parts releasing free neutrons and large quantities of energy (EIA, 2013). The refined uranium-235 used in nuclear electric power generation in the US is produced through the refining of the non-renewable resource, uranium. The US nuclear energy sector consists of 65 nuclear power plants operating a total of 104 reactors located in 31 states (EIA, 2013). In 2011, nuclear power provided 8.05 quadrillion Btu of electricity generation, 8.5% of the US energy system, Table 1. The majority of the 58 million pounds of uranium concentrate (U₃O₈) purchased in 2012 to power the US nuclear reactors was imported from Russia, Canada, Africa, and Australia (EIA, 2013). The direct use of nuclear power does not generate GHG emissions; however, a social impact exists due to the potential for accidental release of radioactive gases and waste material. The recent nuclear accident at Japan's Fukushima nuclear power plant rejuvenated the global debate about the environmental and safety risks of nuclear power (BP, 2013). The perceived

safety concerns associated with nuclear power contributed to the 6.9% global decrease in nuclear power generation (BP, 2013).

Renewable Energy

The renewable energy sources contributing to the US energy system include wind, solar, hydroelectric, geothermal, and biomass. Renewable energy is a classification of energy sources originating from the power of the sun, gravitational attraction between the Earth and the moon, and the Earth's geothermal activity (Goldemberg, 2012). A variety of methods are used to harness the kinetic, potential, and thermal energy contained within the renewable energy sources (EIA, 2013). Technological advances and decreasing production costs have led to renewable energy generating 8.6% of the global energy demand (BP, 2013).

In the US, renewable energy accounts for 9.4% of the US energy system's primary energy supply, Table 1. The energy produced from renewable energy is primarily used to generate electricity (55%), provide energy in various forms to the residential, commercial, and industrial sectors (32%), and biofuel for transportation (13%) (Lawrence Livermore National Laboratory, 2013).

The direct and indirect use of renewable energy generates GHG emissions, land utilization, water consumption, and social impact externalities. The environmental impacts include GHG emissions from the equipment used during production, transmission and end-use utilization (EIA, 2013). Land utilization and water contamination are externalities created during the production of biomass, the establishment of water reservoirs, and the collection of wind, solar, and geothermal energy (EIA, 2013). The environmental and social impact of renewable energy is a two dimensional problem created primarily during the production and harvesting of the energy and secondarily from consuming the energy (Abbasi & Abbasi, 2000).

Energy Demand

The supplied energy resources combine to meet the total US energy demand of the residential (21.6 quadrillion Btu), commercial (18 quadrillion Btu), industrial (30.6 quadrillion Btu), and transportation (27.1 quadrillion Btu) sectors (EIA, 2013). The residential sector energy consumption per household, accounting for heating, cooling, electrical, and miscellaneous loads, is expected to decrease 22% in 2040 due to the sector's declining energy intensity (EIA, 2013). The declining energy intensity is a product of increasing energy efficiency standards for heating and lighting (EIA, 2013). The commercial sector energy consumption per square foot is expected to decrease 0.4% annually to 2040 (EIA, 2013). Energy intensity reductions of 10.8% are expected from 2011 to 2040 as a result of the increased energy efficiency standards regulated by Title IV of the Energy Independence and Security Act (EISA) of 2007 (H.R. 6, 2007). The industry sector consumption is expected to increase by 19% from 2011 to 2040 while industrial shipments increase by 76% (EIA, 2013). The increasing energy efficiency is projected based on an industrial shift from energy-intensive production of chemicals, refining, and raw material processing to the less-intensive production of computers and transportation equipment (EIA, 2013). The transportation sector is expected to increase by 18 to 58% based on economic growth

(EIA, 2013). The projected growth in consumption is partially offset by the improved average fuel economy standards regulated by EISA 2007 (H.R. 6, 2007).

Supply

The US energy system's primary goal is to supply the energy demanded to facilitate the growth of the US economy. Achieving this goal is possible through a combination of demand-side management (DSM) and supply forecasting. Energy DSM evolved from the 1970s oil crisis through a combination of energy conservation programs, legislative mandates, and advances in technology (Bhattacharyya, 2011). Supply forecasting, and the concern over energy supplies, was also elevated by the 1970s oil crisis (Bhattacharyya, 2011). The current challenge to the US energy system is how to supply "clean," reliable, and affordable energy in sufficient quantities to meet the demand (Verrastro & Ladislaw, 2007). This research project will focus on the interrelationships affecting the supply side of the US energy system.

ENERGY SYSTEM OF SYSTEMS

The operation and effectiveness of the energy system can only be understood through an investigation of the entities constituting the system. The extent and composition of the US energy system includes economic, societal, and environmental costs hidden beneath layers of balance sheets, legislation, and information released by advocacy groups (Rapier, 2012). These layers form from the compounding influence of the energy environment and indirect control of the energy production system, the US political system, and the sustainability system. The energy environment represents a multitude of sources outside the system that shape the context and constraints influencing energy production, political, and sustainability systems to create the US energy system of systems. The energy production system accounts for producing the requisite energy to supply the continually increasing demand. The political system establishes the legislative regulations governing the US energy system and determines the taxes, mandates, and incentives effecting the distribution of energy sources. The sustainability system represents the advocacy associated with energy system's externalities. The combination of these systems contributes to the organized complexity of the US energy system-of-systems and influences the efficiency of the US energy supply system.

THE ENERGY ENVIRONMENT

The energy powering the US economy, irrespective of its source, is an international commodity crucial to every aspect of modern global society. In spite of the recent downturn in US energy consumption, global energy consumption increased 1.8% to 530.4 quadrillion Btu in 2012 (BP, 2013). The International Energy Agency (IEA) forecasts continued growth in energy consumption based on increasing global population and economic development (Miller, 2011). The current increasing energy demand originates in the emerging economies of China and India, driving a 10-year average energy consumption increase of 2.6% (BP, 2013) and stoking concerns over the future supply and price of energy. Along with demand, the energy environment affects the availability of economically cheap energy through geopolitical events, from nuclear reactor damage in Fukushima following a tsunami to the political unrest following the Arab Spring revolutions in the Middle East (EIA, 2013). In addition to increasing global energy consumption

and energy security; the US energy system environment faces the structural challenges of the US legislative process, inadequate energy distribution networks, calls for energy independence, and growing concern for energy's influence on climate change. The aggregate effects of these influences form the components of the energy environment in which the US energy systems operates, Figure 2.



Figure 2. Components of the Energy Environment

Geopolitics and Pricing

Bielecki (2002) defines energy security as the cost effective, reliable and consistent supply of energy to meet the needs of an economy. The concentration of energy resources in politically unstable regions and the increasing cost of energy creates an energy security issue for the economic powerhouses of the United States of America, the European Union, Russia, and China (Jun, Kim, & Chang, 2009). The global disruptions resulting from war, geopolitical turmoil, sanctions, extreme weather, and unforeseen infrastructure maintenance create a persistent challenge to the management and distribution of energy resources (IEA, 2012). The continuing political unrest spreading throughout the organization of the petroleum exporting countries (OPEC) and the increasing energy demands of emerging economies further elevates the supply-side risks in the international energy market (IEA, 2012). Because fossil fuels are priced on a worldwide market, the growth in energy consumption among emerging economies and the uncertain geopolitics of OPEC translate into changes in international supply and demand affecting the energy prices in the US (Metcalf, 2008).

Legislation

The US energy policy is determined by an amalgamation of federal, state, and local governments using legislation, taxes, subsidies, conservation measures, and financial assistance in the form of grants and loans. The policies established by each level in the US government hierarchy contribute to the US energy policy. The US federal government's energy policy is primarily implemented through fiscal policies enacted using taxes and mandates to discourage behavior and tax subsidies to encourage behavior (Lazzari, 2005). The challenge of identifying and analyzing the direct and indirect effects of federal tax policy on the energy system is highlighted by the approximately 200 bills containing energy related taxes, incentives, and subsidies introduced during each Congress (Lazzari, 2005). The proliferation of legislation impacting the

energy sector and the two-year congressional election cycle impact long-term energy investments due to the uncertainty of energy production and investment tax credit renewals (Metcalf, 2009). The increasing number and complexity of energy regulations is the single biggest risk to long-term investing in the energy industry (Bern, 2011).

Infrastructure

A significant challenge for the US energy system is the conversion of raw energy resources and the transmission of processed energy to the source of demand (Verrastro & Ladislaw, 2007). Meeting this challenge requires an investment in infrastructure to support new energy products to supply the energy production system. The current energy infrastructure is aging and purpose built for fossil fuels; upgrades and new construction adaptable to renewable energy sources permit incremental expansion as technology and economic conditions change (Verrastro & Ladislaw, 2007). To achieve this level of adaptability, the US energy transmission and distribution network will require significant financial investments to meet the increasing and changing demand (Metcalf, 2009). Irrespective of the energy source, end-use energy must ultimately integrate with existing and new distribution networks if their economic and technological benefit is to be realized (Bern, 2011).

Energy Independence

The oil crises of the 1970s highlighted the US's dependence on foreign sources of energy and, among other things, led to calls for energy independence (Yergin, 2011). Energy independence is variously referred to as protection from commodity price volatility (Bielecki, 2002), uncertainty of known energy reserves (Yergin, 2011), geopolitical events (Winzer, 2012), and degree of interdependence between producer and supplier (Sovacool & Brown, 2009). In the US, the conceptualization of energy independence was born from, and continues to refer to, the energy system's vulnerability to the global energy market and to geopolitical upheaval (Winzer, 2012). An energy independence reorientation focused on increasing the diversity of supply, logistics of delivery, flow of international trade, and economic considerations will contribute to long-term security for the US energy system (Verrastro & Ladislaw, 2007).

Climate Change

The growing debate over climate change and the influence of greenhouse gas emissions directly and indirectly attributable to the energy system is an environmental problem with significant consequences for the energy sector. The social conscious, regardless of the underlying reasons, links the energy sector to climate change and the association is reinforced daily by the media and pop-culture (Giddens, 2009). The climate change advocacy group's positions reflect the spectrum of beliefs from skeptics who don't believe or feel attention should be given to greater social concerns, to the mainstream belief in the potential dangers and need for corrective action, and the radicals arguing we are beyond the tipping point and must prepare for the inevitable consequences (Giddens, 2009).

THE ENERGY PRODUCTION SYSTEM

Supply and Demand

The day-to-day operations of the US energy production system constitute the basic competitive market model of supply and demand. The US energy system competitive market consists of energy demand sectors (electricity generation, residential, commercial, industrial, and transportation) and the supply of energy natural resources (coal, natural gas, petroleum, nuclear, solar, wind, hydro, geothermal, and biomass), Figure 3 (Lawrence Livermore National Laboratory, 2013).

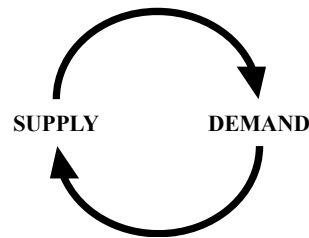


Figure 3. Energy Supply and Demand Causal Loop Diagram

The demand for energy is affected by changes in price, income distribution, population, and expectations; the shift in available supply is the result of price, technology, number of suppliers, and expectations (Krugman & Wells, 2009). The impact of the demand factors fed back to the energy supply is observable in the steady decrease in US energy consumption since the onset of the economic down turn in 2008 (BP, 2013). Changes in the supply and demand curves are not restricted to responses to global economic changes; the management of energy demand can be influenced through energy conservation programs (e.g. improved building codes) (Granade, Creyts, Derkach, Farese, Nyquist, & Ostrowski, 2009), federal legislation increasing efficiency standards (e.g. vehicle fuel economy) (H. R. 94-163, 1975), and changes in individual consumer behavior. Managing a shift in the available supply of energy includes increasing the quantity of proven fossil fuel reserves and decreasing the cost differential of producing energy from fossil fuels and renewable natural resources. Reducing technology and capital costs of renewable energy natural resources is a critical step in removing barriers to their widespread incorporation in the energy production system (Bern, 2011). When the energy system reaches equilibrium, the shifting demand and supply curves will settle on a market-clearing price for specific forms of energy (Krugman & Wells, 2009).

Long-Term Supply and Demand

The long-term operations of the US energy production system is a construct comprised of numerous actors balancing varied and competing externalities to meet the United State's energy requirements. A review of the historical US energy consumption and production from 1949 to 2011, Figure 4, reveals the changing consumption and production of the US energy system and the reliance on imported energy to meet the demand (EIA, 2013). Since 2005 the US net import of petroleum and liquid fuels has decreased due to decreasing energy consumption and increased domestic production (EIA, 2013). The increasing domestic production of crude oil since 2005 was spurred by high oil prices improving the economics of tight reserves and technologically advanced recovery techniques (EIA, 2013).

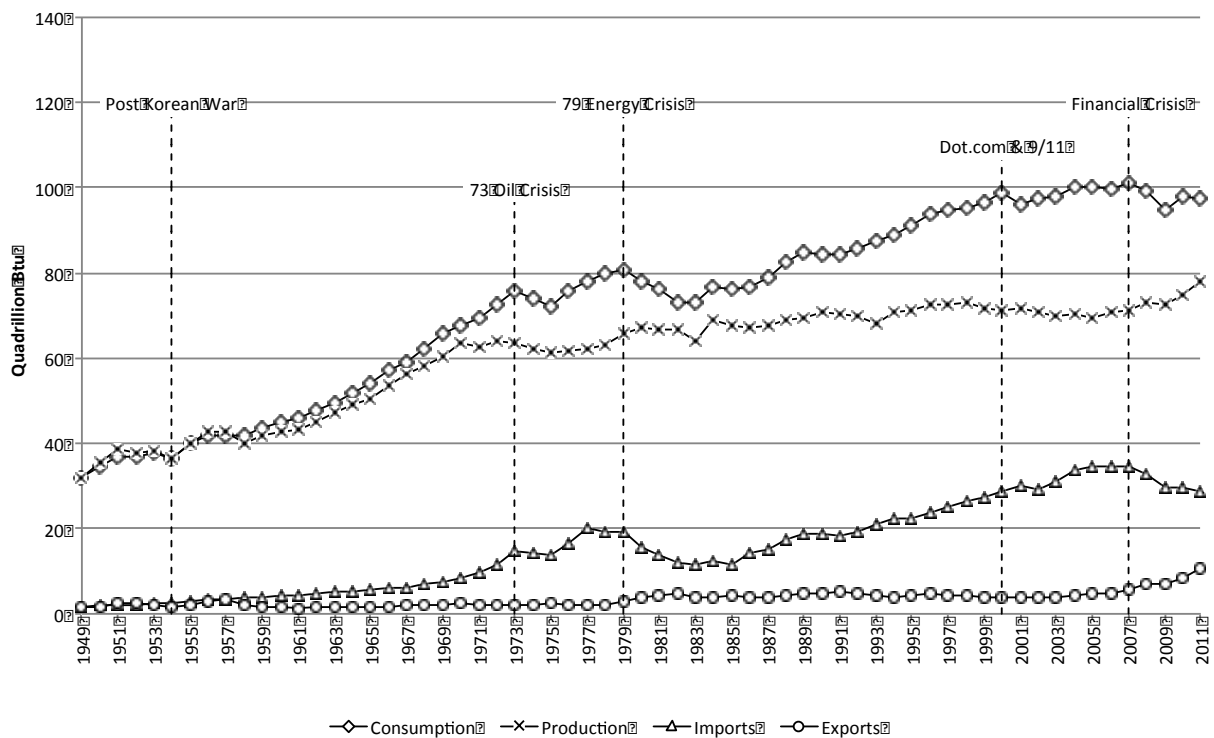


Figure 4. US Energy Consumption and Production Over Time, 1949 to 2011

The economic competitiveness of renewable energy generation is also increasing as economic incentives support their technological development and fossil fuels continue to increase in price (IEA, 2012). However, the long-term stability and growth of renewable energy is subject to the uncertain duration of favorable federal incentives, mandates, and the price of fossil fuels (IEA, 2012). The increasing volatility of fossil fuel energy prices stems from the uncertain business climate and the absence of quality data (Bern, 2011). As emerging economies consume more energy resources the resulting economic performance is clouded by the traditionally poor data quality coming from such markets, further contributing to volatile energy prices (IEA, 2012).

Peak Energy

The long-term energy production system is faced with a peak energy supply problem of increasing global energy consumption and decreasing quantities of cheap energy. The rapid exhaustion of fossil fuels is a common perception in the media and among advocacy groups (Brandt, 2007). Analyzing the rate of fossil fuel depletion is difficult, and in all likelihood not realistic, due to limited access to industry and national datasets concerning known resource reserves and the differing application of methodology and terminology among analysts (Brandt, 2007). Resource depletion to one analyst reflects the availability of “cheap” energy and to another indicates the exhaustion of a particular energy source. Akin to the peak oil debate, peak energy will be driven by an inadequate supply of energy recoverable at an affordable price (Miller, 2011). The continued rise in global energy consumption will further decrease the available supply of cheap energy, Figure 5. The reinforcing relationship of the supply of and demand for cheap energy will continue until the global energy market reaches a peak price point

for energy. Only demand, the cost of producing useable energy, and the price consumers are willing to pay for energy, influence the determination of peak energy. This price point will occur regardless of the known quantities of energy reserves. An abundance of known energy reserves in and of itself will not satisfy demand if the economic cost is prohibitive.

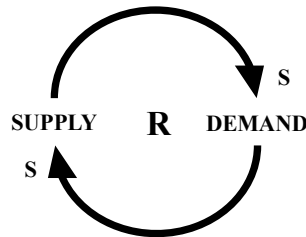


Figure 5. Peak Energy Price Causal Loop Diagram

SUSTAINING THE ENERGY PRODUCTION SYSTEM

The global and US energy environments continue their voracious appetite for energy, consuming a combined 524 quadrillion Btu in 2010 (IEA, 2013). By 2040, the US EIA projects global energy consumption will increase 56% to 820 quadrillion Btu (EIA, 2013). The cyclical nature of the US energy consumption, Figure 4, observed during the major recessions of 1955 (post Korean War), 1973 to 1975 (OPEC oil crisis), 1979 to 1983 (1979 energy crisis), 2001 to 2003 (dot-com bubble and 9/11 attack) indicate the 2007 to 2009 (housing bubble and global financial crisis) recession will be followed by an increase in energy consumption as the economy grows. Therefore, it is reasonable to assume the US energy consumption will continue to increase as the US economy stabilizes. Sustaining the long-term energy production system necessitates augmenting the known supply of energy natural resources. The necessary strategy involves a combination of discovering new reserves of fossil fuels and developing renewable energy sources capable of supplying energy at a competitive price (Bern, 2011). The new sources of energy can augment the existing energy supply to transform the current reinforcing loop, Figure 5, of increasing energy prices to a balanced loop based on less volatile prices due to a diverse and stable supply of economical energy, Figure 6.

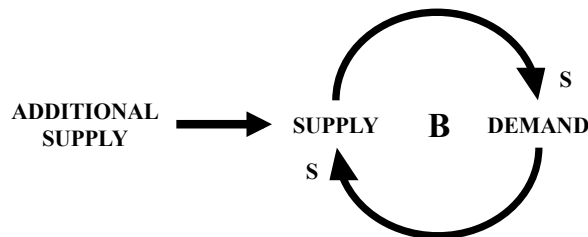


Figure 6. Sustaining the Energy Production System

Augmenting the current fossil fuel supply necessitates expanding the quantity of proven reserves, advancing recovery technology, and developing cleaner combustion methods for converting raw material to energy. The ability of integrated oil companies to grow the proven reserve base has become increasingly complex and uncertain as state-owned and national oil companies control

79% of the global reserves (Bern, 2011). In spite of the concentrated control of reserves, the overall prospect for growth in natural gas and petroleum is strong due to the deepwater pre-salt reserves in Brazil, bitumen in Canada, and tight oil in the US (EIA, 2013). Technology improvements are yielding improved natural gas and oil recovery through the new drilling techniques fracking and hydrofracking and research focused on methods to reduced coal combustion emissions using carbon capture sequestration (Bern, 2011). In addition to fossil fuels developments, renewable energy research is advancing the research and development of energy production and storage capacity to provide a constant power source (Levi, 2013). Regardless of the source of energy, to participate in the competitive market, new fossil fuels and renewable energy projects must be profitable and economically sustainable throughout the project's life regardless of current or proposed government subsidies (Bern, 2011).

Political System

The political system's contribution to the US energy system of systems concerns the process and influences on the decisions made and the legislation enacted (Easton, 1957). According to Easton, the legislative decisions, outputs of the system, are predominantly driven by the inputs to the system, demand for action and the level of support for such action given by the populace in question. Easton establishes the model's boundaries to include all the actions and influences directly related to policy-making and legislative enactment. Further, Easton asserts significant policy changes originate from external influences. However, societal demands fluctuate with the environment; therefore, promotion of policies require continued support to attain a legislative goal (Easton, 1957). The external influences of an advocacy group's desired legislative actions and the required social support represent temporal alliances or conflicts depending on the nature of requested legislation and the desires of society at large, Figure 7. Therefore, the political system, in the context of advocacy for legislative action can operate as a reinforcing loop when advocacy and social support are in agreement or as a balancing loop if they act in opposition to each other.

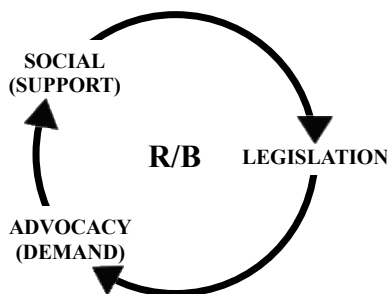


Figure 7. The Demands and Support for Legislative Action

Advocacy organizations exist to promote policy and their influence in the political process has steadily increased since the 1960s (Andrews & Edwards, 2004). Andrews and Edwards found an equal division of for-profit, non-profit, and public interest groups actively lobbying in Washington, DC. Notwithstanding cause, advocacy organizations influence policy process through: 1) agenda setting, 2) access to decision-makers, 3) achieving favorable policies, 4) actively monitoring and crafting policy, and 5) establishing institutional goals and visions (Andrews & Edwards, 2004).

The political system's ability to formulate long-term policy is affected by intertemporal choice between present and future welfare (Nordhaus, 1975). The welfare choice is amplified by a weighting function of policy action during an election cycle versus policy driven as required (Nordhaus, 1975). The difficulty of enacting long-term and meaningful legislation resides in the two-year election cycle of Congress and the populace's focus on immediate concerns. The transmission and reception of information between the populace, advocacy groups and general social support, and their government representatives flattens the policy-making process and may encourage political party negotiation to reduce the cyclic variability (Nordhaus, 1975; Andrews & Edwards, 2004).

The US Congress is susceptible to a perceived need for immediate action by the demands of constituents in response to energy system externalities. The US government and advocacy groups fundamentally believe the competitive market forces are incapable and/or unwilling to develop new sources of energy (Grossman, 2009). This belief is based on the assumptions that innovation is a demand-side phenomenon, technically viable energy sources require government support for commercial viability, and feasible and cost competitive energy sources will gain immediate widespread adoption (Grossman, 2009). The government legislative solutions born of these beliefs are often illusory given the significant technical complexity and interrelationships of energy externalities and the information-poor nature of these emotion-laden issues (Grossman, 2012).

Sustainability System

The sustainability system serves as an economic link between technological choices and the social and environmental consequences. In the context of natural resources, environmental sustainability constitutes the maintenance of natural resources capital (Goodland, 1995). The concept of sustainability is not new, Adam Smith prominently stated the idea in the opening lines of *An Inquiry into the Nature and Causes of the Wealth of Nations* specifying the purpose of annual labor is to fund a nation's necessities of life, which it annually consumes (Smith, 2005). Environmental sustainability, in modern times, was popularized by Garrett Hardin's (1968) *The Tragedy of the Commons* in which he states individual self-interest uses common resources without regard for, and to the detriment of, the masses. The sustainability system impacts decision making by presenting quantifiable measurements of economic, environmental, and social indicators associated with technological decisions (Figge, Hahn, Schaltegger, & Wagner, 2002). Advocacy groups create reinforcing (advocated policy increases externalities) or balancing (advocated policy decreases externalities) loops through capturing the consequences of energy externalities in quantifiable sustainability indicators to demand corrective or protective action, Figure 8.

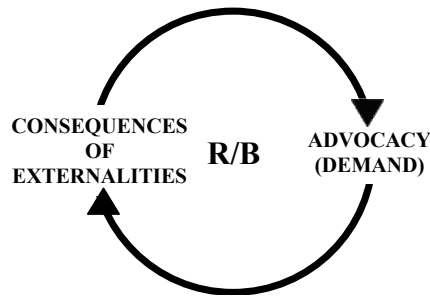


Figure 8. Advocacy for a Sustainable System

The sustainability system captures the social and environmental concerns associated with technological decisions and presents decision makers with economically quantifiable indicators. Assigning monetary values to sustainability indicators quantifies for society the sacrifice required to achieve sustainable levels of consumption (Hueting & Bosch, 1991). Early environmental indicators originated with social science and analytical chemistry research in monitoring of air and water quality (Hezri & Dovers, 2006). In the energy debate, environmental indicators include the price of electricity generation, greenhouse gas emissions, availability and technological limitations, efficiency of energy generation, land use, water consumption, and social impacts (Evans, Strezov, & Evans, 2009). Brown and Sovacool (2007) propose the addition of oil security (% of oil from imports, \$ per barrel, % of non-petroleum transportation fuels, and average fuel economy), energy efficiency (energy intensity and per capita use of energy), electricity reliability (% of natural gas imports, price of natural gas, retail price of electricity, and investments in electric transmission), and environmental quality (SO₂ and CO₂ emissions) as dimensions and indicators of energy sustainability. The concept of sustainability extends beyond the first order effects to include the secondary effects of social changes in the form of labor redistribution, habitat interference, noise pollution, and aesthetic degradation (Abbasi & Abbasi, 2000). Quantifying these sustainability indicators requires specifying relative and absolute indicators for environmental, social, economic, and technological dimensions (La Rovere, Soares, Oliveira, & Lauria, 2010).

ENERGY SUPPLY SYSTEM OF SYSTEMS

The US energy supply system of systems, Figure 9, is the integrated set of the energy production system, the political system, and the sustainability system representing the major externalities of the US energy supply. The steadily increasing consumption of energy in the US, Figure 4, challenges the US energy production system to continue to supply the nation with cheap energy. The changing economic growth influences the production of energy through the changing economic viability of energy recovery from the different sources. As the supply of cheap energy decreases, additional economically viable supplies are required to augment the supply system. The legislative environment created by the political and sustainability systems influences the availability of additional supplies. The enacted legislation, regulation, and mandates lead to favorable or unfavorable environments for different sources of energy. The resulting change creates a pseudo form of centralization where political action controls the energy production system instead of the competitive market. The ability to change the market through legislation in place of competitive market action serves as a feedback mechanism to under-represented

advocacy groups. Such advocates can influence the legislative process toward energy related issues with or without the social support of the general populace.

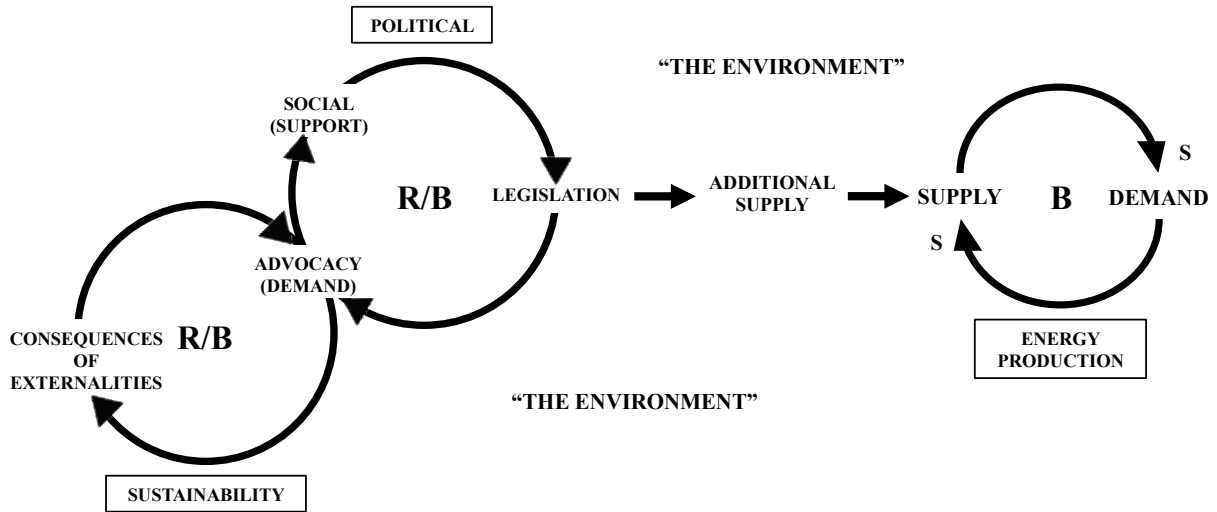


Figure 9. The Energy Supply System of Systems

CONCLUSIONS: UNDERSTANDING THE ENERGY SUPPLY SYSTEM OF SYSTEMS

The US energy supply system is a complex, multi-faceted entity that cannot be easily characterized or defined. The systems epistemology of the US energy system emphasizes the need to understand the components, interrelationships, and relationships influencing the US energy system prior to enacted changes. The US energy system is characterized by: 1) geographically dispersed supply and demand, 2) an established market and distribution system, 3) a product directly or indirectly utilized by every sector of the US economy, and 4) significant influence from the political system (Jacobsson & Bergek, 2004). The energy natural resources powering the US originate on every populated continent; the top five suppliers are Canada, Saudi Arabia, Mexico, Venezuela, and Nigeria comprising 69% of imported crude oil (EIA, 2013). Each supplier represents a source of potential externalities influencing the system. Buffering the system from externalities requires foresight, planning, and time. The US energy production system produces a commodity in a capital-intensive sector requiring long lead times to increase production (Margolis & Kammen, 1999). Lengthy lead times, often in excess of electoral cycles, challenge the system's ability to meet demand in quantity and in methodology. The balance and consistency of government policy affects the confidence and willingness of actors in the US energy system of systems to allocate financial resources to long-lead projects (Levi, 2013). Understanding the structure, interrelationships, and environment the US energy system operates within is a crucial first step in determining if, and how, proposed and forecasted changes may affect a system's end-state.

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SUBLIMINAL ADVERTISING:

The Real Life Status Quo

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SUBLIMINAL ADVERTISING: The Real Life Status Quo

Abstract:

We've all seen those commercials that depict the ideal family, lifestyle, or the thin woman and man. Every so often there is a commercial that challenges that ideal image by showing the mixed family, alternate lifestyle, and the plus sized man and woman. This research paper will address how advertisements have subliminally trained the consumer's mind to challenge what is normal. Advertisements have shaped what the ideal man and woman are over the years but have yet to address the changes in society's acceptance of alternate lifestyles. This study focuses on how advertising has molded consumers' mindsets to reject the everyday reality. Consumers have been brain washed to feel as if they need or have to go out and buy that product in order to become the customer they see the advertisement emulating. The research will address the following questions.

- How does it affect consumers?
- Why do advertisements show these types of stereotypes?
- How advertisement brand products to include those stereotypes
- Why subliminal advertising has taken a life of its own?

Key words: normal, image, reject reality, conform, emulate, view, subliminally, stereotypes, subliminal

SUBLIMINAL ADVERTISING:

The Real Life Status Quo

Introduction

People are barraged with all types of advertisements everyday from the time you wake up till you go to bed. Advertisements are found in many forms such as newspaper, direct mail, radio, television, internet, magazines, and billboards. Consumers aren't aware of the subliminal messages in advertisements. Subliminal advertising has been a hot topic because of the concerns about its play of words. The play on words seen in subliminal advertising has in turn taken part in playing on "consumer's psychological consciousness" (Broyles, 2006). Research has shown that, "advocates feel that advertisements shouldn't profile consumers but the industry thinks differently" (Broyles, 2006). Advertisements classify consumers based on stereotypical views such as physical appearance, race, religion, social class, sexuality, family lifestyle, social demographics, values, age, and alternate lifestyles. Research has found that, "(a) advertisements are deeply woven into the fabric of American culture, both drawing on and redirecting commonly held perceptions and beliefs; and (b) advertisements have a major role in both shaping and mirroring society" (Mastin, 2004).

Consumers have been shown what advertisement companies want them to see is an ideal family, weight, skin color, and lifestyle. With these ideal images in place consumers have rejected anyone who doesn't meet these standards. In recent years many companies such as Dove and Cheerios have begun to challenge advertisements take on what is normal. The responses to the advertisements have been erratic with both positive and negative outcomes. Dove is

aiming to change the, “status quo and offer a broader, healthier, and more democratic view of beauty” (Hopper, 2006). Companies have become more rebellious and are finding new ways to go against social norms like Cheerios by introducing the mixed family.

Advertisements have targeted teenagers because teenagers have a no sense, “of what is real, what could be real and what could never be real” (Wainwright, 2007). Advertisements influence teenager’s thoughts because they are easily influenced and quick to buy. In advertisement print ad, television commercials, and movies teenagers are viewed in many ways. When teenagers see the images in advertisements it influences their thoughts on body image, social class, sexuality, and age. Earlier research has found that advertisements that portray teenagers as, “athletes... young people are encouraged to develop athletic ability or if they are pictured as fun lovers or jet setters, these images are reinforced” (Peterson, 1994). The values promoted in the commercial promote false values that teenagers view the values as a way to live.

Research has identified, “social identity theory... general form of intergroup behavior such as ethnocentrism, stereotypic intergroup attitudes, and intergroup differentiation to social categorization and self-esteem processes” (Harmon, 2006). The SIT research is divided into two separate functions. “ 1) it cognitively segments and orders the social environment, allowing individuals to defines others around them, and 2) it enables the individual to define himself within the social environment.” (Harmon, 2006). People question advertisements that go against social norms without knowing the real reason of why they are questioning the advertisements. The questioning of the social norms has had negative responses attacking people’s weight, religion, sexuality, and race. Some researchers have found that, “Consumer will garner an unfavorable attitude of the advertisement and the spokesperson based on the salient in-group norms, and in-group derogation for the unlikable target will occur” (Harmon, 2006). The

rebellious advertisements create a, “black sheep effect” (Harmon, 2006). Older advertisements gave people a false reality that many felt they could attain.

Advertisement has created a world of its own as a ploy to get consumers to purchase their products. By purchasing the products consumers are hoping that they will be a part of that superficial lifestyle advertisements have created. Advertisements have made companies millions off selling these false dreams to consumers.

Literature Review

Women are showcased in advertisements using sex sells or body image tactics. Advertisements such as Hollister, Victoria’s Secret and Axe show women dressed scantily clad. These advertisements are targeted at women between the ages of 15 to 24. Research has shown that those types of advertisements are, “sending a message that if they are to reach the constructed unattainable ideal” they will have success (Mastin, 2004). Women’s portrayals in advertisements are shown as traditional roles rather than business roles in society. The women are shown in the advertisements as younger and physically attractive. Through research it has found that, “The media and advertising set an unrealistic standard of beauty that most women can’t ever achieve” (Roedl, 2011). The figure 1 below is from a study conducted separately from my research. This study was conducted to show the extent of sexual content on television. (Ayrault, 2008)

Advertisements have stereotyped women’s body types for decades idealizing the woman with the smaller body frame. Women have also been subjected to advertisements that glorify their youthfulness and body features. A study found that women felt that “beauty was based on nearly unobtainable standards of physical attractiveness and that the current narrow definition of

beauty was deeply affecting the outlook of young women” (Roedl, 2011). The stereotyped body images affect women’s confidences and self-esteem. The Dove campaign is using its advertisement to reinforce the notion that all women are not created the same and beauty is found in many forms. The Dove campaign uses women of all shapes, races, and ages to represent its products. Research has shown that Dove is a, “ostensibly a global advertising campaign designed to boost female self-esteem and challenge cultural norms” (Roedl, 2011)

In contrast, advertisements have shown men in very masculine roles. Men are shown in masculine roles that represent them being self-confident, courageous, and energetic. The roles that men are scripted for, “focused primarily on their occupational roles and family concerns were secondary” (Mastin, 2004). Males are more likely to depict a role where, "Men are men, and women are women" (Milner, 2000). Research has also found that the more, “masculine countries are more likely to embrace sharp distinction between the roles of men and women” (Milner, 2000). Research has shown that male masculinity is shown in two forms, “feminine ...feature more relationship themes for male and female characters whereas television advertisements in masculine...feature productivity themes...” (Milner, 2000).

Previous research has shown that, “gender-role portrayals in advertising are influential in society because they can perpetuate stereotypes, and they can present behavioral norms for males and females” (Paek, 2000). The gender role portrayal of women differs from men. Women are known to be in roles that, “as product users, were portrayed as dependent on others (particularly on family members or the opposite sex), and were featured in the home” (Paek, 2000). Indirectly men are seen as, “authorities, were viewed as independent from others, and were placed in occupation settings” (Paek, 2000). The definition of each role differs by showing, “femininity...modesty, quality of life, and a relationship orientation....masculinity...

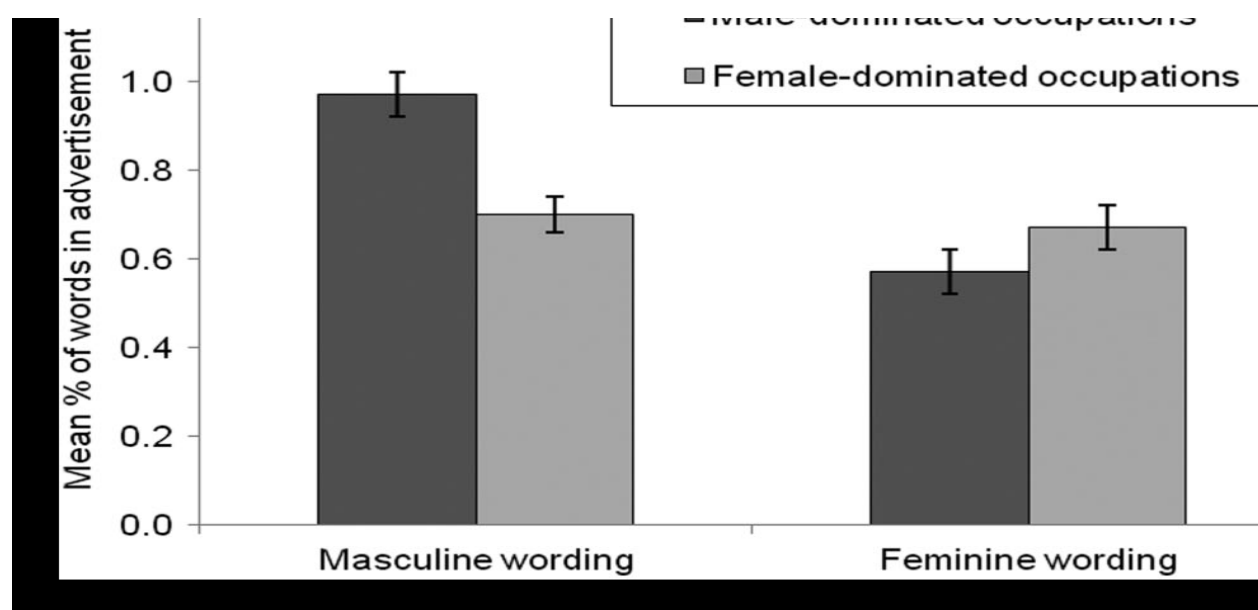
productivity orientation according to occupation-related variables depicted by the prominent character in the advertisement, such as achievement, assertiveness and material success” (Milner, 2000) Other research has found that, “stereotypical messages about relations between men and women and that, much more often than not, they tended to present disparities with regard to power, status, and agency” (Wainwright, 2007). The roles portrayed by male and female, "focused on concrete staging and body positions that bespoke an underlying gender inequality” (Wainwright, 2007). Research supports that there, “is much less psychological research, however, documenting the institutional-level contributors to gender inequality” (Gaucher, 2011)

Researchers have found that stereotyping can, “lead to oversimplified conceptions and misapplied knowledge evaluations, and thus to wrong evaluations of subjects of a social category” (Eisend, 2010). Stereotyping has had a direct effect, “gender gaps” (Eisend, 2010). Men and women re stereotyped into role that advertisers believe are society roles. Research has shown that stereotyped roles have, “lead to expectations and judgments that restrict life opportunities for subjects of a social category” (Eisend, 2010). Martin Eisend, a researcher, noted that the ideas that gender roles are mainly determined by the social environment, and not by biology, although both approaches provide explanations for gender roles and sex differences. (Eisend, 2010) Advertisers still use stereotyping that, “does not reflect the significant advancement of the gender equality movement in many societies” (Eisend, 2010). Some research has found that, “gendered wording may emerge within job advertisements as a subtle mechanism of maintaining gender inequality by keeping women out of male-dominated jobs” (Gaucher, 2011). The following is a study conducted by Gaucher on the gender stereotyping when it comes to industry jobs.

Table 2 Composition of Coded Advertisements, Study 1

Occupation	Advertisements	
	<i>N</i>	%
Male dominated	231	47
Plumber	36	7
Electrician	55	11
Mechanic	14	3
Engineer	59	12
Security guard	22	4
Computer programmer	45	9
Female dominated	262	53
Human resources professional	45	9
Bookkeeper	55	11
Registered nurse	57	11
Early childhood educator	50	10
Administrative assistant	55	11

Figure 2: Mean percentage of gendered wording as a function of occupation area (Study 1). Error bars indicate standard error.



Conceptual Framework

Through the research of Mastin (2004), Peterson (1994), and Ayrault (2008) and my further reading of other research that has been conducted I have been able to break down the types of advertisements into categories. The model show the different advertisements seen on television at any given time and the category each advertisement portrays. Each category can be further broken down into subcategories such as gender roles, type of wording, and the degree of the sexual content.

Figure 3 shows eight categories that an advertisement can fall into. The advertisements can act on consumer's mind-set, emotions, the way they are thinking, the way they feel about sexuality, informational/rational reasoning facts of the advertisement, and the inherent drama and image. This can form the consumer's attitude towards the ad and determine the consumer's purchasing intentions.

Figure 3: Categories Advertisements can be broken down into



Research Methodology

To conduct this research study, an upper level course in the College of Business Administration at Savannah State University was used where the students were shown several advertisements from the Ads of the World Website. The students were advertising and communications majors and were primarily seniors. A structured questionnaire was developed. The six advertisements were employed in the instrument validation. The use of multiple ad samples improves the generalizability of the results (Rossiter 2002). Repeated observations on a single subject also produce less variable data than do observations collected from different subjects, thus improving control (Greenwald 1974; Pearson et al. 1984). To guard against potential bias, the sequence of the ads was counterbalanced (rotated), so that respondents did not simply see a series of one type of appeal followed by a series of the other. Appendix 1 shows the questionnaire used in the study.

72 respondents filled the survey and Table 1 below shows the demographics of the sample.

Table 1: Demographics of the sample

Category	Percentage
<i>Gender</i>	
Male	50.0%
Female	50.0%
<i>Age</i>	
17 - 20	0.0%
21 - 25	83.3%
26 - 30	16.7%
31 - 35	0.0%
36 - 40	0.0%
41 - 45	0.0%
46 - 50	0.0%
51 - 55	0.0%
56 - 60	0.0%
61 and above	0.0%
<i>Ethnicity</i>	
African American	66.7%

White (Caucasian)	33.3%
Hispanic/Latino/ Spanish origin	0.0%
Asian	0.0%
American Indian / Alaska native	0.0%
Native Hawaiian or other Pacific Islander	0.0%
Other	0.0%

The respondents were asked to select the advertisements that appealed to them the most which will then evoke them to want to purchase the product.

I started my research in an open class exercise with eight advertisements to see how my fellow peers would react to the advertisement and if they could recognize the messages hidden within them. The sequence of the advertisements was counterbalanced and was sexual and nonsexual. Some of the advertisements had hidden messages within them that consciously consumers wouldn't notice but subconsciously they would.

Advertisements 1 had the sexual message shown in plain sight and I felt the class would be able to decipher the message clearly. Advertisement 8 was more toned down and was used as the nonsexual advertisement. The reaction from the class was overwhelming because they got the message of the sexual innuendo that was presented in advertisement.

The second advertisement was used to see which of the two would intrigue the test pool more. Advertisement 2 was just a simple advertisement, it was used to compare to advertisement 6 which did have a hidden message in it. Students were more focused on advertisement 6 that had the hidden face or tongue.

Advertisement 3 was of an advertisement that has been used for over 40 plus years and it was compared to the company's newer hipper ad advertisement 5. No one noticed the body hidden within the camel's fur in ad 3 but when it was put side by side with a clearer picture their reaction was surprised.

Advertisement 4 was a advertisement which had ice cream placed to look like the shape of a woman's bottom. I used another advertisement of the ice cream to show the differences in the advertisements. The class appealed more to advertisement 4 than the other.

After testing this small test pool I was ready to move on to a larger test pool to see what surveyor's reaction would be. The results below are from advertisements 1-6 on a larger test pool.

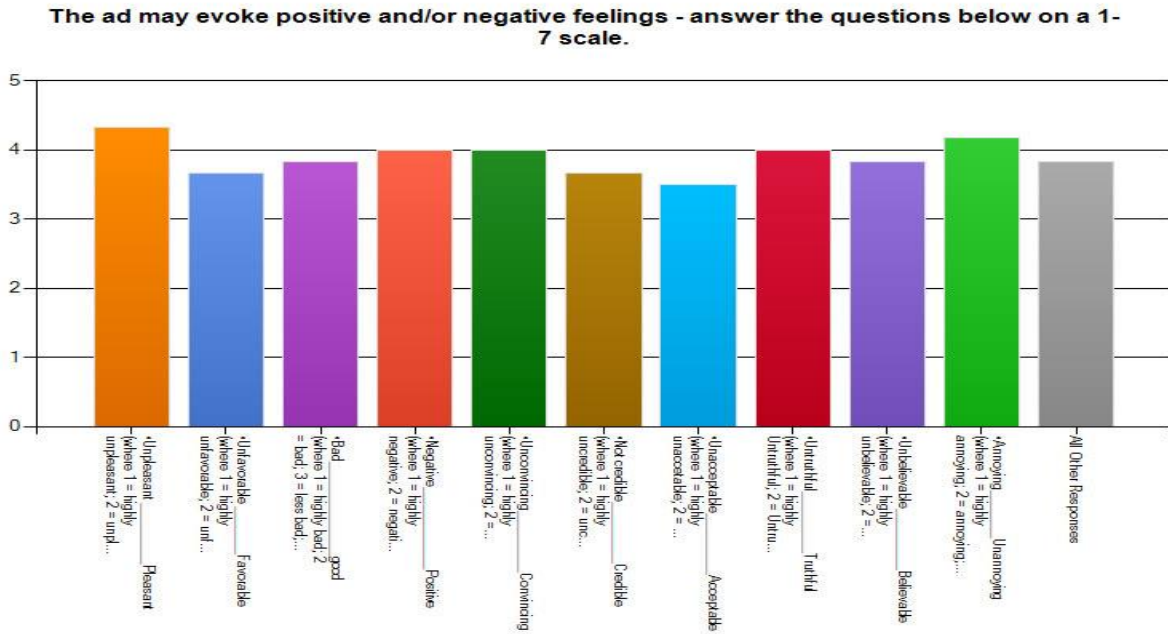
Results and Discussions

Advertisement # 1

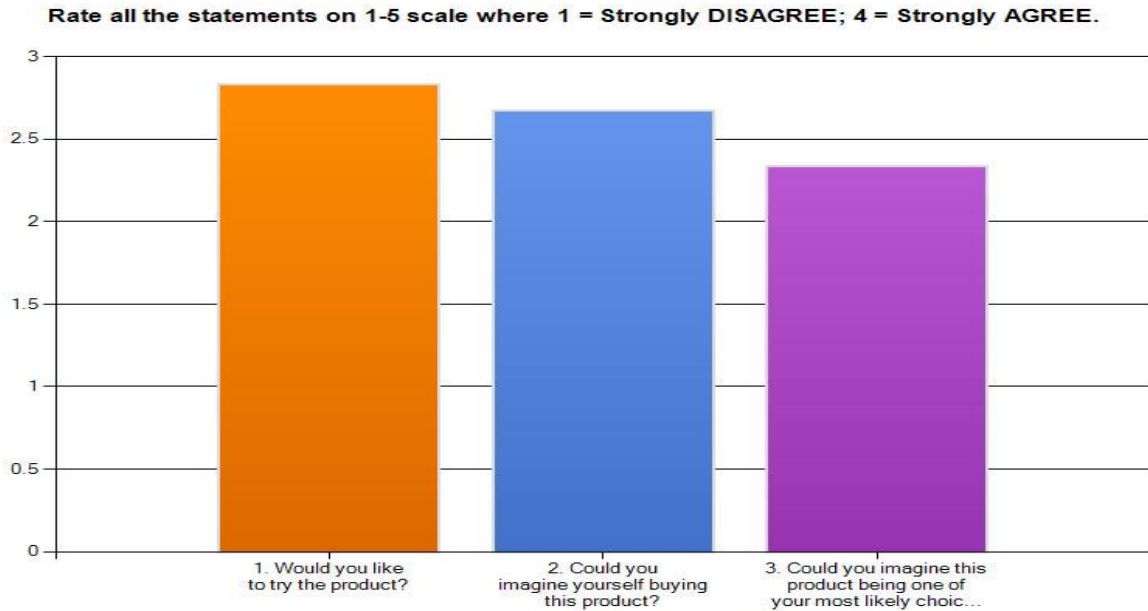
The advertisement that was used was of a lady in a sexually charged advertisement. I felt that the surveyors would have been highly displeased with the advertisement and the message that was shown in it. The survey showed that they were not offended by the advertisement. Although surveyor's felt that it was neither pleasant nor unpleasant they didn't feel that it was acceptable. Of all the ads that were used in the survey I thought this one would yield better results. Although surveyor's feelings were very neutral they said they would not buy the product. We used appendix 1 questionnaire for analyzing brand and advertisement attitudes along with purchase intentions. We found the following results.

Figure 1: Ad-evoked feelings

The advertisements may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.



Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.

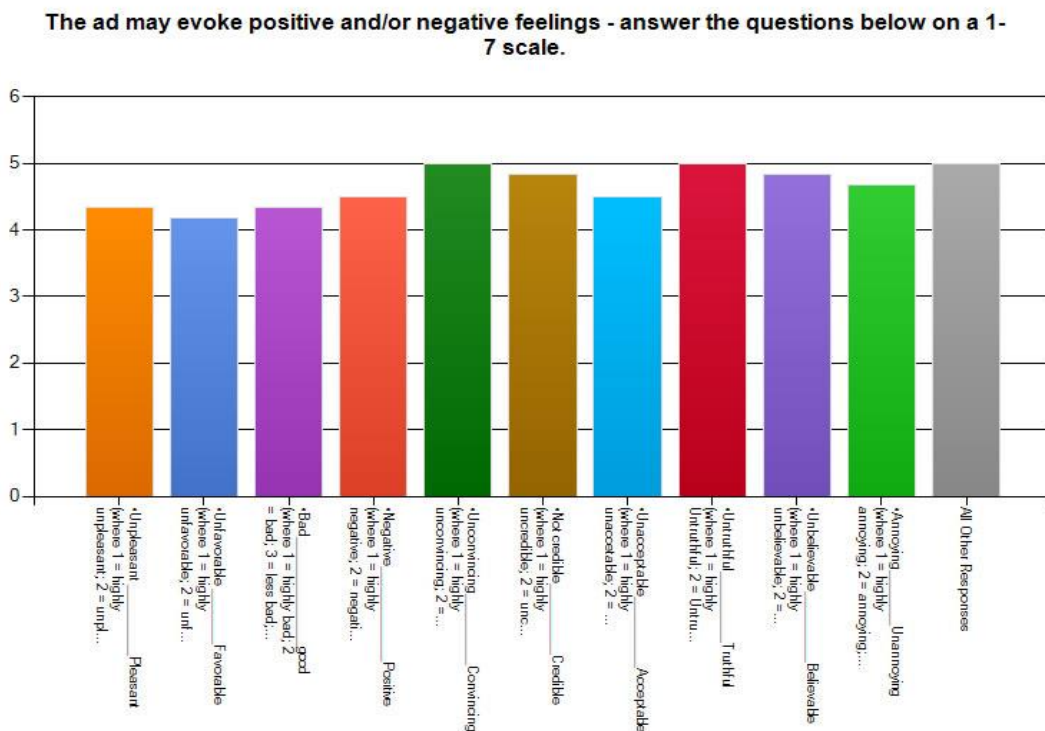


Advertisement # 2

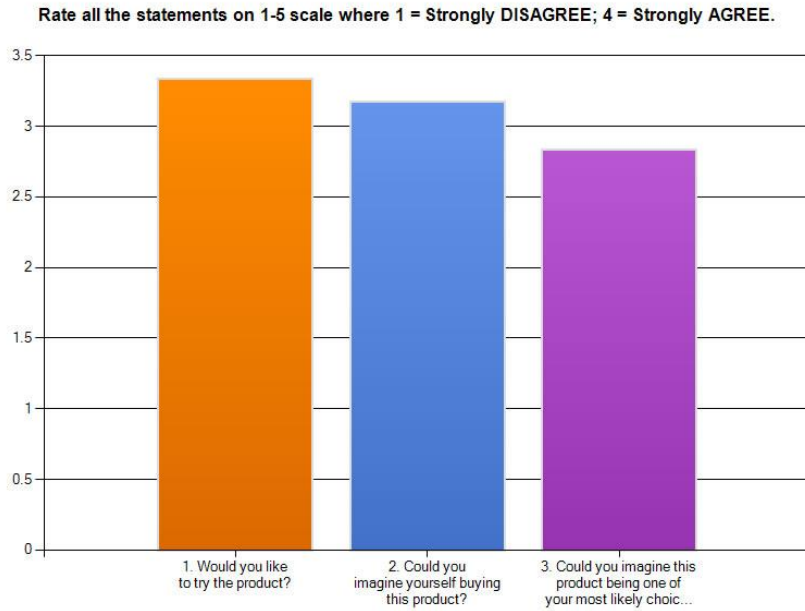
The advertisement that was used was a plain advertisement without any hidden messages. I felt that the surveyors would have been very pleased with the ad but the results showed they were slightly positive toward the advertisement. The slight positive results were only for the advertisement being convincing, truthful, and other. The survey showed that they were not offended by the advertisement. When surveyors were question about future purchases of the product 2 out of 3 of the question had a positive response.

Figure 2: Ad-evoked feelings

The advertisement may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.



Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.



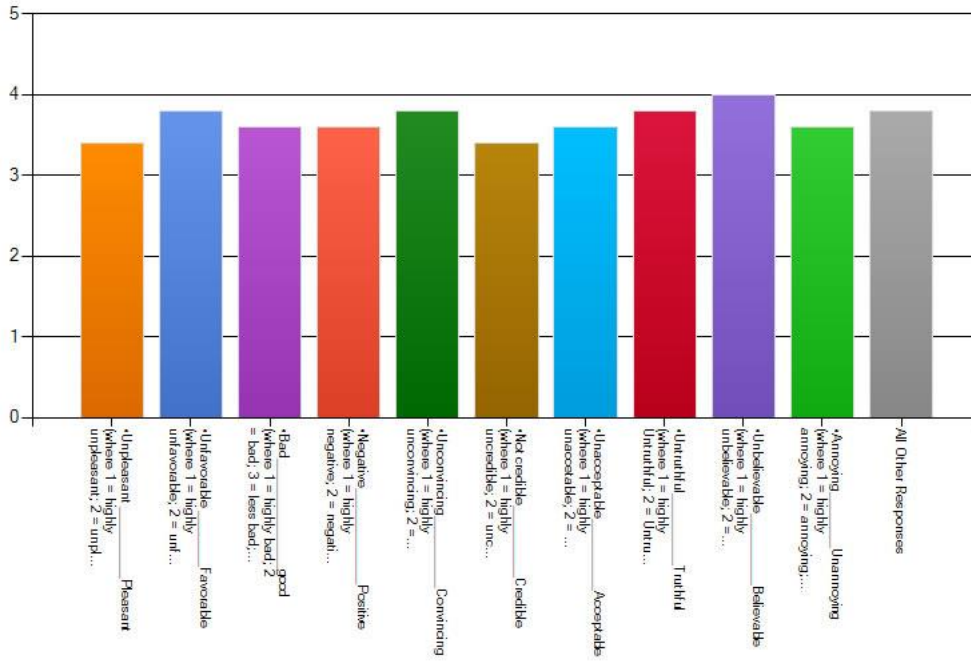
Advertisement # 3

This advertisement had surveyors look very hard to find the picture. There was a second picture provided so that the image would be clearer. The results of the survey showed that surveyor's thought the advertisement was neither believable nor unbelievable. The attitudes towards future purchases of the product were equally low in all categories. I think that because this advertisement was for cigarettes results would be lower unless the surveyor was a smoker but then surveyors are only attracted to certain brands.

Figure 3: Ad-evoked feelings

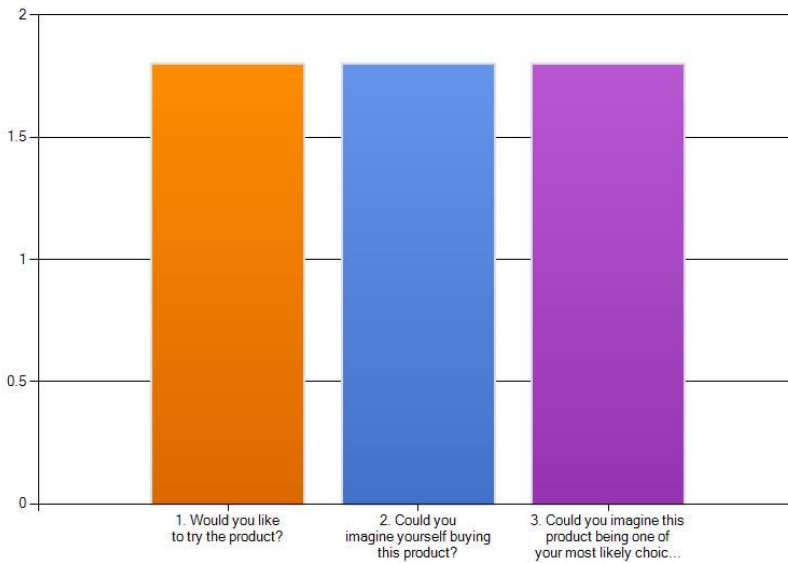
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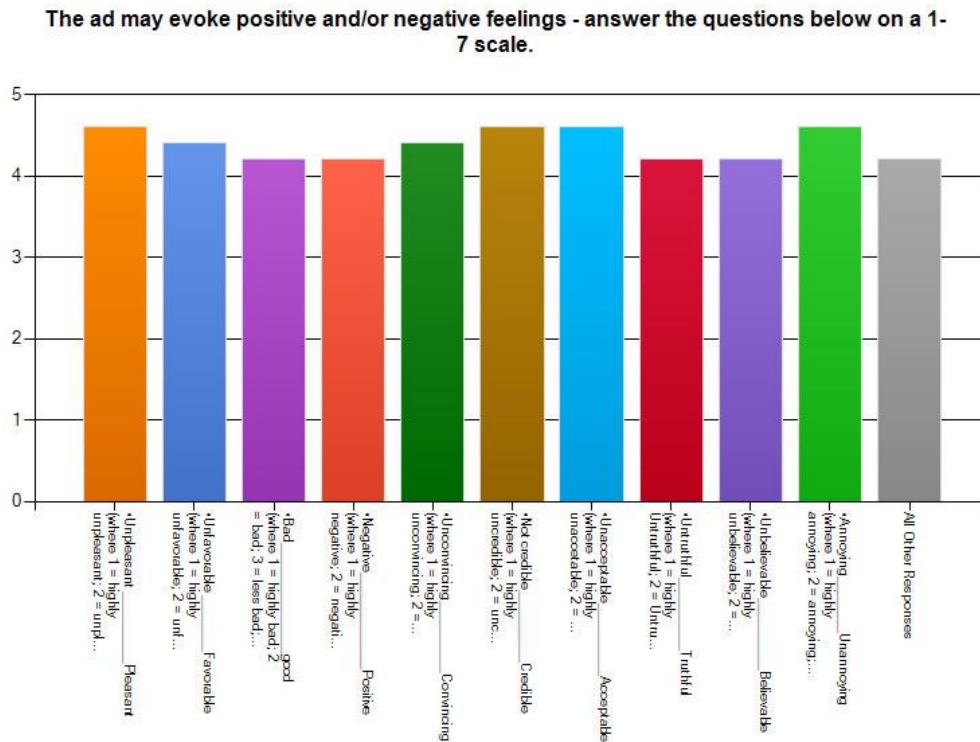


Advertisement # 4

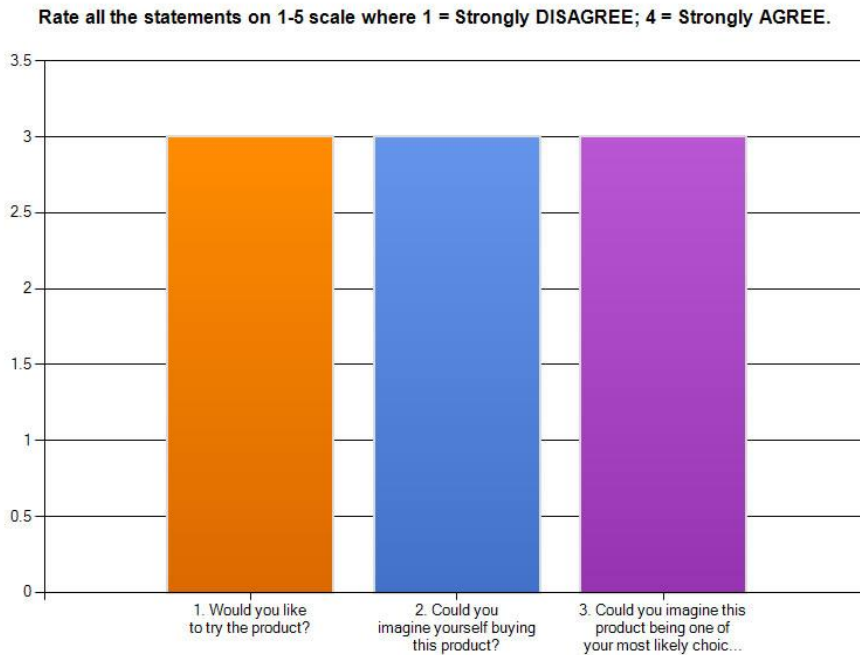
Advertisement 4 held better results with all the ratings above 4. I felt that because of the name consumers would have negative feelings toward the product but they didn't. Surveyor's purchasing attitude towards the product was positive. I think that because this is a food product the results would be higher than the other advertisements used. When customers think of ice cream they have a positive feel. There are many constraints you have to figure in for this advertisement such as have they tried the product and were the hungry at the time of doing the survey.

Figure 4: Ad-evoked feelings

The advertisement may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.



Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.

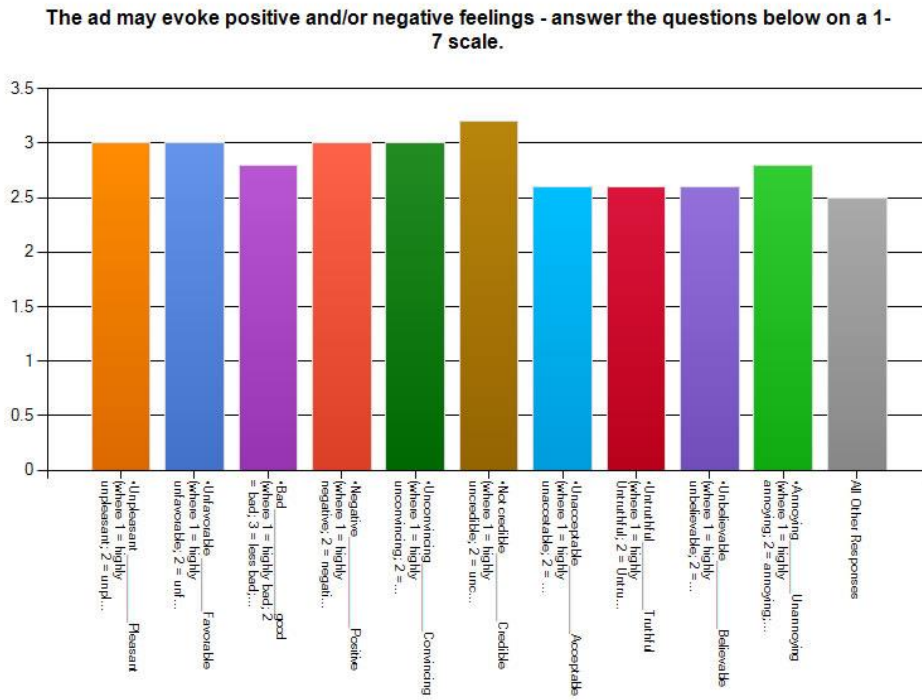


Advertisement # 5

The results of this advertisement were surprising because I thought surveyors would have a higher positive reaction to this advertisement compare to advertisement 3. The results were all below 3 signifying that there was a slightly negative feel. The attitude towards future purchases was very negative. The result of the survey was at three for all of the questions asked, which held the same as advertisement 3. One thing that should be taken into consideration is that this is an advertisement that promotes the use of cigarettes. When surveyors see the advertisement it may automatically bring on a negative feeling just in the previous advertisement that brought on positive feelings.

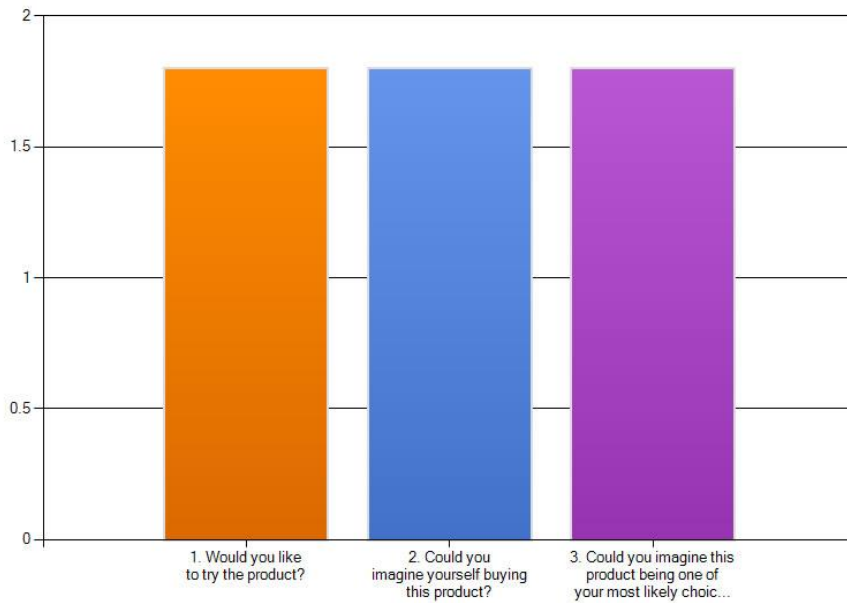
Figure 5: Ad-evoked feelings

The advertisement may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.



Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.

Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.



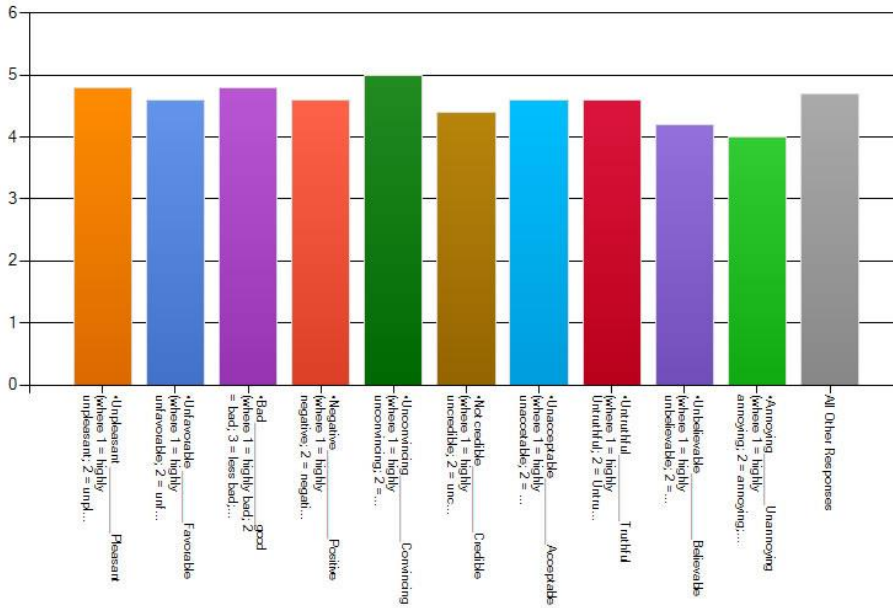
Ad# 6

Advertisement 6 was used in counterbalance with advertisement 2. The results for this advertisement were in the same range as advertisement 2. I was not expecting surveyors to feel any different toward this advertisement than the other. With this being a health supplement surveyors may also have automatic feeling toward those types of products also.

Figure 6: Ad-evoked feelings

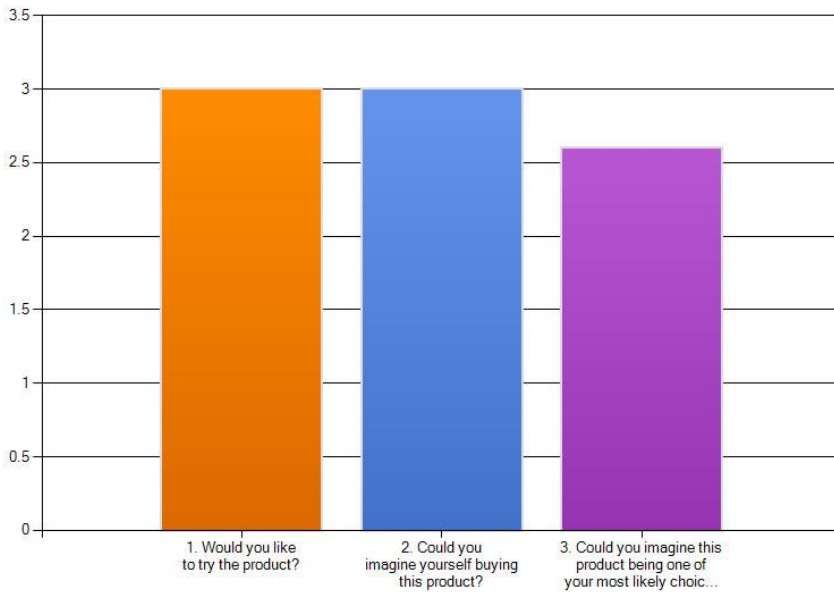
The advertisement may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.

The ad may evoke positive and/or negative feelings - answer the questions below on a 1-7 scale.



Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.

Rate all the statements on 1-5 scale where 1 = Strongly DISAGREE; 4 = Strongly AGREE.



Conclusion

In conclusion advertisers use advertisements to signify a customer's desires and aspirations but not their reality. Advertisements only show one type of lifestyle that signifies wealth. It is not easy for consumers to shatter the alternate reality that advertisers have created instead they try to emulate it. Advertisements have altered the way consumers view themselves to others. Advertisers have formed stereotypes for the way we think of people based on gender, lifestyles, and body size. Companies use advertisements to sell consumers the idea of what they presume are normal lifestyle, ideals, and sexuality. Advertisers use female models to voice their message. Female models presented in the advertisements in an objectified manner to send a sexual message. Advertisers use sex as a way to get consumer to buy their product. As we saw in advertisement 4 if a consumer goes to the store to buy that product they will automatically associate it with sex subconsciously.

My research and testing has shown me that consumers are aware of the messages hidden in most advertisements. I have come to the conclusion that advertisements are selling more than the product or the company but rather a message. The testing pool and surveys brought me to the conclusion that sexual advertisements got more attention than nonsexual advertisements. Advertisers use advertisements to consciously and subconsciously attract consumer's minds. The advertisements all have some sort of sexual message hidden in them. Advertisers have made size, race, and gender a major part of advertising. Some of the advertisements tested had used the female's body in some sort of way to send a sexual message.

Also in my research I found that the subliminal messages advertiser use will most likely effect individuals who consciously think that such messages will alter their behavior. Subliminal suggestions will only work within the bounds of the subjects own mind and the characteristics

describing the said situation. Thus, these subliminal messages can trigger different responses in different individuals. I learned that companies use subliminal advertising as a way to associate certain familiar words to their product. Through word association consumers are lured into buying that product when they are out shopping. Consumers are not consciously aware that they are making this type of connection when they are purchasing the product.

Advertisers will always use subliminal advertisement for promotional symbolic messages that will aim to influence the consumer to either talk about the product among peers, purchase it but it will least leaving them asking or wanting more. The effectiveness of the advertisement depends on timing and the audience it is intended for. If the advertising is successful it will leave the consumers intrigued or interested. In my findings I feel that advertisers will continue to use sex in advertisements even though they are considered inappropriate, long as they can grab your attention and sell the product or service.

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Appendix 1

1. **Attitude toward the ad** (Mitchell and Olson 1981; seven-point semantic differential scales):

Bad—Good

Unpleasant—Pleasant

Unfavorable—Favorable

Negative—Positive

2. **Ad believability** (Bhat, Leigh, and Wardlow 1998; seven-point semantic differential scales):

Convincing—Unconvincing (reverse)

Not credible—Credible

Unacceptable—Acceptable

Untruthful—Truthful

Believable—Unbelievable (reverse)

3. **Ad irritation** (Bhat, Leigh, and Wardlow 1998; seven-point semantic differential scales):

Unannoying—Annoying

Unirritating—Irritating

Undisturbing—Disturbing

4. **Intention to purchase the advertised brand XX** (seven-point Likert scales):

Would you like to try the product?

Could you imagine yourself buying this product?

Could you imagine this product being one of your most likely choices when you next make a purchase?

Ad 1 (used in survey)



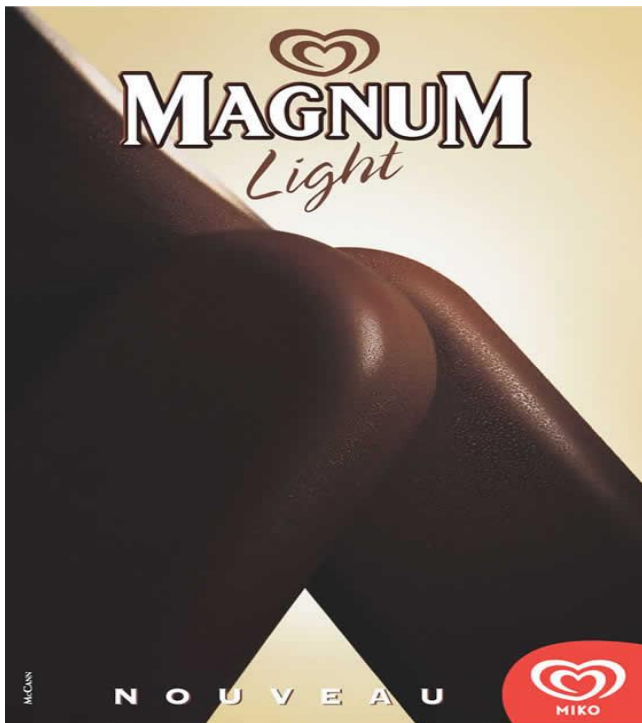
Ad 2 (used in survey)



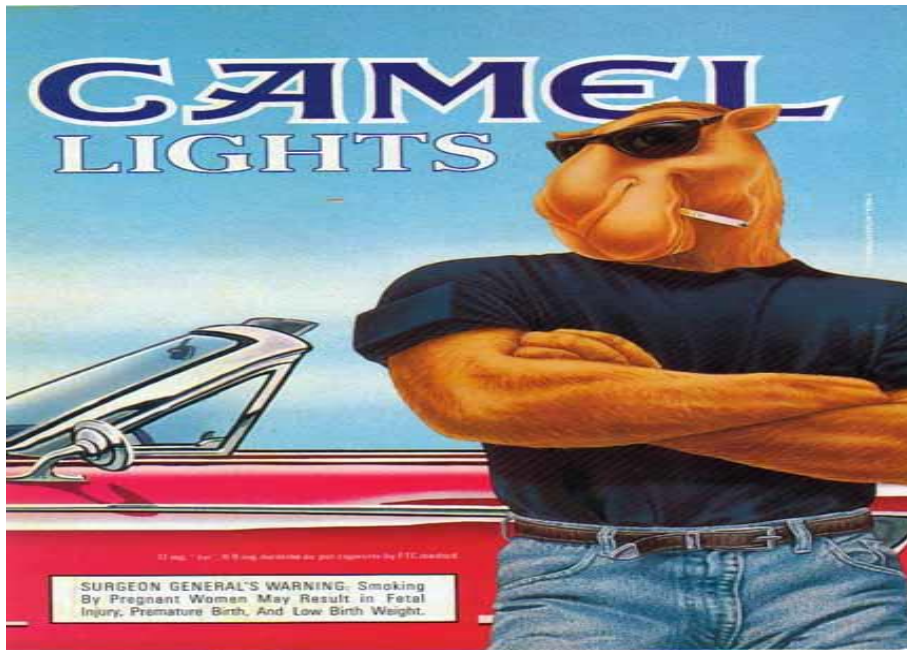
Ad 3 (used in survey)



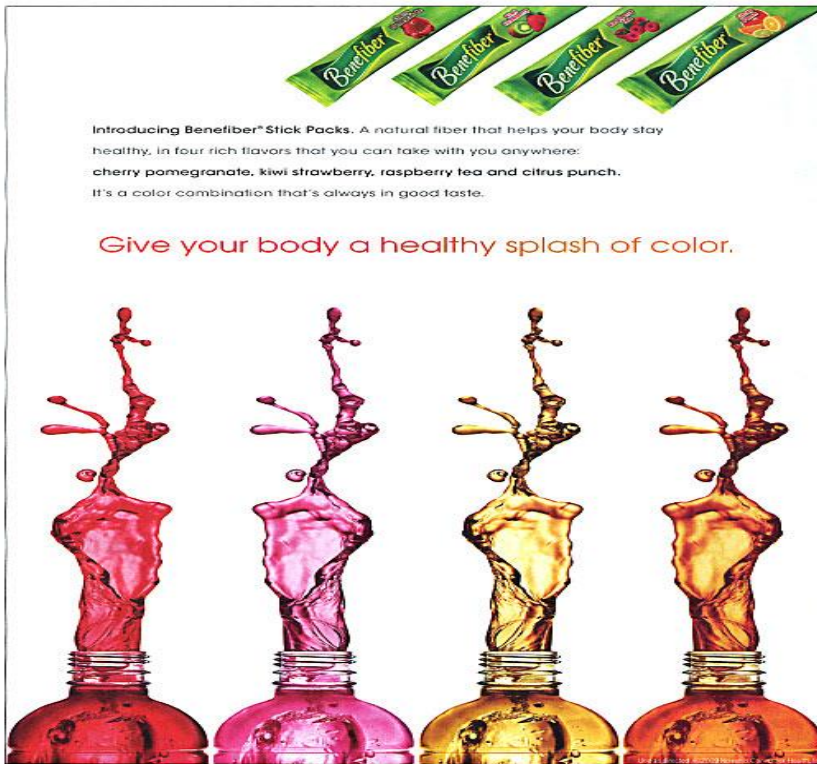
Ad 4 (used in survey)



Ad 5 (used in survey)



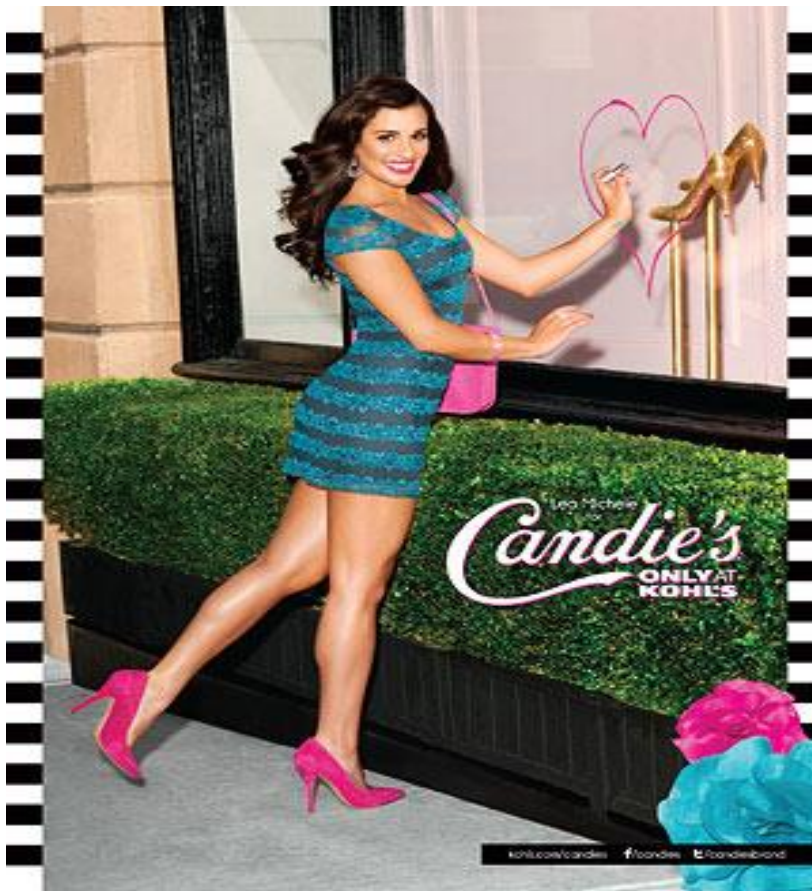
Ad 6 (used in survey)



Ad 7 (not in survey)



Ad 8 (not in survey)



Supply Chain Risk Management of Counterfeit Prescription Medication in the Pharmaceutical Industry

Joshua Darren Lane

Abstract

Supply chain risk management (SCRM) is observing and analyzing the behaviors and outcomes of the supply chain. SCRM is intended to minimize risk to the lowest probability. The pharmaceutical industry has been faced with the threatening issue of counterfeited prescription medication. Because of the high probability risk in counterfeiting medicines, supply chain risk management in the pharmaceutical industry is a necessity. Advanced product design and packaging along with inventory tracking could be used to eliminate counterfeiting in the pharmaceutical industry. The purpose of this research is to determine the impact counterfeit medications has on the respectable firm's overall performance; and how to manage the associated risks of cost increments, the lack of security, non-technological advancements, the non-efficient supply chain issues, and monitoring hand-offs throughout the supply chain. Factor Analysis and Multiple Regression analysis will be used to analyze the data collected via survey. Additionally all hypotheses proposed will be tested for its validity. Specific hypothesis will be designed and tested through empirical analysis by collecting information from surveys of pharmaceutical industries executives. The goal is to discover the influences cost of medication, security precautions, technology, supply chain efficiency, number of hands-offs, risks of counterfeit drugs, and supply chain risk has on the performance in the pharmaceutical industry. The expected outcome is to show the impact, whether negative or positive, counterfeit medications have on the pharmaceutical industries' supply chain efficiency and effectiveness. This analysis will assist in strategic planning of pharmaceutical companies pertaining to research, future forecasting measures, new drug development, security/safety of product, minimizing counterfeited medication levels, and maintaining a satisfactory performance level.

The pharmaceutical industry indubitably requires a source of concentration on controlling the counterfeit medication concerns. A reliable supply chain risk management (SCRM) approach will be a great solution. The SCRM approach main purpose is to lower risk to the bare minimal. Counterfeit medications have become a growing trend, which have strongly impacted the pharmaceutical industry's performance. The risk management of counterfeit medication, in the supply chain, needs to be enhanced. Bringing awareness to the issue of counterfeit medication, in the supply chain, will not only minimize risk, but also allow the pharmaceutical industry to collect lost revenue. Measurement of the supply chain management's efficiency will be a great way to monitor risks in relation to the counterfeiting concerns.

The measurement of risks would include having accurate information to rely on for making decisions. The ideal concept involves having both visibility as well as accessibility. Visibility is important because it allows a constant observance during the supply chain process. Accessibility is necessary to make any improvements and eliminate any existing issues. Alerts are another factor that will provide a significant change in the counterfeit medication issue. Whenever standards are in place and alerts are alarming, the demand for attention is increased, which will lead to more productive actions. Lastly, responsiveness is another great factor that should be used to measure the efficiency and effectiveness of the risk management taking place.

The issue of the counterfeit medication in the pharmaceutical industry's supply chain is the distribution of illegal and harmful substances. These substances is taking revenue from the industry and harming people in the process. A major reason in regards to the counterfeiting issue would be the pricing of the medication; the higher the cost of the medication, the higher the associated risks. The lack of enforcement and technology also play major roles in the risks of counterfeit medications in the supply chain. Because the technology in the industry is not customized to have electronic tracking and trace technology, it leaves room for corruption and

manipulation to occur. The number of hand-offs also heavily influences the industry which also affects the uncertainty of counterfeit drugs and supply chain risk. The uncertainty of counterfeit drugs and supply chain risk then significantly influences the firm's performance. However, a reliable and strong supply chain risk management concept will adhere to all these needs and make an effort to solve the nuisance.

Literature Review

The Supply Chain

The pharmaceutical industry is a billion dollar market with the majority of the leading companies residing in the United States. The remaining companies are located in various countries around the world. This makes the industry engage into international affairs. When indulging into international affairs, the risk level intensifies. The pharmaceutical industry is huge and the supply chain is complex. From the formulation to the manufacturing of the medication, there can be many hand-offs involved. The transportation and the importation of the counterfeit drugs from wholesalers to different pharmacies is the process. Anytime there are multiple hand-offs involved, there is prone to be high risks. Charisse Bruin author of *The Impact of Ownership and Information Sharing on Cold Chain* understands the expected complexity of the medicine process when dealing with the pharmaceutical industry. She states how there are international customs and importation hurdles that must be dealt with in order to keep the activity flow moving smoothly.

Wildgoose, Nick, P Brennan, and S Thompson, states having a clear understanding of your supply chain is mandatory to reduce the risk of the supply chain disruption. "The potential impact of the supply chain disruptions on company performance should be considered well." With that being said, the pharmaceutical industry needs to take this advice and do a strength,

weakness, opportunity, threat (SWOT) analysis on the industry. This will help discover the changes that need to be made and address the significant issues.

In *Mastering Supply Chain Risks*, risks in the supply chain represent a big deal. It states how risks fall as one of the major issues today. It also states how every organization strives for success and uninterrupted operations, and because of this efficient supply chain risk management is crucial. The unique aspect in this research is the idea of risks having different dimensions. It details how a checklist is made which informs management on how to handle the issues. This concept can be beneficial in the pharmaceutical industry prohibition of counterfeit drugs.

Abdallah author of *Global Pharmaceutical Supply Chain: A Quality Perspective* feels that the pharmaceutical industry is gaining enormous global importance. The industry's supply chain structure is getting more and more complicated. By contribution of size, the pharmaceutical industry is dominated by US, Europe and Japan. With being a global supply chain emphasis of cooperation and quality is very important (Abdallah, 2013). In this research, it highlights some pressing issues that the pharmaceutical industry faces. It feels as though the industry is "ill-paced to cope with the issues it faces today." As expected one of those pressing issues includes counterfeit drugs. It stated how much quality is recommended in the pharmaceutical industry and it states how counterfeit drugs contrasts.

Technology

The technological aspect addresses the necessity of enhancement in the security of the prescription drugs. Security in the packaging, the flow of the product through the supply chain, and business transactions should be the initiative. According to Singh, Inderbir, M Kumar, and J Kaur, Radio frequency identification (RFID) technology could be applied to the pharmaceutical industry. It could be used for identification purposes and many other purposes. The most important purpose would be minimizing the counterfeit drug problems. RFID is an automatic

identification method which relies on storing and remotely retrieving data by using RFID tags or transponders (Singh, Kumar, and kaur, 2008).

The security of the pharmaceutical supply chain can be strengthened by innovative packaging technologies and better business practices. The track and trace system and serialization are other methods that could be used to enhance technology. The pedigree is an example of the systems. It was designed to keep record of the distribution the prescription drugs goes through from the manufacture through wholesale transactions. The pedigree tracks the medication until it is dispensed to the pharmacist. The implementation of anti-counterfeit technologies is the prominent preventive measure. (Bansal, Dipika, S Malla, K Gudala, and P Tiwan, 2013)

Horngren, associated with accounting, felt that available information gathering technology is quite beneficial. He tells how bar codes can be used to scan at every point in the production process. This correlates with Singh, Inderbir, M Kumar, and J Kaur, Radio frequency identification (RFID) technology. “Bar codes can be read into a manufacturing cost file by waving a “wand” in the same quick and efficient way supermarket checkouts clerks enter the cost of each item purchased by a customer.” This method could be used not only for accounting purposes, but also for supply chain risk management.

Just as Horngren, Mall, and Mishra both agree on the use of RFID technology. They “consider supply chain management (SCM) crucial for their business, and the advent of RFID was found to enhance the efficiency of the SCM process.” RFID makes the supply chain process effective and efficient. RFID manages the entire supply chain activities like procurement of materials, storing the material, management of inventory, manufacturing process, logistics and management of customer service (Mall and Mishra, 2012).

Efficiency

The pharmaceutical industry is rapidly growing and it deals directly with healthcare. Anytime healthcare is involved, quality control is mandatory. In order to maintain a level of satisfaction, the pharmaceutical industry has to stay focused on effectiveness and efficiency. The urgency of addressing the counterfeit issue is now (Mackey, TK and BA Liang, 2011). Third world countries or countries that lack resources for the medication are at higher risk of engaging into the counterfeiting storm. Mackey and Liang also feel that the improvement of technology will alleviate some stress. In fact, they believe that a reporting system is crucial, making enforcement efforts, and establishing public-private partnerships will help make a difference.

The Role of the pharmacist in preventing distribution of counterfeit medication focuses mainly on the pharmacist's responsibility. As these researchers agree with the previous researcher's opinion, the pharmacist raising awareness, reporting suspicious medication integrity and assist in monitoring fraudulent behavior becomes additional.

According to *Attitude toward risk in supply chain risk management*, the researchers feel that there are only four effective steps for risk management. Detection, evaluation, solution accomplishments, and controlling the risks are the four useful steps. *Useful techniques to minimize risk in supply chain risk management*, agrees because it was stated that "a group of studies have developed a process for managing the risks which consists of four general phases. They are identifying risk, classifying risk, calculating risk, and implementing actions." Both points of view are ways to manage risk in the supply chain and monitor the effectiveness and efficiency of the industry. As data was being collected, *the main tool used in supply chain risk management*, also agreed on the same four steps.

"Managing supply chains in today's competitive world are increasingly challenging. The greater the uncertainties in supply and demand, have led to higher exposure to risks in the supply chain. Therefore, to break the risk spiral, visibility, accuracy, control, accessibility, and

responsiveness is needed. Breaking the risk spiral is not impossible (Christopher, M and H Lee, 2002).

“The system of efficiency analysis of material management, if developed in detail, can facilitate rationalization of the scenarios of sourcing and managing the materials involving the criterion of the highest, or satisfactory, efficiency of a company.” (Śliwaczyński, Bogusław, Koliński, 2012). Only an increase in key processes efficiency will result in increasing the indicators of efficiency of a company's business activity. A very important aspect is also coordination of operational and strategic aims. Both components are needed to be present for satisfactory results. All of this information by Śliwaczyński, and Koliński help constitutes the fact efficiency promotes effectiveness.

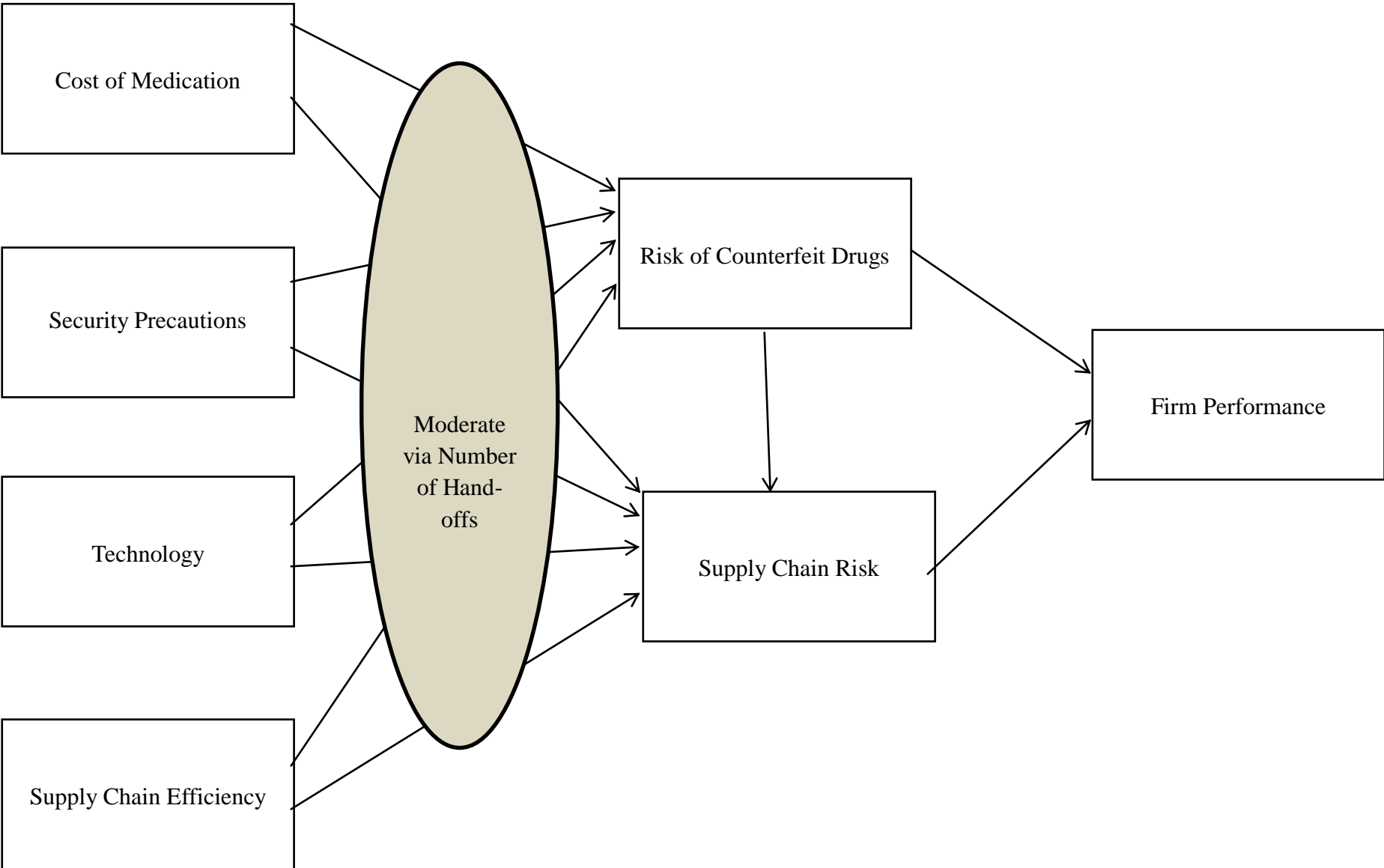
Firm Performance

Masoud states in his research that firm performance is the continuous of processes correlated with work flow. There are various factors that can affect the performance of a firm. In this case cost of medication, technology, security precautions, and efficiency are the factors which are highly influencing the firm's performance. Masoud tells that there is a positive impact of research and development competencies on the firm's performance. Further down in this research, one of the hypotheses states the same data.

Thakkar expounds on how important a firm's performance is in the supply chain. “There are a number of conceptual frameworks and discussions on characteristics, hierarchy and structure of performance measurement frameworks in the literature; however, there is a lack of investigation on understanding the supply chain measures which relates the objectives and motivations of various entities in the supply chain.” His research communicates the necessity of measurement of the firm's performance. He states in his research how measurement should be understandable by all supply chain members and should offer minimum opportunity for

manipulation (Schroeder et al., 1986). The communication between the management of the pharmaceutical industry is a must in order for the firm's performance to maintain a positive outcome.

Concept Model



Hypotheses

The cost of medication is a variable factor. The higher the production cost for a medication increases the chances of counterfeiting the medication. The lower production cost for a medication decreases the chances of counterfeiting the medication. If there is a high level of counterfeit drugs in the supply chain there is a negative effect on firm's performance. If there is a low level of counterfeit drugs in the supply chain there is a positive effect on the firm's performance.

H1a: Cost of medication has a significant influence on the risk of counterfeit drugs

H1b: There is a strong correlation between cost of medication and supply chain risk

Governance, security, and compliance strongly affect the supply chain. A stronger emphasis on security precautions in the supply chain lowers the risks of counterfeit drugs. The weaker the emphasis on security precautions in the supply chain, the higher the risks of counterfeit drugs. Without safety control, there is a high level of counterfeit drugs, which negatively influences the firm's performance. With safety control, there is a low level of counterfeit drugs, which positively influences the firm's performance.

H2a: Security precautions strongly affect the risks of counterfeit drugs

H2b: There is strong correlation between security precautions and supply chain risk

As the use of technology improves in the supply chain, associated risk will be lowered. As the use of technology remains constant, the associated risks will increase. There is a positive impact on supply chain risk when new ideas of prohibition of counterfeit drugs are on the rise. However, there is a negative impact on supply chain risk when there is no research and development or new contraceptives in relation to the production of counterfeit drugs. Advancement of technology and research and development in the prohibition of counterfeit

drugs, enables a positive impact on the firm's performance. No advancement of technology, nor research and development, establishes a negative impact on the firm's performance.

H3a: Technology has a significant influence on the risk of counterfeit drugs

H3b: There is a strong correlation between technology and supply chain risk

Supply chain management of efficiency will make a positive impact on the supply chain.

As the information's accuracy, visibility, and accessibility increases, supply chain risk decreases.

The stronger the emphasis on alerts for signs of variability and responsiveness results in lower risks. The lack of measurements for constant efficiency will increase supply chain risks and have a negative impact on the firm's performance. The presence of procedures with respect to monitoring variation within the supply chain will decrease risks, which will have a positive impact on the firm's performance.

H4a: Supply chain efficiency reduces the risk of counterfeit drugs

H4b: Efficiency positively impacts the supply chain

Moderation of the number of hand-offs significantly impacts the risk of counterfeit drugs.

There is a direct relationship between hand-offs and risk. The fewer the hand-offs, the lower the associated risks. The greater the hands-offs, the higher the risk. As hands-offs are decreased, risk of counterfeit drugs and supply chain risk are decreased which implies a positive firm's performance. As hands-offs increase, risk of counterfeit drugs and supply chain risk are increased which implies a negative firm's performance.

H5a: The number of hands-offs will moderate the influence on the cost of the medication, security precautions, technology, and supply chain efficiency on risk of counterfeit drugs.

H5b: The number of hands-offs will moderate the influence on the cost of the medication, security precautions, technology, and supply chain efficiency on supply chain risk.

The risk of counterfeit drugs in the supply chain is impacted by many factors. The cost of medication, safety precautions, technology, and supply chain efficiency can create both high and low variability within the supply chain. Contingency of counterfeit drugs varies either negatively or positively on the performance of the firm. If the uncertainty of counterfeit drugs is high, the supply chain risk is also high. If the uncertainty of counterfeit drugs is low, then supply chain risk is low.

H6a: There is a direct relationship between the uncertainty of counterfeit drugs and supply chain risk

H6b: Uncertainty of counterfeit drugs has a negative impression on the firm's performance

Supply chain risk strongly affects the firm's performance. It is the basis of measurement for the firm's performance. As risk increases, the firm's performance is negatively affected. As risk decreases, the firm's performance is positively affected.

H7: There is a strong correlation between the supply chain risk and the firm's performance

An efficient firm's performance is the key objective. A performance can either be negatively or positively impacted by risk of counterfeit drugs and supply chain risk. As either of the two factor increases, there is a negative impact on overall performance. As the factors decreases, there is a positive impact on overall performance.

H8: There is a significant influence on the firm's performance, due to the variations on risks of counterfeit drugs and supply chain risk.

Conclusion

The distribution of counterfeit prescription medication in the pharmaceutical industry has become a threatening issue to the industry. The risk management of the supply chain has many factors that influence the performance of the firm. The cost of medication varying from high to low, strongly affects the risks of the supply chain. The level of security and governance has an impact on the process of the supply chain. Technology is another variable factor that requires some modification in order to minimize the risks in the supply chain. The number of hand-offs of the medication from the formulation to the pharmacy, really needs to be closely observed. During this time, the risks are at its greatest. Supply chain management efficiency is a great measurement of performance. This analysis will be a great opportunity for the pharmaceutical companies to gain insight for future strategic planning pertaining to research, and new drug development. Also it will be beneficial for future forecasting measures, and enhancing the security and safety of the medication. Every factor that influences the risks of counterfeit drugs also has a impact on the levels of counterfeit drugs. The optimal goal is to minimize the counterfeit medication levels as a whole and to maintain a positive firm's performance. The international relationships and cooperation, which is another factor, could be look further into. Knowing these factors impact is beneficial, but discovering how counterfeit drugs actually penetrates the supply chain and ways to completely prohibit them from occurring can also be look further into.

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Making Statistics More Effective in Schools of Business sessions @ SEDSI 2014

10:15 AM Thursday, February 20, Session Chair: Bob Andrews, **Location: McRae Room**

Methods and Content for Providing Better Statistics Instruction

Presenters: **Chris Lowery & William J. Miller (Georgia College & State University)**
Joan Donohue (University of South Carolina)
Robin Synder

Abstract: Program creation and course instruction involves deciding what should be included, how it should be delivered and selecting the best supplements to use to assist in the learning process. Session presenters will give their perspectives on: 1. Adapting course delivery and structure to different audiences, 2. Experiences with two different business statistics textbooks and course management systems, 3. Giving students exposure to Bayesian statistical methods. These initial presentations will serve as a springboard for the audience to react to the presenter's perspectives and provide their own perspectives on these topics.

1:30 PM Thursday, February 20, Session Chairs: Bob & Wilma Andrews, **Location: McRae Room**

Overview of Analytics Capabilities for Excel 2013 Data

Workshop Leaders: **Bob & Wilma Andrews (Virginia Commonwealth University)**

Abstract: Traditional uses of Excel do not take advantage of the analytics capabilities of Excel 2013 Professional. This session will explore these capabilities and give an overview of new 2013 features that include Office Apps, PowerView, PowerPivot, PowerMap (GeoFlow), and PowerQuery and a couple Excel Add-ins that can be easily used for analytics.

3 PM Thursday, February 20, Session Chair: Bob Andrews, **Location: McRae Room**

What Issues do Big Data Present for Business Education?

Presenters: **Bob Andrews (Virginia Commonwealth University)**
Kellie Keeling (University of Denver) &
Bob Stine (Wharton School of the University of Pennsylvania)

Abstract: Big Data has received a lot of attention in business publications. How should course content and curriculum be influenced by Big Data? Are there different skills and knowledge that we should be teaching to better prepare students for a business environment that will be seeking to obtain actionable knowledge from the increased volume, variety and velocity of available data? Are there topics that have been historically taught in business statistics that should be replaced with Big Data relevant topics? The presenters and those attending will discuss these questions.

8:45 AM on Friday, February 21, Session Chair: Bob Andrews, **Location: McRae Room**

Experience with Adding Analytics to the Academic Program

Presenters: **Kirk Karwan (Furman University)**
Kellie Keeling (University of Denver)
Cem Canel, Stephen Hill & Barry Wray (UNC Wilmington)

Abstract: Analytics is a hot topic with numerous sources forecasting that the future demand for individuals with analytics skills will exceed the supply. Universities are considering how analytics offerings can be included in their program offerings to provide better job opportunities for their graduates. The session will focus on experiences in creating an analytics course and in determining the curriculum for a degree component in analytics. Session leaders have a variety of experiences ranging from the undergraduate to graduate level. Audience members will be encouraged to share their experience and enter into discussion about analytics courses and curriculum.

10:15 AM on Friday, February 21, Session Chair: Bob Andrews, **Location: McRae Room**

Real-World Application & Usage of IBM Analytics Technology

Presenter: **Anthony J. Young (IBM)**
Coordinator: **Penelope Gardner (IBM)**

Abstract: Faculty in Schools of Business seeking to make statistics more effective will benefit from this session that will begin with the end goal in mind--what are employers looking for a recent grad to be able to do their first day on the job? Building on a foundation of understanding of what is data mining, and how it differs from statistics, the ideal future employee will understand the problem being solved, how technology like IBM SPSS Modeler can be used to solve the problem, and finally communicate that value of the insights gained to the business. This session will include a digestible, impactful demo of how SPSS Modeler can be used in your courses to provide insights.