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The Impact Of Technology On Management Control: Degradation, Empowerment, Or Technology Dominance?

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THE IMPACT OF TECHNOLOGY ON MANAGEMENT CONTROL: DEGRADATION, EMPOWERMENT, OR DOMINANCE?

by

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ABSTRACT

The evolution of technology brings with it the evolution of business processes. Without a doubt, technology changes how work is performed. At first glance, workplace technology appears to be a great boon to society. However, research presents opposing views on how workplace technologies impact the individual. One perspective argues that organizations utilize technology to redesign work processes, such that the worker requires less skill, autonomy, and compensation. The opposing perspective argues that organizations utilize technology to empower employees to improve efficiency and profits. This dissertation consists of three interrelated studies examining workplace technology's impact on decision makers. The first study examines the capability of an enterprise system to increase the application of scientific management techniques to middle management and, consequently, to degrade middle management's work by limiting their autonomy. The second study investigates the capability of an enterprise system to facilitate the empowerment of managers via mutual monitoring and social identification. The third study builds upon the first study by examining how limiting autonomy through technology impacts the intrinsic motivation of decision makers and, as a result, affects the decision making process.

Study one applies labor process theory to explain how enterprise systems can degrade the work of middle management via scientific management techniques. The purpose of this study is to test if the expectations of labor process theory can be applied to enterprise systems. In order to test this assertion, a field survey utilizing 189 middle managers is employed and the data is analyzed using component based structural equation modeling. The results indicate that

enterprise system integration increases two scientific management techniques, formalization and performance measurement, but do not reveal a significant relationship between enterprise system integration and routinization. Interestingly, the results also indicate that routinization is the only scientific management technique, of the three studied, that directly limits the autonomy of the middle managers. Although performance measurement does not reduce autonomy directly, performance measurement interacts with routinization to reduce autonomy. This study contributes to the enterprise system literature by demonstrating enterprise systems' ability to increase the degree of scientific management applied to middle management. It also contributes to labor process theory by revealing that routinization may be the scientific management technique that determines whether other control techniques are utilized in a manner consistent with labor process theory.

The ability of an enterprise system to facilitate the application of Mary Parker Follett's managerial control concepts are investigated in the second study. Specifically, Follett theorizes that information sharing facilitates the internalization of group goals and empowers individuals to have more influence and be more effective. This study employs a survey of 206 managers to test the theoretical relationships. The results indicate that enterprise system integration increases information sharing in the form of mutual monitoring, consequently, leading to social identification among peer managers. Additionally, social identification among peer managers empowers managers to have more influence over the organization. The study contributes to empowerment research by acknowledging and verifying the role that social identification plays in translating an empowering work climate into empowered managers. The study's conclusion

that enterprise system integration facilitates the application of Follett's managerial control concepts extends both enterprise system and managerial control literature.

The third study builds upon study one by examining the affect that autonomy has upon the decision maker. This study marries self-determination theory and technology dominance theory to understand the role that self-determination, intrinsic motivation, and engagement have upon technology dominance. Self-determination theory asserts that higher degrees of self-determination increase intrinsic motivation. Furthermore, self-determination research finds that intrinsic motivation increases engagement, while technology dominance research indicates that lack of engagement is an antecedent of technology dominance. Thus, applying self-determination theory as a predictor of technology dominance suggests that autonomy and relatedness associated with a task increase the intrinsic motivation to complete that task and consequently increase engagement in the task. Task engagement, in turn, reduces the likelihood of technology dominance. The proposed theoretical model is tested experimentally with 83 junior level business students. The results do not support the theoretical model, however the findings reveal that intrinsic motivation does reduce the likelihood of technology dominance. This indicates that intrinsic motivation as a predictor of technology dominance should be further investigated. Additionally, the study contributes to technology dominance literature by exhibiting a more appropriate operationalization of the inappropriate reliance aspect of technology dominance.

This dissertation reveals that various theories concerning workplace technology and management control techniques have both validity and limitations. Labor process theorists cannot assume that all technologies and management control techniques are utilized to undermine the employee's value to the organization, as Study 2 reveals that enterprise systems

and mutual monitoring lead to empowered managers. Likewise, proponents of enterprise systems cannot assume that the integrated nature of enterprise systems is always utilized in an empowering manner, as Study 1 reveals the increased performance measurement through enterprise systems can be utilized to limit managers in a routinized job environment. While the third study was unable to determine that the control features in technology affect the intrinsic motivation to complete a task, the findings do reveal that intrinsic motivation is directly related to technology dominance. The findings and theoretical refinements demonstrate that workplace technology and management control have a complicated relationship with the employee and that the various theories concerning them cannot be applied universally.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 GENERAL INTRODUCTION

The evolution of technology brings with it the evolution of the business process. Without a doubt, technology changes how work is performed. From the assembly line to the computer, technology revolutionizes the work place. At first glance, workplace technology appears to be a great boon to society. Mechanical technology galvanized the industrial revolution and initiated mass production (Braverman, 1974); while information technology enabled multinational organizations to coordinate activities and employees worldwide (Freidman, 2005). In simple terms, workplace technology changes the business process to increase efficiency while maintaining or increasing management control. For decades, organizational and accounting researchers have debated the effect of workplace technology and job design on the worker. One perspective, the radical structuralist paradigm, argues that organizations utilize technology to redesign work processes, such that the worker requires less skill, freedom, and compensation (Lewis and Grimes, 1999; Braverman, 1974). An alternate perspective, the functionalist paradigm, argues that organizations utilize technology to improve efficiency and profits (Lewis and Grimes, 1999). In response to radical structuralist critiques, functionalists argue that workplace technology can create the opportunity for workers to upskill to more complex activities (Burris, 1998). The purpose of this dissertation is to continue this debate in the context of organizational decision makers and examine the role of management control techniques as portrayed by each theoretical perspective.

This dissertation focuses on organizational decision makers because current information technology is changing how their work is performed. Specifically, enterprise systems integrate

business units, which increase the standardization and visibility of activities undertaken by the business unit manager (Davenport, 1998; Gattiker and Goodhue, 2004). Enterprise systems are information systems that span the entire organization and allow the transfer of information across hierarchies, divisions, and locations. Additionally, enterprise systems may incorporate knowledge management, business intelligence, and other decision support systems (Elbashir et al., 2011; Lee et al., 2003). This dissertation highlights and tests theories that explain the type of impact that these technologies may have on the decision and the decision maker. Two studies examine the relationship between enterprise systems and managerial control, while the third study examines the relationship between decision support system features, the decision maker and the decision. Specifically, Study 1 examines enterprise systems' ability to degrade middle management work by increasing the formalization and performance measurement of middle management tasks and ultimately reducing middle manager job autonomy. Study 2 examines the opposing view. Enterprise systems are expected to empower management, by increasing coordination through social identification and mutual monitoring. Study 3 follows up on Study 1 to determine the effect of autonomy upon decision maker motivation, decision maker engagement and ultimately the decision. The following sub-sections provide a brief overview of the theory, methods, and actual findings of each study.

Study 1: The Role that Enterprise Systems Play in the Degradation of Middle Management's Work

Study 1 applies labor process theory to explain how enterprise systems can degrade the work of middle management. Labor process theory characterizes the production of services and

products in a capitalist society as a battle between capital and labor (Braverman, 1974). Capital, the owners of resources, strives to maximize profits by reducing the cost of labor. Capital reduces the cost of labor through a process of scientific management developed by Frederick Taylor. The philosophy undergirding scientific management, Taylorism, asserts that management should specify how work should be performed and labor should not deviate from those specifications, such that the specialized knowledge of the labor process belongs to capital and not labor (Braverman, 1974; Taylor, 1911). Capital degrades work by removing labor's autonomy, thus weakening their negotiating leverage and devaluing their wages. Enterprise system integration increases the level of scientific management that is applied to middle management because enterprise system integration demands a certain level of standardization and measures more of middle management's performance in the system (Segars et al., 2001; Elmes et al., 2005). In accordance with labor process theory, enterprise system integration's facilitation of scientific management is expected to degrade middle management's work.

In order to test the assertion that enterprise systems degrade middle management work via the application of scientific management techniques, this study employs a field survey of 189 middle managers. The field survey gathers data on organizational concepts of enterprise system integration, formalization, performance measurement, routinization, and job autonomy. Scientific management techniques are operationalized as formalization, performance measurement, and routinization. The degradation of middle manager work is operationalized through low job autonomy. Thus, enterprise system integration is expected to increase formalization, performance measurement, and routinization of middle manager work; while formalization, performance measurement, and routinization are expected to reduce job

autonomy. These hypotheses are tested simultaneously in a structural model using partial least squares.

The results of the study support specific hypotheses, but do not support the overarching assertion that enterprise system integration degrades the work of middle management. Specifically, the study finds that enterprise system integration indeed increases the degree to which middle management work is formally specified as well as the degree to which middle management work is measured in the system. However, the degree to which middle management work becomes an unchanging routine is not driven by enterprise system integration. Additionally, the routinization of middle manager work reduces the autonomy of middle managers, while performance measurement and formalization of middle management work do not. However, the combination of performance measurement and routinization reduce job autonomy in addition to the reduction caused by routinization alone. In general, this study partially supports the notion that enterprise systems are utilized in a fashion consistent with labor process theory. Specifically, the increased performance measurement that is created by enterprise systems can be used to degrade labor when combined with routinization.

Study 2: The Impact of Mutual Monitoring and Enterprise System Integration on the Empowerment of Managers

Study 2 utilizes Mary Parker Follett's concepts of integration and "power with" to explain how enterprise systems empower managers through team work (Follett and Graham, 1995). Follett's concept of integration refers to a process by which opposing entities identify with the other's objectives and come together to align their objectives. This requires each entity

to relinquish some control over their own domain in order to share control with the other entity over both domains. Follett refers to this shared control as "power with", which should result in the empowerment of the individual entities. Enterprise system integration facilitates Follett's concepts of integration and "power with" in the organizational setting, by forcing related divisions to share and utilize each other's information (Lee et al., 2003).

In order to test the assertion that enterprise system integration empowers management through Follett's concepts of integration and "power with", this study employs a field survey of 206 business unit managers. The survey gathers information on the organizational concepts of enterprise system integration, mutual monitoring, social identification, impact, and competence. Follett's concept of integration results in social identification, while Follett's concept of "power with" drives empowerment at the individual level. Enterprise system integration is expected to foster social identification directly, as well as indirectly through mutual monitoring. Social identification is expected to increase both competence and impact. These hypotheses are tested simultaneously using structural equation modeling.

The statistical findings strongly support the theory that enterprise system integration facilitates Follett's concept of integration and subsequently "power with". The statistical results show that enterprise system integration indeed fosters social identification and enables mutual monitoring with managers of related business units. Mutual monitoring also fosters social identification among peer managers. Social identification, in turn, increases the impact managers have upon their organization. Statistically, the construct of competence did not meet convergent validity requirements. Thus, no inference is made for the relationship between social identification and competence. Overall, the structural model demonstrates sufficient fit and

significant path coefficients, providing strong support for the theory. This study concludes that enterprise system integration encourages the convergence of goals, as manifested by social identification, through the information sharing provided by mutual monitoring. This empowers managers as their impact upon their organization increases with social identification.

Study 3: Self-determination Theory as a Predictor for Technology Dominance

Study 3 utilizes self-determination theory to understand the role of intrinsic motivation in technology dominance. Technology dominance refers to a state of mind where decision makers relinquish primary decision making authority to technology (Arnold and Sutton, 1998). This is evidenced by improper reliance on technology, even when there are signs that the technology could be incorrect (Rochlin, 1997). Prior research focuses upon cognitive load, cognitive fit, and experience as predictors of decision aid reliance (Seow, 2011; McCall et al., 2008; Mascha and Smedley, 2007; Hampton, 2005; Mueller and Anderson, 2002; Rose and Wolf, 2000; Rose 2002). Factors contributing to inappropriate reliance are less studied. This study posits intrinsic motivation as a factor that affects inappropriate reliance. Additionally, this study theorizes that the degree of self-determination built into the decision aid impacts intrinsic motivation for that specific task (Assor et al., 2002; Walker et al., 2006; Arnold and Sutton, 1998).

Self-determination theory asserts that the degree of personal freedom related to an activity increases the level of intrinsic motivation associated with that activity (Deci and Ryan, 1985). Self-determination is further specified as the concepts of autonomy and relatedness. Autonomy refers to the ability to determine one's own process, while relatedness refers to the

encouragement by superiors and peers to exercise personal autonomy. Autonomy and relatedness have been found to increase intrinsic motivation (Deci and Ryan, 1985), while intrinsic motivation is linked to technology dominance through engagement (Kowal and Fortier, 1999; Rochlin, 1997: Arnold and Sutton, 1998). Research shows that people that are intrinsically motivated to participate in an activity are also more engaged in that activity (Kowal and Fortier, 1999); on the other hand, technology dominance is characterized by a lack of engagement (Rochlin, 1997: Arnold and Sutton, 1998). Therefore, this study proposes a theoretical model where autonomy and relatedness associated with the task impacts intrinsic motivation towards the task, which affects the degree of engagement in the task, which inversely impacts technology dominance.

The proposed theoretical model is tested experimentally. Participants are asked to make a capital budgeting decision. Each participant is provided the same decision aid to perform calculations necessary to make the decision. The degree of autonomy and relatedness associated with the task are manipulated. Intrinsic motivation towards academic tasks in general, intrinsic motivation specific to the experimental task, and engagement in the experimental task are measured using validated psychological scales. Technology dominance is evaluated based on the appropriate use of the decision aid.

The results of the study do not support the theoretical model, yet the findings do reveal that intrinsic motivation affects technology dominance. Specifically, the degree of intrinsic motivation towards academic tasks in general increases the likelihood that the participant is likely to use the decision aid appropriately. However, the experimental manipulations of self-determination do not affect the degree of intrinsic motivation for the experimental task. Intrinsic

motivation for the task does in fact impact engagement in the task; however, engagement in the task, as measured, is not linked to technology dominance. Although the theoretical model is not supported, this study provides evidence that intrinsic motivation is an important factor in determining technology dominance. Thus, studying the link between self-determination theory and technology dominance should not be abandoned.

Overall Conclusion

The three studies contained in this dissertation investigate the impact that workplace technology and management control have upon decision makers. Each study focuses upon different controlling characteristics of technology in order to refine and evaluate theories concerning organizations' use of workplace technologies and the impact technology has on decision makers. The studies in this dissertation find more evidence for the positive impacts of workplace technology on the decision maker than evidence for the negative impacts of workplace technology on the decision maker. For example, the mutual monitoring created by enterprise systems forges relationships between peer managers, such that social identification as a team is achieved. This social identification increases managers' influence and control over their organizations. Contrary to expectations, increased monitoring in the form of performance measurement does not appear to limit the freedom of managers, except when combined with high routinization. Additionally, the expected inverse relationship between intrinsic motivation and controls built into the technology is not found.

The three studies also provide contributions to theory. The first study refines labor process theory. Specifically, the study reveals that all scientific management techniques cannot be viewed as sources of control that limit the freedom of employees. Routinization of job tasks is revealed as the technique that reduces the freedom of employees and could be the contingency that determines when performance measurement is used in a manner consistent with labor process theory. The second study refines theories on empowerment management. While it supports theories that posit that empowering work environments lead to empowered personnel, it also reveals that social identification is an important intermediary step in that process. Study 3 expands the theory of technology dominance to include intrinsic motivation and pursues a different avenue of technology dominance research.

This dissertation reveals that various theories concerning workplace technology and management control techniques have both validity and limitations. Labor process theorists cannot assume that all technologies and management control techniques are utilized to undermine the employee's value to the organization, as Study 2 reveals that enterprise systems and mutual monitoring lead to empowered managers. Likewise, proponents of enterprise systems cannot assume that the integrated nature of enterprise systems is always utilized in an empowering manner, as Study 1 reveals the increased performance measurement through enterprise systems can be utilized to limit managers in a routinized job environment. The findings and theoretical refinements demonstrate that workplace technology and management control have a complicated relationship with the employee and that the various theories concerning them cannot be applied universally.

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CHAPTER 2 STUDY 1: THE ROLE THAT ENTERPRISE SYSTEMS PLAY IN THE DEGRADATION OF MIDDLE MANAGEMENTS' WORK.

Introduction

Technological advancements play an important role in the evolution of labor processes (Braverman, 1974; Rochlin, 1997; Friedman, 2005). Academics and practitioners, alike, agree that technology improves efficiency, lowers cost, and may even lighten the physical burden of labor (Braverman, 1974; Rochlin, 1997; McColloch, 1983; Friedman, 2005). Yet, labor process theory proposes that technology plays an important role in the degradation of the work, which is to say that technology is used to dehumanize labor by limiting the role of the worker within his or her own work (Braverman, 1974; Rochlin, 1997; Sy and Tinker, 2010). Specifically, new technologies are utilized to standardize and restrict how work is performed so that the worker has no influence on how to conduct their own work (Dillard et al., 2005). The purpose of this study is to test technology's role within labor process theory by examining whether enterprise system integration advances the degradation of work. Specifically, this study examines whether enterprise system integration proliferates the application of scientific management[1] techniques upon middle management, leading to the degradation of middle management.

This study focuses on the relationship between enterprise system integration and middle management through the lens of labor process theory for various reasons. First, middle

[1] The theory underlying scientific management is that there is one best way of doing every act that has to be performed at work (Taylor, 1911). Thus, scientific management techniques will develop formal work procedures that can be repeated (Rochlin, 1997: Braverman, 1974). Additionally, performance must be measured and rewarded in order to reduce "slacking" by employees (Braverman, 1974).

management work processes are an interesting phenomenon to study through the labor process theory lens because middle managers operate in two opposing roles within labor process theory, as labor and as agents of capital. Second, enterprise system integration has the potential to degrade middle management work by taking away their control over their labor process. Enterprise system integration encourages the standardization of middle management procedures (Morton and Hu, 2008; Segars et al., 2001) and measures middle manager performance (Elbashir et al., 2011; Elmes et al., 2005), which are key to the degradation of work (Prechel, 1994; Braverman, 1974). The early enterprise systems literature touts that the greatest benefits to be gained from enterprise system integration accrue at the strategic level. These benefits are alleged to accrue as a result of improvement to the alignment of everyday decisions and strategic objectives (Beretta, 2002), yet the impact upon middle management is less documented. This study theorizes that enterprise system integration degrades the work of middle management by increasing the use of scientific management techniques upon middle management and degrading their work.

This theory is evaluated through the examination of 189 survey responses. The survey is designed specifically for this study and administered to middle managers in a variety of industries. A particular strength of this study's methodology is the utilization of previously established organizational behavior constructs to examine scientific management and degradation of work. A structural model is constructed that links enterprise system integration to the degradation of work (autonomy) indirectly through three aspects of scientific management (formalization, routinization, and performance measurement). Autonomy is defined as the ability to determine how one's own work is performed (Hackman and Oldham, 1980; Spreitzer, 1995).

Formalization refers to the extent to which specific procedures for carrying out work are documented (Bacharach et al., 1990; Hage and Aiken, 1967). Performance measurement is the extent to which work performance is captured in the information system (Hall, 2008); while routinization is the repetitive nature of one's work (Bacharach et al., 1990). The relationships between these latent constructs are analyzed simultaneously through component based structural equation modeling.

This study contributes to the management accounting, enterprise system, and critical AIS literatures. The use of a survey and structural equation modeling allows this study to add to the relatively sparse area of generalizable studies on the impact of enterprise system integration to managerial control (Arnold et al., 2011; Kallunki et al., 2011; Chapman and Kihn, 2009; Rom and Rohde, 2007; Arnold, 2006). The results of the study indicate that enterprise system integration does increase two aspects of scientific management, formalization and performance measurement. However, routinization is unrelated to enterprise system integration. Interestingly, routinization is the only aspect of scientific management that directly increases the degradation of work, in the form of reduced autonomy. Performance measurement only contributes to the degradation of work when combined with higher degrees of routinization. These results contribute to labor process theory by elucidating potential nuances. Specifically, the results indicate that routinization of managers is the aspect of scientific management that directly leads to the degradation of work. Additionally routinization interacts with performance measurement, such that high levels of both further contribute to the degradation of work beyond that of routinization alone. Also, contrary to the expectations of labor process theory, the results show that the power asymmetries inherent to the organizational hierarchy do not always generate

processes to further the degradation of work for subordinates (Adler and Borys, 1997; Lewis and Grimes, 1999).

This study is important to practice for a variety of reasons. Specifically, labor process theory predicts that degradation of work results in long term deskilling of the laborer (Braverman, 1974; Rochlin, 1997). Although this study does not examine deskilling directly, the degradation of middle management's work leads to questions about the quality of middle management's experience as they move up the corporate latter. Additionally, a lack of autonomy, which characterizes degradation of work, is associated with diminished feelings of competence, increased job stress, and lowered performance (Hall, 2008; Morgeson and Delaney-Klinger, 2005). Thus, the findings in this study have implications for the short term and long term performance of managers.

The rest of this paper is divided into seven sections. The literature review section describes the academic literature that examines enterprise systems and management control. The theory development section has two purposes. The first is to explain labor process theory and conceptualize the degradation of work as organizational behavior concepts (i.e. formalization, routinization, performance measurement, and job autonomy). The second purpose is to review the role that technology has played in the degradation of work for different workplace populations. The hypothesis development provides theoretical support for the impact of enterprise systems on formalization, routinization, performance measurement, and job autonomy. The methodology section discusses the survey collection process and explains the operationalization of each construct. The results provide the statistical analyses and are followed by the discussion, limitations, and conclusion.

Literature Review

Enterprise systems are information systems that span the entire organization. Enterprise systems allow the transfer of information across organizational hierarchies, departments, and locations (Davenport, 1998). Enterprise systems may consist of a single software and database, which is typical of an enterprise resource planning system. Additionally, enterprise systems include enterprise application integration systems, which consist of several applications that work together with middleware to provide integrated information. In this study, enterprise systems is an umbrella term that covers enterprise resource planning systems, enterprise application integration systems and any other information system that integrates enterprise wide information. Enterprise system integration is the extent to which an organization's information system aggregates and disseminates information across the entire organization.

Researchers agree that enterprise system integration should have a large impact upon organizational performance and organizational structures (Rom and Rohde, 2007; Nicolaou and Bhattacharya, 2006, Sutton, 2006; Scapens and Jazayeri, 2003). While the expectation is clear, the evidence is not (Poston and Grabski, 2001; Hayes et al., 2001). Researchers and practitioners alike expect that enterprise system integration will improve efficiency by applying industry best practices and improve strategic management by providing real time information (Beretta, 2002; Davenport, 1998). However, some research indicates that the bottom line may not improve (Poston and Grabski, 2001; Hayes et al., 2001). Some argue that this demonstrates an inability to maintain competitive advantage due to a lack of differentiation within an industry, as a specific technology may become an industry standard (Rikhardsson and Kraemmergaard, 2006; Beard and Summer, 2004). Although the immediate effects of enterprise system implementation have

not been established, time lag studies find that it takes as little as two years to see improvement in efficiency and financial performance (Weir et al., 2007; Nicolaou and Bhattacharya, 2006; Nicolaou, 2004). Additionally, the improvement intensifies if the enterprise systems are used to expand the use of non-financial information for management purposes (Weir et al., 2007). This finding highlights the effect that enterprise systems can have on management control systems.

Several case studies detail various impacts that enterprise systems have upon management accounting and control systems. Management accounting roles can be displaced and management accountants may be forced to find new ways of contributing to their companies. Scapens and Jazayeri (2003) note that routine management accounting tasks are performed by the enterprise system, giving managers ownership over management accounting data and allowing managers to co-opt management accounting activities. Contrarily, Dechow and Mouritsen (2005) observe a case in which management accountants remained the primary producer and owner of management accounting data due to a failure to fully integrate. The inability to fully integrate management accounting data forces management accountants to act as the intermediary between business units and strategic management. Interestingly, both studies observe a conscience effort by central authority to standardize management accounting across business units for the purposes of greater visibility and control.

A separate case reveals that the enterprise system integration reorganizes processes and contradicts managers' notions of control (Quattrone and Hopper, 2005). Responsibilities and accountabilities realign and managers feel that accountability is significantly diminished (Quattrone and Hopper, 2005). Sia et al. (2002) also note a realignment of responsibilities. Billing, finance, and accounting clerks are forced to expand their knowledge bases as their

departments' traditional boundaries collapse. Across case studies, the integration of information increases visibility and pressurizes the work environment as users feel compelled to perform their tasks correctly and in a timely fashion (Quattrone and Hopper, 2005; Elmes et al., 2005; Sia et al., 2002). Within this context, management feels empowered by the availability of data, while low level employees feel coerced by the availability of data.

The generalizability of these findings is limited as they only relate to a select few companies and they occur near the implementation of enterprise systems. The time lag needed for financial performance improvements to manifest indicates that the descriptions of the state of the organization around the implementation may not be representative of the organization when use of the enterprise systems has been stabilized (Weir et al., 2007; Nicolaou and Bhattacharya, 2006; Nicolaou, 2004). Thus, research undertaken after the enterprise system has been stabilized may provide different insights.

The few generalizable studies on enterprise systems and managerial control find that enterprise systems facilitate enterprise risk management and encourage the use of formal and informal controls, and positively impact firm performance (Arnold et al., 2011; Kallunki et al., 2011; Weir et al., 2007). Only one published study, to this author's knowledge, uses generalizable methods to determine whether enterprise systems empower or degrade management (Chapman and Kihn, 2009). Specifically, Chapman and Kihn (2009) examine whether enterprise system integration fosters budgeting control systems with characteristics of enabling control as identified by Adler and Borys (1996). The four characteristics of enabling controls are repair, internal transparency, global transparency, and flexibility. The repair characteristic represents the ability to alter or circumvent the management control system if it is

not working as intended. Internal transparency indicates that the management control system helps employees understand how they can perform their task best. In complement to internal transparency, management control systems that help employees understand how their tasks contribute to the broader organization possess global transparency. Flexibility characterizes room for choices in the performance of tasks (Adler and Borys, 1996; Ahrens and Chapman 2004; Chapman and Kihn, 2009).

Chapman and Kihn (2009) find that enterprise system integration is positively related to three of the four enabling controls: repair, internal transparency, and global transparency. However, enterprise system integration is negatively associated with the fourth enabling control, flexibility. Given that the Chapman and Kihn (2009) survey focuses on the budgeting process, their findings indicate that enterprise system integration helps the budgeting process guide employees in the performance of their tasks, show employees how they contribute to the broader organization, and provide the ability to repair broken controls. However, Chapman and Kihn (2009) also find that enterprise system integration is linked to budgeting processes that reduce the discretion managers have in making expenditures. From a broader perspective, these findings provide contradictory evidence. The increase in the characteristic of repair indicates that enterprise system integration increases managers' discretion to circumvent or overrule an incorrect use of budgetary controls; yet, the decrease in the characteristic of flexibility indicates that enterprise system integration decreases managers' discretion related to expenditures.

This study builds upon this line of research by exploring, in more depth, the relationship between enterprise system integration and manager discretion. In particular, this study expands upon what attributes of managerial control (formalization, routinization, or performance

measurement) lead to a reduction in manager discretion. Additionally, the methodological focus on the budgeting process found in Chapman and Kihn (2009) is expanded to include all duties of middle management. While Chapman and Kihn (2009) emphasized the relationship between enterprise system integration and enabling control characteristics, this study elucidates the relationship between enterprise system integration, aspects of scientific management, and the degradation of work.

Theory Development

Labor process theory characterizes production in a capitalist society in terms of a battle between capital (owners) and labor (employees) (Braverman, 1974). As a battle, both capital and labor vie for leverage in seeking the spoils of war. From an economic perspective, capital seeks to reduce the cost of labor in order to increase profits, while labor seeks to increase their share of revenue. Capital controls the physical resources needed for large scale production and labor controls the manpower. The labor process is the process by which the resources and the manpower are combined to add value to the finished product/service. The party that possesses the greater amount of knowledge concerning how to optimally combine manpower and resources increases their value to the organization and can claim higher portions of the added value (Braverman, 1974). To say it plainly, if capital possesses more knowledge of the steps required to produce the end product than labor, capital will develop a set of steps that reduces the required skill level. Thus, capital can hire less skilled workers and demand lower wages to increase profits. Conversely, if labor possesses more knowledge of the steps required to produce the end

product than capital, labor is considered skilled and can demand higher salary/wages which reduces the amount profit that goes to capital.

The labor process is controlled with knowledge. Capital can wholly control the labor process, when they can produce specific instructions for every aspect of work. When capital no longer needs labor to think about their tasks (i.e. labor no longer needs specialized knowledge), labor becomes replaceable. Braverman (1974) credits Frederick Winslow Taylor with developing the technical fashion by which capital obtains control of the labor process. Taylor's management philosophy asserts that adequate control is achieved when management not only sets outcome requirements, but also dictates precisely how a task should be performed (Taylor, 1911). Management must acquire all of the knowledge about the task and break it down into small steps. Management can then take control of the task by providing specific instructions on how to accomplish the task. When this management technique is properly applied, the laborer does not have to think about what to do (Braverman, 1974). Taylor referred to this process as scientific management; while labor process researchers refer to this as the degradation of work (Cooper and Taylor, 2000; Braverman, 1974). Therefore, the degradation of work is characterized by a lack of job autonomy where work instructions are specified and the laborer cannot deviate from those specifications.

The degradation of work is accomplished through three aspects of scientific management: formalization, routinization and performance measurement (Bryer, 2006; Harley et al., 2006; Prechel, 1994; Braverman, 1974; Taylor, 1911). Formalization refers to the specification of job procedures (Hage and Aiken, 1967). Performance measurement is the process by which superiors monitor and evaluate the performance of subordinates. Formalization and performance

measurement go hand in hand as performance measurement encourages and enforces adherence to set procedures, which is essential for management to control the labor process. Routinization is characterized as the consistent and repetitive nature of work. Routinization is often the result of developing efficient work processes through specialization and often comes with standardization of tasks (Ohly et al., 2006; Scapens and Jazayeri, 2003). Formalization, routinization, and performance measurement are organizational behavior concepts that represent the application of scientific management to specify efficient work procedures and ensure adherence to said work procedures (Harley et al., 2006; Prechel, 1994; Braverman, 1974; Taylor, 1911). Thus, labor process theory can be stated in organizational behavior terms with the following statement: capital will utilize formalization, routinization, and performance measurement to decrease job autonomy (Harley et al., 2006; Prechel, 1994; Braverman, 1974; Taylor, 1911).

Although scientific management is carried out through formalization, routinization, and performance measurement, technology determines the level at which they can be applied. Mechanical technology allows for the scientific management of manual labor (Braverman, 1974). Information technology and computers allow for the scientific management of information workers (Rochlin, 1997; McColloch, 1983). A brief overview of these major technological changes helps to establish the tendency of organizations to utilize technology to degrade work.

Braverman (1974) demonstrated how scientific management created an efficient, albeit alienated, work force. Taylor focuses on the management of workshop employees, such as factory floor workers in the 1920's. Taylor studied the job and turned it into small steps. Workers

were then assigned to particular steps, given specific instructions, and paid based on how well they performed that step. This created distinct advantages for management. Employees no longer hold proprietary information regarding production, meaning that less skilled workers can be hired at lower wages. This degradation of work not only provided management with unprecedented power, but also provided the foundation for assembly lines. Eventually, advances in technology produced machines that could replace many workers.

As the manual labor force dissipated, the information workforce[2] expanded (McColloch, 1983). Organizations grew larger and needed to maintain control through different aspects of accounting, which requires information and documentation. Large organizations needed managers, accountants, and clerical workers to keep track of production, sales, employees, customers, and all other resources. Thus, the industrial revolution, characterized by mechanical technology innovations, witnessed the marginalization of manual labor with an increase in information work (McColloch, 1983).

Another technological innovation, the computer, has now reduced the need for clerical work. McColloch (1983) noted a 50 percent decrease in bookkeepers from 1960 to 1965. Although bookkeepers were considered highly skilled, the ease of codifying their tasks made the job an easy target for computerization. Cooper and Taylor (2000) detail the division of labor and deskilling among accounting clerks to further support the proposition that scientific management plays a heavy role in the degradation of the labor process. Computerization has noticeably infringed on more and more of the white collar workforce, where intellect and skill are highly

[2] Information workforce includes all types of record keeping, reporting, and customer service at all levels of management.

compensated until the position can be degraded through scientific management (Mithas and Whitaker, 2007; Rochlin, 1997).

Although management imposes and enforces scientific management upon their subordinates, they are also victims of scientific management (Prechel, 1994; Saravanamuthu and Tinker, 2003). Organizations have reduced the amount of judgment exercised in decisions by examining decision processes and creating formal responses to be exercised companywide (Prechel, 1994; Grey, 1999). These policies are encoded into the information system and proliferated throughout the organization. Enterprise systems provide the technology that can affect middle management like no previous technology could. Enterprise systems integrate the distinct divisions of a firm into enterprise wide processes. Enterprise system integration provides upper management access to information from all business functions. To facilitate this integration, the separate business functions and regions must utilize standard data architecture (Chapman and Kihn, 2009; Davenport, 1998). Although middle managers provide input, the final decision concerning the data architecture are decided by upper management. Without this integration of functions, middle managers are gatekeepers of their information providing strategic managers with the chosen result oriented performance indicators. As enterprise system integration provides information to upper management, more of the middle manager's activity can be captured. Upper management may impose formalized procedures upon middle managers' to ensure standardization of information. Labor process theory suggests that upper management will utilize enterprise system integration to degrade the work of middle managers, using the tools of scientific management (e.g. formalization, routinization, and performance measurement). Similar to the manner in which mechanical technology degraded the work of manual laborer and

computer processing degraded the work of the clerical worker; integrated enterprise systems may degrade the work of middle management. The theoretical relationship between enterprise systems, scientific management techniques, and degradation of middle management work is depicted in Figure 2-1.

Hypothesis Development

Enterprise systems aggregate information from different functions and disseminate this information across the enterprise (Davenport, 1998). These systems are designed to breakdown functional barriers and combine functional units into cross-functional business processes (Broadbent et al., 1999; Beretta, 2002). Additionally, enterprise systems are well suited for formalized organizational structures, which are characterized with well specified and rigid work procedures (Morton and Hu, 2008). Thus, to fully integrate an enterprise system requires extensive documentation of systems and processes (Zairi, 1997). The processes are evaluated, improved, and encoded into the enterprise system. Pre-specified IT packages come equipped with specific business procedures; however, the packages can be customized to reflect any business procedure. Whether pre-specified or customized, successful integration of an enterprise system is accompanied by a thorough examination and documentation of business processes (Zairi, 1997). The documentation of these procedures creates the formalization that details the manner in which to perform these tasks within the enterprise system. This is integral to attaining useful data from the enterprise system. Diverse users must understand and define the data in the same way. Furthermore, enterprise system integration often entails automated and interconnected

technologies that force work to be performed in a specified manner (Morton and Hu, 2008). Thus, in an organization that has successfully integrated their business with an enterprise system, tasks are highly interdependent and must be performed in a standardized manner to achieve optimal coordination (Morton and Hu, 2008; Segars et al., 2001).

For lower level positions, the implementation of an enterprise system may not affect the extent of documentation or formalization of procedures because lower level positions may already be well documented in large organizations. On the other hand, integration of an enterprise system should increase the level of formalization for middle management. This is because some of the middle manager's activities that may have been performed outside of a non-integrated information system must be performed within an integrated enterprise system. For example, developing reports for upper management in a non-integrated system may have been an activity for the middle manager and an accountant to perform in the manner that both of them deem suitable. However, upper management may have designed specific procedures for generating reports in an integrated system. Stated more generally, in order for information from different regions and functions to integrate in a real time, standard information and procedures must be formalized across the organization (Gattiker and Goodhue, 2004).[3]

H1: Enterprise system integration increases the formalization of middle management work.

Research examining the relationship between enterprise systems and managerial accounting techniques is mixed (Rom and Rohde, 2007). In many cases, enterprise systems

[3] Enterprise systems do not require that all tasks are formalized; rather enterprise systems will formalize more tasks or create additional formalized tasks.

improve operations and financial reporting, but management accounting remains the same (Granlund and Malmi, 2002; Scapens and Jazayeri, 2003; Brazel and Dang, 2008; Rom and Rhode, 2007). Advanced managerial techniques, such as activity based costing and balanced score cards, may be maintained outside of the enterprise system (Granlund and Malmi, 2002). In contrast, more recent studies find that organizations are beginning to utilize their enterprise systems to expand the capabilities of their management control systems (Wier et al., 2007; Elbashir et al., 2011).

Much of the enterprise system research examines cases close to the implementation of the system, which is a possible reason that research found little evidence that enterprise systems affect management control systems. As organizations work out the implementation issues and become familiar with their enterprise systems, they may start to take advantage of the managerial control opportunities created through fully integrating the enterprise system. Enterprise system integration makes more of middle management's performance visible, providing upper management with the ability to apply scientific management techniques to middle management (Elmes et al., 2005). Enterprise system integration provides the platform to record intricate measures of business activities (Elbashir et al., 2008; Chapman and Kihn, 2009). Business intelligence software can harness this information to develop advanced managerial control mechanisms, such as sophisticated performance measurement (Elbashir et al., 2011). Upper management is inclined to expand performance measurement of middle managers because it tightens their control, coordinates various members of middle management, and leads to better overall performance (Elmes et al., 2005; Segars et al., 2001; Beretta, 2002). This is consistent with labor process theory as the theory predicts that capital will utilize new technologies to apply

scientific management to more organizational roles in an effort to lower the cost of labor and increase profits (Braverman, 1974; Bryer, 2006). Enterprise system integration creates the opportunity expand performance measurement of middle managers, which strengthens upper management's control over middle management. Hence, the following hypothesis is derived.

H2: Enterprise system integration expands the performance measurement of middle management work.

Workplace technologies, including enterprise systems, are often associated with the routinization of job tasks (Ohly et al., 2006; Scapens and Jazayeri, 2003; Clegg, 1984). Based on their case study, Scapens and Jazayeri (2003) conclude that enterprise systems increase the integration, standardization, centralization, and routinization of organizational activities. Routinization is not an automatic result of enterprise system integration; rather, routinization is achieved through a purposeful simplification and specialization of job tasks (Child, 1972; Oldham and Hackman, 2010; Clegg, 1984). However, enterprise system integration does create the opportunity to design middle management job tasks in a way that is more routinized, which provides upper management more control over middle management (Attaran, 2004; Scapens and Jazayeri, 2003: Clegg, 1984). Labor process theory explains that capital, represented by upper management, strives to maximize their control and is, therefore, likely to utilize enterprise system integration to routinize the work of middle management to further control middle management (Clegg, 1984; Braverman, 1974).

H3: Enterprise system integration increases the routinization of middle management work.

Labor process theory suggests that the organization will apply performance measurement techniques to enforce adherence to the policies and procedures (Wouters and Wilderon, 2008; Braverman, 1974; Taylor, 1911). However, management may determine that some tasks are not well suited for performance measurement. Academic literature weighed in on this debate when Hopwood (1972) found that a heavy focus on performance measurements is linked to job stress and should have a negative effect on job performance. In contrast, Otley (1978) failed to find any such relationship. Hirst (1983) revealed that task uncertainty is a key contingency in understanding the relationship between performance measurement and job performance. The subsequent studies found that focusing on the performance measurement of tasks with low uncertainty improves performance. In contrast, focusing on performance measurement of tasks with high uncertainty diminishes performance (Hirst, 1983; Brownell and Hirst, 1986). Brownell and Hirst (1986) explain that tasks with low uncertainty are easily formalized, because the steps to complete the task are known and can be documented. Thus, one can conclude that formalized tasks lend themselves to successful performance measurement. This is intuitive, because formalization of a task indicates that both the organization and the employee understand the requirements of that task. Thus, they are more likely to measure the performance of that task appropriately. Hence, the following hypothesis is derived.

H4: The formalization of middle management work expands performance measurement of middle management work.

Formalized policies and procedures are tools of managerial control (Childs, 1972). They describe the proper actions to take and decisions to make under specific circumstances. Weber's (1947) theory of bureaucratic control suggests that formalized procedures and policies can shift

certain decision making authority down to low level employees. This is evidenced in many companies today as their customer service representatives are equipped to deal with more customer issues than ever before (Chen and Popovich, 2003). This can be seen as decentralizing control or decentralizing the authority of action (Prechel, 1994). The low level employee only has the authority to act within the specified policies and procedures provided by corporate, but they do not have the freedom to exercise judgment. The organization maintains control, yet the action and authority is decentralized to the frontline (Prechel; 1994). Thus, low level employees can have increased authority and decreased autonomy.

Positions that require judgment and the performance of unstructured tasks traditionally require autonomy. In some environments, middle managers exercise judgment and solve unstructured problems (Prechel, 1994; Grey, 1999). In other environments, strategic management has determined the best way for middle managers to make those decisions and solve those problems. Through formalization, upper management's preferences are documented and encoded into procedures and policies, thereby removing the personal judgment from middle managers (Segars et al., 2001). As described in labor process theory, specifying and formalizing procedures is utilized to force standardization and tighten control across the firm. This standardization and tightening of control prevents middle managers from utilizing their own discretion and judgment in the completion of their tasks, thus degrading middle management work.

H5: The formalization of middle management work advances the degradation of middle management work.

Performance measurement makes a person visible to their superiors and increases managerial control (Miller and O'Leary, 1987). Prior research has noted the shortcomings of purely financial performance measures and reports situations where managers act in a way that increases a specific financial performance measure to the detriment of the overall competitive position (Hirst, 1983; Brownell and Hirst, 1986). In response, prior research suggests the use of non-financial measures in addition to financial measures to improve managerial control (Keegan et al., 1989; Kaplan and Norton, 1996). Measuring performance drivers expand performance measurement beyond the measurement of results to cover more of the actions that a person or business unit undertakes providing more comprehensiveness. The impact that broadening and deepening performance measurement has upon financial performance is still under debate. The arguments for the benefits of broad and deep performance measurement are persuasive, but they may not be supported by evidence (Norreklit, 2000).

Kaplan and Norton (1996) explain that diverse performance measures can align behaviors with the overall company goal better than financial metrics. Labor process theory proposes that this occurs through coercive performance measures (Wouters and Wilderon, 2008). Contrarily, Hall (2008) argues that the feedback from performance measurement empowers employees. In fact, Hall (2008) finds a positive correlation between performance measurement and the degree of autonomy that managers have as they perform their work. However, Hall (2008) applies these concepts at two different levels, performance measurement in relation to the business unit and autonomy in relation to the manager. Perhaps more measurement of business unit performance compensates for less performance measures directly over the manager. Thus, the relationship between performance measurement of the manager and the autonomy of the manager is not

observed in the Hall (2008) study. This study hypothesizes on the impact of increased performance measurement and the level of discretion given to the manager. In accordance with labor process theory, performance measurement is expected to force middle management to perform tasks according to formal procedures (Wouters and Wilderon, 2008; Widener et al., 2008). Additionally, expanded performance measurement may capture process as well as outcomes, further restricting how middle management performs their tasks. Hence, expanded performance measurement limits the ability to utilize discretion in how to perform tasks, thus, advancing the degradation of work.

H6: The performance measurement of middle management work advances the degradation of middle management work.

Routinization, the repetitious nature of work, is also expected to advance the degradation of middle management work. Routinization does not only indicate that a particular task is done the same way every time, but also indicates that the set of daily tasks does not change from day to day (Bacharach et al., 1990; Clegg, 1984). Theoretically, routinization is a task structure choice that is designed to reduce the discretion that labor has in regards to how work is performed (Oldham and Hackman, 2010; Clegg, 1984). In accordance with labor process theory, capital designs a routinized work process to limit the need for employee thought (Braverman, 1974). Capital divides the work process into small steps and assigns employees to specialize in a specific task (Taylor, 1911). This task must be done a specific way at a specific time in order to coordinate and work with the other tasks being performed. Thus, the employee cannot diverge from the specified procedures. In essence routinization is a scientific management technique

designed with the specific purpose to eliminate employee discretion and render labor replaceable (Clegg, 1984, Braverman, 1974).

Additionally, empirical evidence suggests that routinization advances the degradation of work by limiting the amount of discretion that laborers can apply in their daily work tasks. Organizational behavior studies refer to this concept of discretion as autonomy (Dierdorff and Morgeson, 2007; Peirce et al., 2004; Currivan, 2000). In many studies that include both routinization and autonomy, they are both considered job characteristics that make up work structure; and, there interrelationships with each other are taken for granted or are not a primary concern (Dierdorff and Morgeson, 2007; Peirce et al., 2004; Currivn, 2000). However, these studies indirectly demonstrate that routinization and autonomy are inversely related. For example, routinization decreases experienced control, while autonomy increases experienced control (Peirce et al., 2004). Additionally, routinization decreases job satisfaction, while autonomy increases job satisfaction (Currivan, 2000). Thus, empirical research suggests that routinization advances the degradation of work by limiting the judgment employees can use in determining how to perform their work tasks.

H7: The routinization of middle management work advances the degradation of middle management work.

Figure 2-2 presents the research model and shows the hypothesized relationships between the constructs.

Research Methodology

This study focuses on the relationship between enterprise system integration, formalization, performance measurement, routinization, and autonomy. These constructs are unobservable and cannot be measured directly. In order to obtain data on these constructs, this study employs the field survey method. Participants answered Likert style scale items to address the above mentioned constructs as well as demographic questions on themselves and their organization.

Most survey items were adapted from validated constructs. Items were added or eliminated based on discussion with academic experts. Consistent with Dillman (2000), the survey was given to three business unit managers to assess how the item measures would be received by the target population. These business unit managers completed the survey as if they were actual participants. The business unit managers then provided feedback on each item. After receiving feedback, final revisions were made.

A market research firm was employed in order to gain access to the appropriate respondents for this study. This firm specializes in business, rather than consumer, survey respondents. The survey was presented to respondents in an online format and contained active controls that rerouted respondents who did not meet the following criteria.

- How many people are employed by your organization? (The organization must employ over one thousand people.)
- How long has your company's current information system been in place? (The company's information system must have been in place for longer than one year.)

- Do you manage a business unit, department, division, or functional area? (The respondent must answer "yes" to this question.)
- Which of the following responsibilities best describes the unit that you manage? (The respondent must indicate that they are managers of business units that participate in value chain activities.)

A respondent who failed to answer any question appropriately was immediately directed away from the survey.

The online survey was programmed so that any respondent from the same IP address as a previous respondent could not log on to the survey. Further, the survey also contained read check questions that instructed the reader to choose specific answers in order to continue. For example, a read check question would state: "I am reading this survey very carefully. Please indicate strongly agree." A respondent who did not mark the answer as instructed, was immediately rerouted out of the survey. These read check questions removed 111 respondents.

The market research firm was able to provide 214 complete responses. Five respondents were eliminated because their answers to the open ended questions were suspiciously identical. Three respondents were eliminated because they responded "no basis to answer" for three or more indicators within a single construct. This study focuses on the impact of technology to the middle management; therefore, an additional 17 respondents were eliminated because they were part of the top management team (e.g. chief executive officer, chief information officer, chief operations officer). Therefore, 189 of 214 were retained for hypothesis testing. The constructs for this study required respondents to answer 30 Likert style questions and therefore produced 5,670 data points. Twenty of the 5,670 (0.35 percent) data points indicated the respondent had marked

no basis for answering. These data points were treated as missing data and replaced by the series mean.

Additional demographic information on the respondents can be found in Table 2-1. The sample included 104 (55.0 percent) male and 88 (44.4 percent) female respondents. Most respondents worked in the manufacturing, retail, and services industry sectors, each constituting approximately twenty percent of the sample. In addition, the tenure at the organization was varied. Ninety-seven respondents (51.3 percent) have worked in their organization between one and ten years. Eighty-eight respondents (44.4 percent) have worked for their organization for more than ten years. Only seven respondents (3.7 percent) joined their organization less than a year prior to responding to the survey. In summary, the respondents represented various industries and levels of experience.

Operationalization and the Survey Instrument

The following paragraphs describe the operationalization of the theoretical constructs. The survey instrument combines previously validated survey items from different research streams. Therefore, each theoretical construct is defined and the origins of the survey items discussed.

Enterprise System Integration

A key characteristic of enterprise systems is their integration. However, the level of integration associated with enterprise systems should be conceived as a continuum, rather than a dichotomy (Granlund and Malmi, 2002). Although enterprise systems may have varying degrees of hardware integration, the extent of data integration distinguishes enterprise systems from other

information systems (Rom and Rohde, 2007). Thus, the enterprise systems construct is operationalized as the degree to which information is integrated across functions, locations, and hierarchy.

The item measures used to measure enterprise systems integration were adapted from several studies (Arnold et al., 2011; Chapman and Kihn; 2009; Byrd and Turner, 2000). Byrd and Turner (2000) developed and validated a construct called IT integration that reflects the ability of an information system to integrate information across functions, locations, and hierarchies. Arnold et al. (2011) applied an adapted version of Byrd and Turner's (2000) IT integration scale. Chapman and Kihn (2009) utilized two different items to measure IT integration in their study. Items in this study are adopted from the Arnold et al (2011) and the Chapman and Kihn (2009) studies. These items can be seen in panel A of Table 2-2, along with the corresponding mean responses.

Formalization- An Aspect of Scientific Management

Labor process theory explains that scientific management strives to breakdown an employee's job into simple tasks and provides specific instructions to how to perform those tasks (Braverman, 1974). This aspect of scientific measurement is operationalized as formalization. The degree of formalization refers to the degree to which procedures, rules, and policies are specified. Hage and Aiken (1967) defined the concept and developed measures for formalization. Subsequent research built off Hage and Aiken's (1967) measures to validate more refined measures of formalization (Bacharach et al., 1990; Dewar et al., 1980). Past research seems to

approach formalization as an organizational characteristic rather than a job characteristic.[4] Therefore, the items are adapted to specify the respondents' jobs rather the respondents' organizations.

The item measures for formalization and their means are shown in panel B of Table 2-2. Close review of the formalization items reveals multidimensionality. Some items focus on the procedures and policies related to the job tasks, while another item relates to job descriptions, and yet another related to organizational hierarchy. This multidimensionality requires that formalization be specified as a formative construct (Petter et al., 2007).

Performance Measurement- An Aspect of Scientific Management

Performance measurement describes how broadly and deeply a person's performance is measured and evaluated. Labor process theory explains that performance measurement is a scientific management technique used to enforce formal procedures and incentivize maximum effort (Braverman, 1974; Bryer, 2006). Hall (2008) develops a scale to measure how comprehensive a performance measurement system is. This study adapts these measures to indicate how much of a person's performance is captured in the information system. Consistent with prior research (Malina and Selto, 2001), Hall (2008) explains that more parsimonious performance measurement systems are considered more comprehensive. Additionally, much of the comprehensive performance measurement literature is embedded in the balanced scorecard

[4] Formalization as a consistent characteristic throughout an organization is theoretically plausible and convenient statistically, but strict adherence to this underlying assumption may not be as palatable. For example, if organization "X" has more formalized procedures for low level employees in department "B" than organization "Y" has in department "B", then organization "X" should have more formalized procedures than organization "Y" for all comparable departments. This is very unlikely.

literature, which requires that performance measurements are related to strategic objectives. However, this study is not concerned with parsimoniousness or strategic objectives of the performance measures. Therefore, this study only adopts measures that specifically indicate the breadth or depth of the performance measurement system. In simple terms, these measures describe how much of a person's performance activity is measured. Panel C of Table 2-2, displays these measurement items and their means.

Routinization- An Aspect of Scientific Management

Labor process theory also explains that scientific management seeks to remove the need for the worker by turning job tasks into thoughtless routines (Braverman, 1974; Clegg, 1984). Organizational research identifies this job characteristic as routinization (Hage and Aiken, 1964). The degree of routinization refers to the degree to which daily job tasks do not change (Hage and Aiken, 1964; Bacharach et al., 1990). Bacharach et al (1990) also developed and validated updated measures for routinization. As with formalization, research has measured routinization as an organizational characteristic; therefore the items are adapted to specify the routinization of the respondent's work rather than their organization. Panel D of Table 2-2, displays these items and their means.

Autonomy- An Operationalization of Degradation of Work

Autonomy gives employees the ability to exercise judgment on the performance of their tasks. Thus, a lack of autonomy is a reasonable proxy for degradation of work as described by Braverman (1974). Job autonomy is defined as a person's ability to determine how their own work is performed. Within research, the concept of job autonomy has many labels. Hackman and

Oldham (1980) provide three item measures of job autonomy, which Spreitzer (1995) borrows and then labels self-determination. Jackson et al. (1993) also measures a similar construct, job control, which was developed for use in the manufacturing environment rendering some of those items irrelevant. The current study adapts relevant measurement items from all three studies. These items and their means are displayed in panel E of Table 2-2.

Human Complexity- Common Method Marker

Panel F of Table 2-2 displays measurement items for of the construct human complexity (Wrightsman, 1964), which is collected to help assess common method bias. It measures the respondents' opinions of how complex human nature is. There is no theoretical reason that the human complexity construct should be correlated to any of the other constructs. However, it was collected using the same method at the exact same time. Any common variance between this construct and all of the other constructs can be attributed to the single source, single method collection of data. This construct was only utilized in the assessment of common method bias.

Results

Exploratory Factor Analysis

Exploratory factor analysis was conducted in order to obtain an initial assessment of the latent constructs and their indicators. As most of the indicators were utilized in previous studies and each indicator's construct is known *a priori*, the goal of this exploratory factor analysis is to eliminate cross loading indicators and assess the dimensionality of the latent constructs. Table 2-3 shows the results of initial iteration of exploratory factor analysis. Table 2-3 displays two

errant factors. The first enterprise system integration scale item, ES1, generated its own factor and was removed. The fourth routinization scale item, Rout4, created the same problem and also was removed. Items that cross-load on other constructs with a factor loading greater than .4 were eliminated from analysis, as recommended by Hair et al. (2006). This resulted in the removal of item ES7 from the enterprise systems integration scale. Items with factor loadings less than 0.500 are also eliminated, causing the removal of item Form1 from the formalization scale, item Rout4 from the routinization scale, and items ES3, ES6 and ES7 from the enterprise systems scale. Each of these items was removed one at a time until all of the remaining items met the loading and cross loading criteria. Table 2-4 displays the factor loadings of the final iteration of exploratory factor analysis.

Confirmatory Factor Analysis

Convergent and discriminant validity, measures of construct validity, are assessed through confirmatory factor analysis. Due to formalization's formative nature, partial least squares was chosen over covariance based structural equation modeling to conduct confirmatory factor analysis and model testing. Table 2-5 displays the factor loadings from the confirmatory factor analysis for all constructs except formalization. Because formalization is a formative measure, which is a linear composite, multicollinearity must be assessed. Table 2-6 provides the outer weights and variance inflation factors for each item indicator for formalization. The variance inflation factor for each indicator is lower than the 3.300 cutoff recommended by Petter et al. (2007), demonstrating that this construct is correctly specified as formative rather than

reflective. The outer weights of the formalization measurement items reveals how each item is weighted toward the linear composite.

In order to achieve convergent validity, Hair et al. (2006) recommends that each construct have an average variance extracted of at least 0.500 and composite reliability of at least 0.700. As shown in Table 2-7, each construct's average variance extracted exceeds 0.500 and their composite reliability exceeds 0.700. In conjunction, these measures indicate that each construct explains an appropriate amount of variance in the measures and displays an appropriate amount of internal consistency. Additionally Table 2-7, which displays the squared inter-construct correlations, confirms discriminant validity as each construct's average variance extracted is greater than its squared inter-construct correlations with other latent variables. Thus, each construct explains more of the variation in its measures than in other constructs. With convergent and discriminant validity established, the model is deemed suitable for hypothesis testing.

Hypothesis Testing

Hypotheses 1 through 7 are tested via the path coefficients. These results are found in Figure 2-3 and Table 2-8. All hypotheses are directional; therefore p-values are calculated as one-tailed. The theoretical model asserts that enterprise system integration increase the level of scientific management that is applied to middle management. Hypotheses one through four test this part of the theory. Hypothesis 1 states that enterprise system integration increases the formalization of middle management work. This hypothesis is supported, as the path coefficient between enterprise system integration and formalization is 0.460 (p-value < 0.001), which is

positive and highly significant (see Figure 2-3 and Table 2-8). Formalization's R-squared of 0.212 shows that the enterprise system integration construct explains 21.2 percent of the variance in the formalization of middle management work procedures. Hypothesis 2 asserts that enterprise system integration increases the extent of performance measurement of middle management and is also supported. Figure 2-3 displays the path coefficient between enterprise systems and performance measurement is positive and highly significant at 0.429 with a p-value of < 0.001. Hypothesis 3 posits that enterprise system integration increases the routinization of middle management work. Hypothesis 3 is not supported as the path coefficient is -0.034 and is not significantly different from zero. Figure 2-3 displays an R-squared of 0.001 for routinization, indicating that enterprise systems explain only 0.1% of the variation in routinization of middle management. Hypothesis 4 asserts that formalization increases performance measurement. Figure 2-3 shows that the path coefficient is positive and highly significant, at 0.300 (p-value < 0.001). Performance measurement's R-squared reveals that enterprise system integration and formalization jointly explain 39.3% of the variance in performance measurement (see Figure 2-3). The theory is partially supported as enterprise system integration increases the application of some scientific management techniques, but not all scientific management techniques.

The theoretical model also posits that scientific management techniques degrade middle management work, to be evidenced by a decrease in job autonomy. Hypotheses five through seven test this assertion. Hypothesis 5 states that formalization of middle management job procedures advances the degradation of middle manager work. As shown in Figure 2-3 and Table 2-8, this is not supported as the path coefficient between formalization and autonomy is not significantly different from zero (-0.043, p-value = 0.308). Hypothesis 6 states that the

application of performance measurement to middle management advances degradation of middle managers' work. Table 2-8 and Figure 2-3 display that hypothesis 6 is not supported either as the path coefficient between performance measurement and autonomy is not significantly different from zero (0.131, p-value = 0.256). Hypothesis 7 posits that the routinization of middle management work advances the degradation of middle managers' work. Hypothesis 7 is supported with a negative path coefficient of -0.358 that is highly significant (p-value < 0.001) between routinization and autonomy. Figure 2-3 shows that the R-squared for autonomy is 0.141. This indicates that routinization, performance measurement, and formalization explain 14.1% of the variation in autonomy. These three hypotheses show weak support for the assertion that scientific management techniques advance the degradation of work, as routinization is the only scientific management technique that reduces job autonomy.

In conjunction, the hypothesis testing fails to support the overall theory that the enterprise system integration contributes to the degradation of middle management work via scientific management techniques. Although enterprise system integration increases formalization and performance measurement of middle management, neither technique appears to reduce the job autonomy of middle managers. Although routinization clearly decreases autonomy, routinization is not related to enterprise system integration. Thus, there is not a significant indirect effect of enterprise system integration upon the autonomy of middle management.

Common Method Bias

All responses for a given organization were provided by the same source utilizing the same method. Thus, common method bias could be a source of common variance that

contributes to the correlations between constructs. To proxy the effect of the single source single method data collection, a theoretically unrelated construct was also collected (Richardson et al. 2009). As mentioned earlier, this variable measures the respondents' views on the complexity of human nature. There is no theoretical reason that an individual's personal views on the complexity of human nature should be correlated with organizational level characteristics. If the single source and collection method are causing a significant common method bias, the human complexity construct will be correlated with each construct. If common method variance is the driving force behind relationships between the constructs, the inclusion of the human complexity construct will dampen or even reverse the inaccurate parameters (Richardson et al., 2009). However, all previously significant model parameters remain significant in the presence of the human complexity construct. Table 2-9 displays that the human complexity construct is significantly associated with the performance measurement construct (0.236, p-value < 0.003). As human complexity is only significantly related to one of the five constructs in model, the presence of common method bias is difficult to diagnose. Some researchers would equate the common method bias to the lowest correlation between the common method construct and the model constructs (Richardson et al., 2009). Given this approach, the common method bias would be insignificant. Additionally, the model parameters are robust to the inclusion of the common method construct. Specifically, hypotheses one, two, four, and seven remain significant with the inclusion of the common method marker (human complexity construct).

Supplemental Analysis

In the interest of thoroughness, routinization's role as a moderator is tested in supplemental analysis. Although previous literature questions routinization's role as a moderator (Adler and Borys, 1996), this research study did not present these hypotheses prior to data collection. However to bolster results, all supplemental analyses were pre-tested on a previous data collection and significant results verified using the same data from this study. Thus, any conclusions gained from this supplemental analysis must be scrutinized with the understanding that the statistical tests were initially exploratory and then verified on an independent data set. Three separate models were tested to determine routinization's moderation effect. Specifically, routinization interacted with formalization alone in one model, performance measurement alone in another model, and both in another model. The only model that produced a significant moderation result is the model where routinization is interacted with performance measurement alone.

Table 2-10 shows that hypotheses one, two, four and seven are still supported; while hypotheses three, five, and six remain unsupported. However, Table 2-10 reveals that performance measurement and routinization interact to decrease autonomy more than routinization alone, as shown by the interaction term's path coefficient (-0.189, p-value = .018). This additional effect is also evidenced by additional variance being explained in the moderation model. The original model explained 14.1% (Figure 2-3) of the variance in autonomy, while the model with the interaction term explains an additional 3.3% to explain a total of 17.4% (Figure 2-4) of the variance in autonomy. Therefore, the combination of performance measurement and

routinization has a more negative effect on autonomy than routinization or performance measurement alone.

Limitations

As with any study, there are certain limitations that must be recognized. This study utilized self-reported survey data, which consists of perceptions and may not correlate perfectly with reality. Anonymity is usually a priority when collecting survey information, thus organizational specifics and the use of control variables are limited. The lack of explanatory power, there is more unexplained variance than explained variance, highlights the need for more contextual variables. Thus, there are obvious omitted variables; however the level of explanatory power observed is noteworthy given that each construct has very few predictors. Additionally, managers represent a broad range of potential work experiences. Therefore, contextual variables are even more relevant. The hierarchal rank of the manager may have an impact on the level of degradation that manager may experience. Enterprise systems have also been associated with the elimination of positions (Harley et al., 2006). The experiences of these managers are not represented. Finally, the results cannot be generalized to managers of support functions, because all respondents were required to participate in value chain activities.

Discussion

This study examines the potential of enterprise systems to utilize scientific management techniques to degrade the work of middle management. Managers have a dual role with the

management control system. They are subjects of control and agents of control, simultaneously (Harley et al., 2006; Prechel, 1994). This unique position gives managers some ability to influence the implementation and utilization of organizational technology, such as enterprise systems. As expected, enterprise systems are enabled by formalization to expand the performance measurement of managers. These expectations are strongly supported by the evidence. Therefore, enterprise systems may actuate further standardization of management processes and enable organizations to measure more manager activity. However, enterprise systems appear to have no significant effect upon the routinization or autonomy of middle management work.

The evidence demonstrates that increased formalization and visibility may not be used to limit managers' discretion directly. The lack of evidence for the expected negative relationship between formalization and autonomy is counter intuitive. Some research suggests that as certain tasks become formalized and routinized, managers take on more non-routine tasks; while the routine tasks are pushed down to non-managers (Harley et al., 2006). This may be due to managers' influence over how enterprise systems are implemented and integrated into the everyday operations. Managers are likely to use their influence to reinforce their role within the organization (Harley et al., 2006).

Although no direct relationship between performance measurement and autonomy is found, supplementary analysis reveals that performance measurement does amplify the negative effects of routinization. In other words, performance measurement does enforce the degradation of work in highly routinized environments. Another intriguing result is that the scientific management techniques, formalization and performance measurement, are not correlated with

routinization. For now, enterprise systems apparently have not turned middle management into the victim of their own control mechanisms.

Conclusion

The literature is rife with contrasting portrayals of enterprise systems' impact upon management control (Elmes et al., 2005; Sia et al., 2002; Quattrone and Hopper, 2005). Dillard et al. (2005) asserts that enterprise systems isolate; while Quattrone and Hopper (2005) find that enterprise systems collapse distance and break down barriers. Elmes et al. (2005) and Sia et al. (2002) both find empowering and coercive aspects of enterprise systems. The purpose of this study is to examine whether the labor process narratives of enterprise systems should be generalized. The evidence, or lack thereof, highlights the need to apply contingency theory to the labor process narrative. The findings indicate that performance measurement only acts in accordance to labor process when combined with the routinization of tasks. There may be other characteristics that explain when certain scientific management techniques are applied in ways that are consistent with the labor process theory.

The contribution of this paper mainly lies in how it limits the generalization of assumptions taken for granted by labor process theorists. Specifically, the findings in this study are in direct contrast to the assertion that the power asymmetries inherent in capitalist organizations cause scientific management techniques to be applied in a manner consistent with labor process theory. Given the evidence provided by this study, either the aforementioned power asymmetries do not apply to middle management or additional factors are integral in

determining whether scientific management techniques will be applied in such a manner. Thus, enterprise systems integration, formalization, and performance measurement cannot be considered to inherently advance the degradation of work. However, this study provides evidence that the organizations that choose to routinize job tasks are likely to use performance measurement as a tool to further degrade the work experience.

Figures

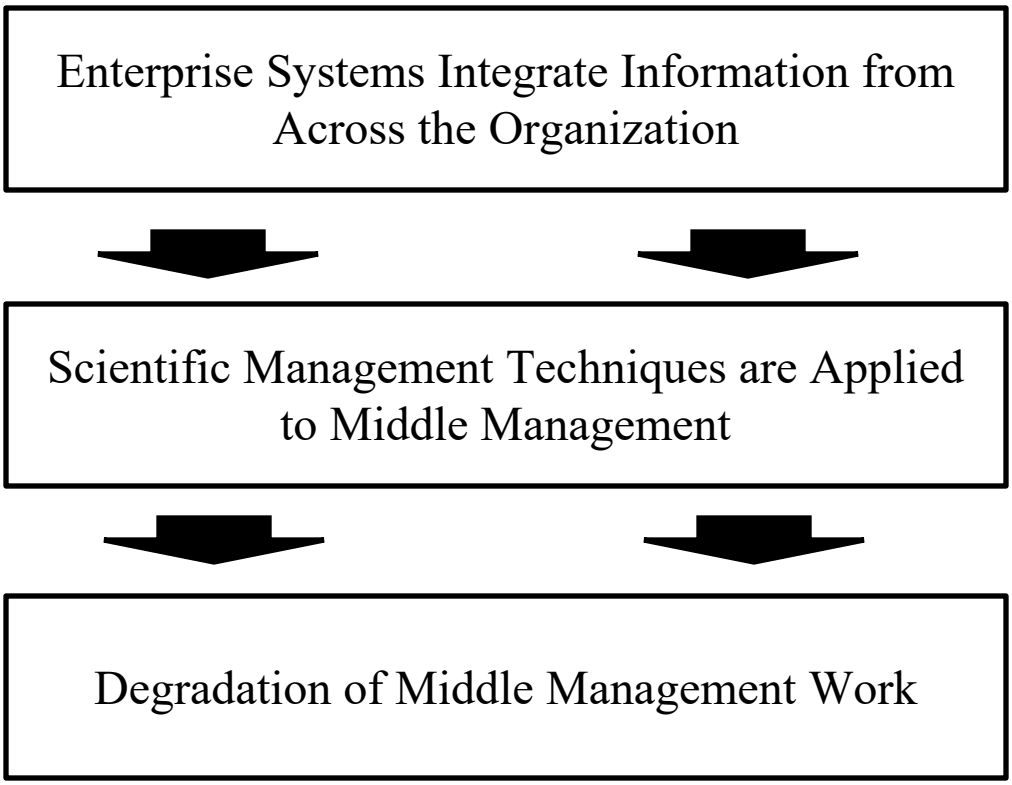

Figure 2-1: Theoretical Model

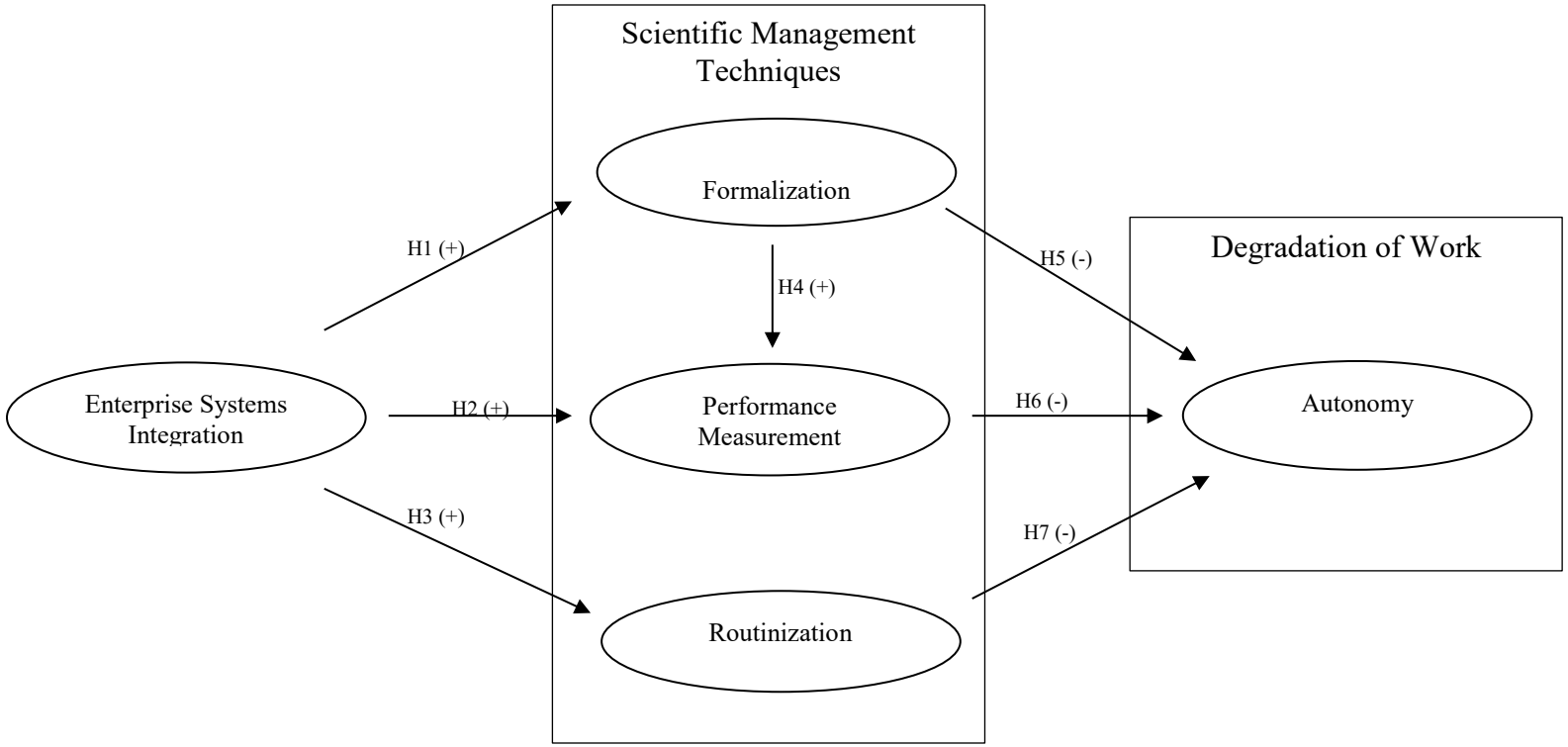

Figure 2-2: Research Model

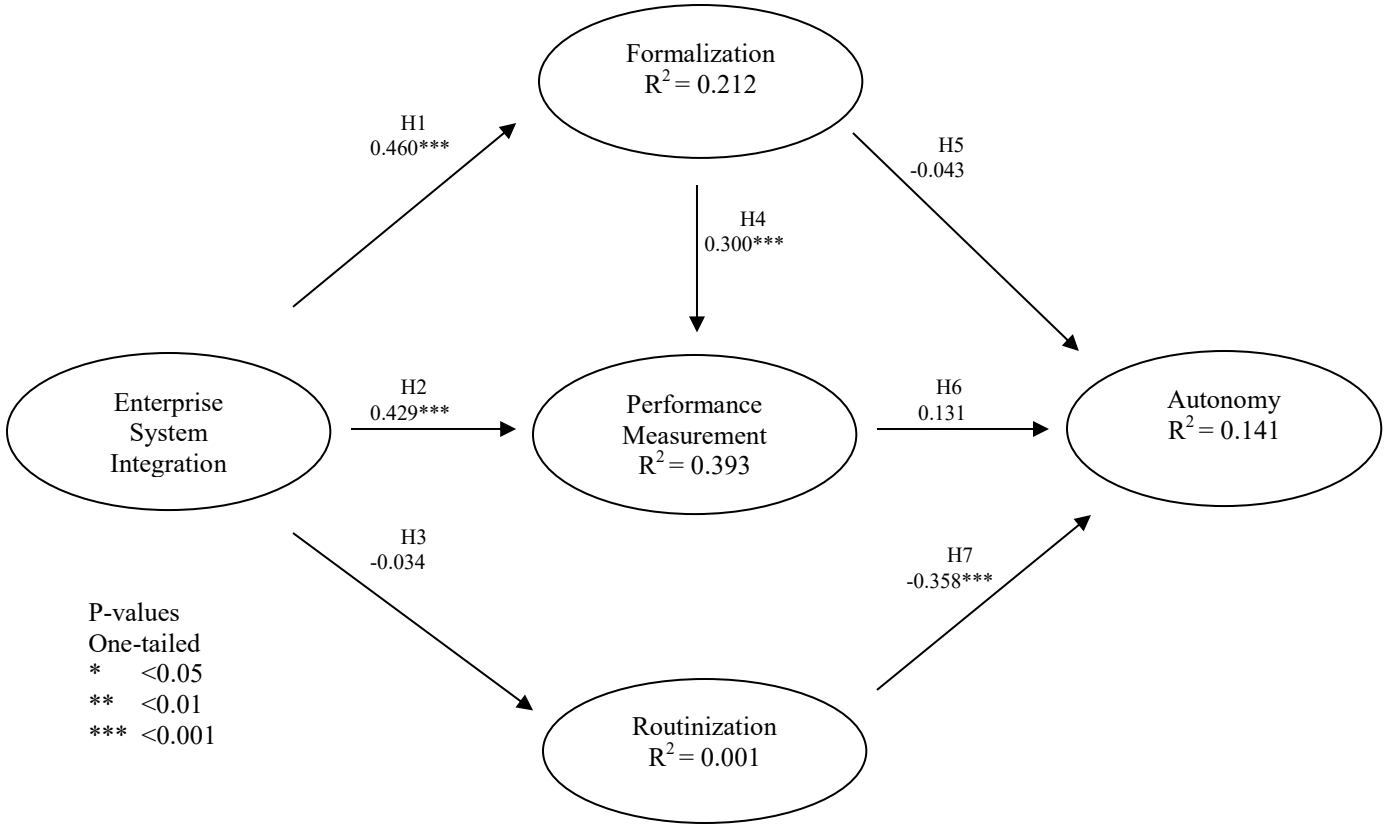

Figure 2-3: Structural Model

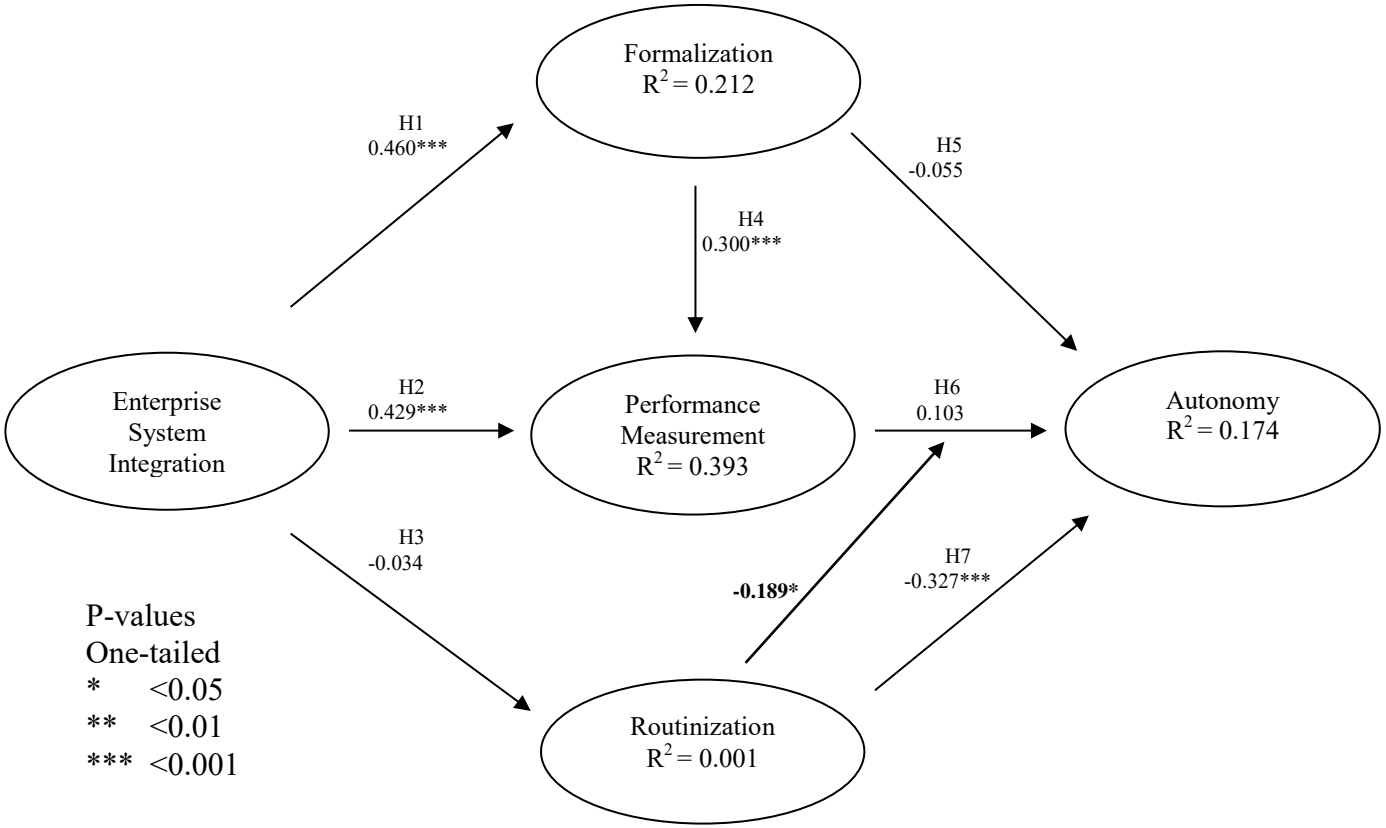

Figure 2-4: Supplemental Analysis

Tables

Table 2-1: Demographic Information

Table 2-1 Demographic Information (n = 189)			
Panel A	Gender		
	Male	Female	Did not answer
	104 (55.0%)	84(44.5%)	1 (0.5%)

Panel B	Tenure at Current Organization	
	Less than 1 year	7 (3.7%)
	1 to 5 years	41 (21.7%)
	6 to 10 years	56 (29.6%)
	11 to 15 years	36 (19.0%)
	16 to 20 years	16 (8.5%)
	More than 20 years	33 (17.5%)

Panel C	Publicly Traded Organization	
	Publicly traded	Not publicly traded
	101 (53.4%)	88 (46.6%)

Panel D	Training Provided on Current System	
	Training Provided	No Training
	157(83.1%)	32 (16.9%)

Panel E	Training included members from other units, departments, etc…	
	Cross-functional Groups	Not Cross-functional Groups
	119	43

Panel F	Industry	
	Manufacturing	42 (22.3%)
	Retail Trade	41 (21.7%)
	Services	38 (20.1%)
	Finance, Insurance and Real Estate	14 (7.4%)
	Telecommunications	9 (4.8%)
	Transportation and Public Utilities	8 (4.2%)
	Audit/Consulting	4 (2.1%)
	Construction	4 (2.1%)
	Agriculture Services, Forestry and Fishing	1(0.5%)
	Natural Resource Exploration and Processing	1 (0.5%)
	Wholesale Trade	1 (0.5%)
	Mining	0 (0.0%)
	Other	26 (13.8%)

Table 2-2: Survey Instrument

Table 2-2 Survey Instrument (n = 189)			
Panel A			
Item	Enterprise System Integration Scale	Mean*	SD
ES1	Information in reports produced by our information systems is based on common sources of data (e.g. a common database).	3.90	0.796
ES2	We have an integrated information system that stores both financial and non-financial information.	3.19	1.142
ES3	Information is shared seamlessly across our organization, regardless of the function.	3.16	1.085
ES4	Remote, branch, and mobile offices have easy access to organization wide data.	3.61	0.994
ES5	Information is shared seamlessly across our organization, regardless of the location.	3.33	1.077
ES6	High level managers have easy access to data from all functions.	4.10	0.872
ES7	Information from different functions cannot be easily aggregated.	3.73	0.951
Panel B			
Item	Formalization Scale	Mean*	SD
Form1	I have procedures for dealing with every situation I encounter in my job.	3.90	1.068
Form2	There is NOT a document indicating the general procedures that I should follow in my job (RC)	3.65	1.262
Form3	There is a complete written description for my job.	3.81	1.163
Form4	There is a handbook or manual for performing my job.	3.07	1.282
Form5	There are defined procedures specifying the proper channels of communication that I should use in my job.	3.83	1.103
Form6	There is very LITTLE written guidance as to how I should perform my job. (RC)	3.28	1.308

Panel C			
Item	Performance Measurement Scale	Mean*	SD
PM1	Our information system is able to provide a range of measures that cover the majority of my duties.	3.87	0.904
PM2	Our information system is able to provide a broad range of performance information about different activities involved in the completion of my duties.	3.84	0.915
PM3	Our information system is NOT able to provide a diverse set of measures related to the key performance areas of my work. (RC)	3.61	1.008
PM4	Our information system is able to provide information on different facets of my performance.	3.74	0.868
PM5	Our information system is NOT able to provide a variety of information about the different aspects of my work. (RC)	3.58	1.057
PM6	Our information system is able to provide detailed information about my performance.	3.45	1.141
Panel D			
Item	Routinization Scale	Mean*	SD
Rout1	I have something different to do every day in my job. (RC)	2.22	0.924
Rout2	There is something new happening every day at my job. (RC)	1.98	0.854
Rout3	My job is routine.	2.56	1.154
Rout4	I perform my job in the same manner every time.	2.77	1.101
Panel E			
Item	Autonomy Scale	Mean*	SD
Aut1	I decide the order in which I perform my work tasks.	4.20	0.791
Aut2	I have opportunity for freedom in how I do my work.	4.10	0.864
Aut3	I choose the methods to use in carrying out my work tasks.	4.04	0.865
Aut4	I plan my own work.	3.94	0.965

Item	Autonomy Scale	Mean*	SD
Aut5	I have opportunity for independence in how I do my work.	4.09	0.830
Aut6	I have autonomy in determining how I do my work.	3.69	0.957
Panel F			
Item	Human Complexity Scale	Mean*	SD
HumCom1	I find that my first impressions of people are frequently wrong. (RC)	3.92	0.924
HumCom2	I CANNOT accurately describe a person in a few words. (RC)	3.95	0.972
HumCom3	When I meet a person, I look for one basic characteristic through which I try to understand him/her.	3.15	0.936
HumCom4	I think I get a good idea of a person's nature after a brief conversation.	3.81	0.807
HumCom5	People are too complex to ever be understood fully. (RC)	3.40	1.16

* Scale is from 1 to 5
ES = Enterprise system integration scale item
Form = Formalization scale item
PM = Performance measurement scale item
Rout = Routinization scale item
Aut = Autonomy scale item
HumCom = Human complexity scale item
RC = Reverse coded

Table 2-3: Exploratory Factor Analysis (initial iteration)

Table 2-3
Exploratory Factor Analysis
(first iteration)

	ES	Form	PM	Rout	Aut	Rout4	ES1
ES1	**.041**	-.058	.054	.046	.048	-.038	.811
ES2	**.767**	-.078	.205	.078	-.028	-.128	-.115
ES3	**.427**	.108	.195	.209	.039	-.427	.103
ES4	**.803**	-.054	-.083	-.043	-.063	-.019	.228
ES5	**.890**	.051	-.018	-.051	.011	-.041	-.037
ES6	**.258**	-.019	.288	-.088	.003	.063	.449
ES7	**.074**	-.036	.503	-.164	-.018	.255	.139
Form1	.258	**.413**	.048	-.108	.116	.295	.006
Form2	-.277	**.691**	.102	-.082	-.106	-.108	.177
Form3	.125	**.704**	-.082	-.100	-.019	.128	.016
Form4	.111	**.795**	-.024	.001	-.046	.039	-.215
Form5	.068	**.700**	.037	.048	.115	-.045	-.017
Form6	-.134	**.877**	.042	.120	.005	-.050	-.019
PM1	-.019	.172	**.746**	.078	.035	.085	.009
PM2	-.035	-.010	**.898**	-.039	-.084	.142	-.034
PM3	-.078	.042	**.791**	.065	.022	-.195	.195
PM4	.078	.026	**.723**	-.069	-.065	.027	-.053
PM5	-.078	-.097	**.907**	-.003	.065	-.076	.042
PM6	.081	.012	**.770**	.002	-.039	.125	-.080
Rout1	-.125	-.045	.066	**.812**	-.055	.136	-.060
Rout2	.047	.082	-.131	**.853**	.047	.132	.119
Rout3	.098	-.099	.043	**.669**	.014	.570	-.058
Rout4	-.098	.032	.123	**.282**	-.007	.759	-.005
Aut1	-.126	-.047	.007	.074	**.729**	.169	.267
Aut2	.002	-.158	.261	-.118	**.634**	-.034	-.287
Aut3	.015	.009	-.055	-.192	**.676**	.226	-.008
Aut4	-.049	-.013	-.064	-.010	**.741**	-.053	.282
Aut5	-.060	.031	.139	-.029	**.743**	-.174	-.220
Aut6	.125	-.030	-.161	.089	**.768**	-.147	.031
Aut7	-.014	.129	-.089	.083	**.850**	.036	-.056

ES = Enterprise system integration scale item
Form = Formalization scale item
PM = Performance measurement scale item
Rout = Routinization scale item
Aut = Autonomy scale item

Table 2-4: Exploratory Factor Analysis (final iteration)

Table 2-4 Exploratory Factor Analysis (final iteration)					
	ES	Form	PM	Rout	Aut
ES2	**.679**	-.067	.256	.053	.001
ES4	**.807**	-.009	.023	-.032	-.087
ES5	**.845**	.068	.035	-.045	.033
Form2	-.247	**.702**	.145	-.121	-.131
Form3	.224	**.693**	-.111	-.057	-.004
Form4	.099	**.753**	-.051	.000	-.004
Form5	.105	**.696**	.033	.059	.139
Form6	-.115	**.849**	.068	.067	-.001
PM1	.059	.161	**.727**	.095	.048
PM2	.057	-.009	**.821**	.023	-.047
PM3	-.087	.055	**.883**	-.040	-.024
PM4	.160	.014	**.671**	-.057	-.041
PM5	-.064	-.092	**.912**	-.064	.051
PM6	.173	.004	**.696**	.075	.007
Rout1	-.211	-.057	.107	**.771**	-.080
Rout2	-.044	.109	-.047	**.856**	.017
Rout3	.173	-.096	-.040	**.823**	.042
Aut1	.009	-.035	.022	.145	**.695**
Aut2	-.048	-.178	.191	-.094	**.695**
Aut3	.115	.008	-.133	-.074	**.708**
Aut4	-.002	.026	.004	-.036	**.690**
Aut5	-.165	.017	.134	-.081	**.771**
Aut6	.030	.000	-.097	.020	**.748**
Aut7	-.035	.118	-.079	.071	**.847**

ES = Enterprise system integration scale item
Form = Formalization scale item
PM = Performance measurement scale item
Rout = Routinization scale item
Aut = Autonomy scale item

Table 2-5: Confirmatory Factor Analysis

Table 2-5 Confirmatory Factor Analysis				
	ES	PM	Rout	Aut
ES2	0.846			
ES4	0.787			
ES5	0.918			
PM1		0.856		
PM2		0.853		
PM3		0.838		
PM4		0.770		
PM5		0.812		
PM6		0.809		
Rout1			0.863	
Rout2			0.846	
Rout3			0.755	
Aut1				0.603
Aut2				0.779
Aut3				0.743
Aut4				0.713
Aut5				0.820
Aut6				0.710
Aut7				0.786
ES = Enterprise system integration scale item PM = Performance measurement scale item Rout = Routinization scale item Aut = Autonomy scale item				

Table 2-6: Formative Construct Assessment

Table 2-6 Formative Construct Assessment of Formalization		
Items	Outer Weights	Variance Inflation Factors
Form1	--	1.332
Form2	0.095	1.388
Form3	0.323	1.563
Form4	0.221	1.754
Form5	0.486	1.709
Form6	0.153	1.967
Form = Formalization scale item		

Table 2-7: Convergent and Discriminant Validity

Table 2-7 Convergent and Discriminant Validity				
	Enterprise System Integration	Performance Measurement	Routinization	Autonomy
Composite Reliability Coefficient	0.888	0.927	0.862	0.893
Average Variance Extracted	0.726	0.678	0.678	0.547
Squared inter-construct correlations				
Enterprise System Integration	1.00			
Performance Measurement	0.323	1.00		
Routinization	0.001	0.000	1.00	
Autonomy	0.007	0.013	0.127	1.00

Table 2-8: Hypotheses Tests

Table 2-8 Hypotheses Tests				
	Path Coefficient	Standard Error	t-value	p-value (1-tailed)
Hypothesis 1	0.460	0.068	6.78	< 0.001
Hypothesis 2	0.429	0.065	6.54	< 0.001
Hypothesis 3	-0.034	0.093	0.36	0.359
Hypothesis 4	0.300	0.071	4.24	< 0.001
Hypothesis 5	-0.043	0.127	0.33	0.371
Hypothesis 6	0.131	0.114	1.14	0.128
Hypothesis 7	-0.358	0.078	4.58	< 0.001

Table 2-9: Common Method Bias

Table 2-9 Common Method Bias				
	Path Coefficient	Standard Error	t-value	p-value (1-tailed)
Hypothesis 1	0.459	0.065	7.07	< 0.001
Hypothesis 2	0.435	0.069	6.27	< 0.001
Hypothesis 3	-0.035	0.091	0.38	.352
Hypothesis 4	0.279	0.081	3.44	< 0.001
Hypothesis 5	-0.046	0.128	0.36	0.359
Hypothesis 6	0.124	0.107	1.15	0.126
Hypothesis 7	-0.359	0.083	4.35	< 0.001
CMB → ES	0.014	0.109	0.12	0.452
CMB → Formal	0.064	0.093	0.69	0.246
CMB → PM	0.236	0.085	2.78	0.003
CMB → Rout	0.014	0.095	0.15	0.440
CMB → Aut	0.040	0.093	0.43	0.334
Formal = Formalization construct PM = Performance measurement construct Rout = Routinization construct Aut = Autonomy construct				

Table 2-10: Supplemental Analysis

Table 2-10 Supplemental Analysis				
	Path Coefficient	Standard Error	t-value	p-value (1-tailed)
Hypothesis 1	0.460	0.062	7.43	< 0.001
Hypothesis 2	0.429	0.068	6.36	< 0.001
Hypothesis 3	-0.034	0.091	0.37	0.356
Hypothesis 4	0.300	0.074	4.05	< 0.001
Hypothesis 5	-0.055	0.117	0.47	0.320
Hypothesis 6	0.103	0.107	0.96	0.169
Hypothesis 7	-0.327	0.067	4.89	< 0.001
Rout * PM → Aut	-0.189	0.089	2.11	0.018
Aut = Autonomy construct Rout * PM = Moderation (interaction) variable of routinization and performance measurement.				

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CHAPTER 3 STUDY 2: THE IMPACT OF MUTUAL MONITORING AND ENTERPRISE SYSTEM INTEGRATION ON THE EMPOWERMENT OF MANAGERS

Introduction

Enterprise systems, such as enterprise resource planning systems and enterprise application integration systems, dominate the information technology utilized in large organizations. These systems span across an organization's various business units, functions, and geographic regions to provide enterprise level information. Due to their ability to decrease cycle times and improve customer service at reduced operating costs, many firms implement enterprise systems to remain competitive (Rikhardsson and Kraemmergaard, 2006). Enterprise system implementations have been reported to have drastic impacts on business, motivating large numbers of case studies and event studies on their implementation (e.g. Rikhardsson and Kraemmergaard, 2006; Quattrone and Hopper, 2005; Poston and Grabski, 2001; Nicolaou, 2004). However, there are few generalizable studies on the behavioral impacts that enterprise systems have upon managerial control (Arnold, 2006; Chapman and Kihn, 2009).

Prior research reveals that the implementation of an enterprise system often requires the re-engineering of business processes and changes the way in which management control is applied throughout the organization (Davenport, 1998; Quattrone and Hopper, 2005; Elmes et al., 2005). Chapman and Kihn (2009) find that enterprise system integration develops more enabling controls that should empower an organization's employees. However, research reports that enterprise system integration can empower some organizational members, while limiting others (Sia et al., 2002; Elmes et al., 2005). Empowerment represents the amount of perceived

influence an employee has over organizational outcomes as well as their confidence to perform their job effectively. As a result, empowerment is important because it represents a win-win situation for organizations and employees, as empowerment is associated with job performance and job satisfaction (Seibert et al., 2004; Hall, 2008).

This study examines the empowering capabilities of enterprise system integration through the theoretical lens of Mary Parker Follett (Follett and Graham, 1995). Follett's perspective on management control focuses upon cooperation and sharing power. Enterprise system integration enhances an organization's ability to apply Follett's concepts. The purpose of this study is to test whether enterprise system integration empowers managers by facilitating the application of Follett's concepts among managers. More specifically, this study focuses on the ability of integrated enterprise systems to facilitate the development of a group identity among peer managers directly, as well as indirectly, through the process of mutual monitoring (Lee and Lee, 2000; Towry 2003). Furthermore, this study examines whether social identification with peer managers increases managers' empowerment cognitions (Follett and Graham, 1995; Sluss and Ashforth, 2008; Randolph, 1995).

These theoretical relationships are tested using responses from 206 survey responses. The field survey is designed specifically for this study and is administered to managers in a variety of industries. The constructs of interest that are examined in this study are enterprise systems integration, social identification, mutual monitoring, and empowerment. These constructs are adapted from previously validated measures. Empowerment includes two aspects of psychological empowerment, impact and competence (Spreitzer, 1995). Impact is defined as the amount of perceived influence over organizational outcomes; whereas competence represents the

confidence a person has in their ability to perform their job effectively. These constructs were tested using structural equation modeling.

The results reveal that enterprise system integration does in fact empower managers through the application of Follett's concepts. Enterprise system integration has significant and positive associations with, both, mutual monitoring and social identification among peer managers. Mutual monitoring also increases social identification. Additionally, analysis reveals that social identification increases the psychological empowerment construct of impact.

The results of this study contribute to the accounting literature in several ways. Firstly, it adds to the sparse area of generalizable studies on the impact of enterprise systems on managerial control systems. This study shows that enterprise systems facilitate empowering managerial control systems. Secondly, it examines the relationship between peer control mechanisms and social identification. While previous studies employ experimental and qualitative research methodologies to demonstrate that peer controls encourage group members to internalize group goals and act in the best interest of the group (Widener et al., 2008; Rowe, 2004; Towry, 2003), this study employs the field survey methodology to verify the occurrence of this phenomenon in the workplace. Thirdly, this study specifies social identification as a mechanism through which managers can be empowered.

This study finds that enterprise systems empower middle managers, which is important to practice because the literature has established links between empowerment and performance (Seibert et al., 2004; Hall, 2008). This study also provides a deeper understanding of how information technology affects the managerial control system, revealing insights that can help management better utilize enterprise systems in the control process. Specifically, the results of

this study suggest that managers can and should utilize enterprise systems to encourage teamwork between managers.

The rest of this paper is organized into seven sections. The theory section explains the overarching theory and explains Follett's theoretical concepts. Detailed support for the individual relationships predicted by the overarching theory is explored in the hypothesis development section. The research methodology section details how the data is collected. Statistical findings are reported in the results section. The discussion and limitations sections elaborate upon the theoretical significance of the statistical findings, while the conclusion focuses upon how the theory and findings contribute to academia and practice.

Theory

Enterprise systems disseminate information up and down an organization. This free flow of information is designed to empower frontline employees and provide increased organizational control to upper level executives. As organizations adopt enterprise systems, middle management is forced to release some of its decision making authority to the frontline and information that was previously proprietary to the broader organization. Anecdotal evidence suggests that lower level middle managers are eliminated and the impact to mid-/high-level managers is not clear. Critical theory suggests that enterprise systems are designed to flatten organizations and marginalize middle management (Rochlin, 1997). However, cross-functional information sharing fostered by enterprise system integration may enhance certain aspects of middle managers' control (Follett and Graham, 1995).

In the 1930s and 1940s, Mary Parker Follett examined and explicated a unique application of power and control within organizations. Follett viewed conflict in the workplace as an opportunity to "integrate" interests and knowledge (Follett and Graham, 1995)[5]. Although Taylorist management techniques overshadowed Follett's perspective to the point of obscurity, Peter Drucker crowned her as a prophet of management whose ideas were ahead of her time (Follett and Graham, 1995). She is rarely cited in the empowerment literature, but Follett's concepts of power sharing are embedded in the empowerment movement in the 1990's that encouraged organizations to delegate authority to frontline employees. Enterprise systems seemingly embody her ideas of power sharing, integration, and coordination.

Power

The concept of power throughout organizational research is amorphous at best. However, Follett provides some definitions of power and related concepts and distinguishes between power, control, and authority (Follett and Graham, 1995). Power is the ability to initiate action or change. Control, on the other hand, is power in action or the exercise of power; and, authority is more clearly defined as the formal right of control. The right of control and the corresponding power may be independent of each other. Power often shifts without the formal right of control actually changing and vice versa. The current paper accepts Follett's definitions of power, control, and authority as useful for dialogue, but does not argue for or against their veracity.

Follett's epistemological perspective explains that power in an organization is not fixed. Power is not a pie to be divided, and individual power is not diminished when shared. The ability

[5] Follett and Graham 1995 is a collection of Mary Parker Follett's writings from 1930's and 40's. Mary Parker Follett is highly cited for her ideas on government and other social structures.

for one individual to influence another individual does not preclude the other individual from possessing the ability to exert influence in return (Follett and Graham, 1995). Power in this context has a synergistic attribute, where the sum of individual powers does not necessarily equal the total power. In fact, Follett suggests that division and hoarding of power reduces overall power, while integrating towards a singular unit increases overall power (Parker, 1984).

Integration

Follett views conflict as the coming together of differing perspectives that provide individuals an opportunity to learn from others. Follett's concept of integration (FCI)[6] is used to describe the process of learning from each other in such a way that allows a solution to the conflict to be achieved without compromise from either side. This is achieved when the differing sides see a bigger picture and set a unified goal based on new enlightenment rather than compromise (Follett and Graham, 1995).[7] FCI requires an open exchange of information and ideas. The open exchange shares power and control as knowledge is a huge source of power. The unification of this information and knowledge may produce a more informative knowledge and enhance the total power between the two differing sides. Follett refers to this shared power structure as "power with". "Power with", as defined by Follett, will equal more than the sum of the two disaggregated powers (Follett and Graham, 1985). In practical terms, this means that the cooperation generated through FCI will increase control and effectiveness. At the individual level, "power with", empowers employees to perform their job more effectively and

[6] FCI will be used in reference to Follett's concept of integration to avoid confusion with the general term integration.
[7] Follett explains that integration is a way to solve conflicts, but acknowledges that it may not be possible in all situations.

competently. Additionally, “power with” denotes an increased influence over outcomes and performance (Follett and Graham, 1995). Thus, “power with” embodies the psychological empowerment concepts of competence and impact.

FCI can be broken down into information sharing and social identification. Differing parties share their knowledge, unify it, and apply it to the shared goal. Unification involves the parties ascribing to an identity that includes all parties (Follettt and Graham, 1995). Social identification is defined as a sense of belonging to a group and occurs through interpersonal interaction, intense information sharing, and interdependency (Ashforth and Mael, 1989; Towry, 2003). Social identification with a group also entails sharing in the successes and failures as well as intertwining personal and group values (Sluss and Ashforth, 2008). As individuals or organizations share information and attain a shared identity, they gain a shared control over their outcomes and processes (Follett and Graham, 1995). Shared control over outcomes and processes enhances the overall control and empowers employees as all interrelated activities are performed to achieve the same purpose (Follett and Graham, 1995; Parker, 1984).

Theoretical Model

An enterprise system is an information technology that unifies the information of the many different functions, business units, and regions of an organization. In the purest form of an enterprise system, all functions of an organization use differing modules of the same information system. The information between functions must be compatible, requiring a standardized data format (Lee et al., 2003). To accomplish this successfully, various sub-units must come together and present their information and processing needs (Beretta, 2002). The unit managers are

encouraged to think at the enterprise level as the various sub-units strive to integrate their information. The process required to determine an agreed upon standardized data format epitomizes FCI. In essence, an organization must undergo FCI to successfully integrate an enterprise system.

Enterprise systems do not organize information according to traditional business sub-units, but instead organize information according to their processes. A process encompasses all activities along an internal supply chain, regardless of the functional unit. Certain distinctions are still necessary to maintain segregation of duties and enforce internal controls, but the information flow is completely integrated from beginning to end (Attaran, 2004). All organizational sub-units (which constitute internal supply chains) input and store information into the same enterprise system, and information that was previously unit information becomes fully transparent to other members of the internal supply chain (Chapman and Kihn, 2009). When conflicts of interest between business units occur, unit managers should make decisions that benefit the entire process because their actions are visible to each other (Towry, 2003; Widener et al., 2008). An organization undergoes FCI as its members transition from thinking and acting at the functional level to thinking and acting at the process level that enterprise system integration requires.

Enterprise system integration facilitates peer based controls that help foster the new identity developed through FCI. In particular, the ability to view peer managers' information creates an informal system of mutual monitoring that encourages, some might say coerces, managers to choose actions that are most beneficial to the process rather than that manager's unit (Beretta, 2002; Rankin, 2004; Towry, 2003; Sewell, 1998). While managers have influence over the actions in their own unit, mutual monitoring allows them to exert social pressure over related

units in their supply chain (Widener et al., 2008). The shared identity that is fostered from enterprise system integration and the social pressure of mutual monitoring compels managers to share previously autocratic control with peer managers. This loss of autocratic control is offset with indirect control over peer managers' units, possibly increasing the individual manager's overall control and effectiveness (Elmes et al., 2005; Sia et al., 2002). Examining the effect of enterprise system integration upon management through the lens of FCI leads to a theoretical model where enterprise system integration facilitates FCI, which results in social identification. Social identification, in turn, enables a shared control ("power with") that empowers middle managers. More specifically, the degree of enterprise system integration affects the visibility of organizational information, which drives the managerial control mechanism of mutual monitoring. Enterprise system integration and mutual monitoring, both, help cultivate social identification among peer managers. Social identification, in turn, increases managers' empowerment. In reference to Mary Parker Follett's theory, social identification is the end result of Follett's concept of "integration" and psychological empowerment represents "power with". The theoretical model which depicts the relationships between these concepts is shown in Figure 3-1.

Hypothesis Development

Enterprise systems integrate information across departments, functions, business units, and geographic regions. Enterprise systems standardize data formats and definitions allowing meaningful aggregation of information from different business units (Attaran, 2004). Additionally, sharing databases across business units, functions, and regions allows real time

information to be generated (Chapman and Kihn, 2009). In short, enterprise systems possess information from differing departments, functions, and business units and have the ability to aggregate that information automatically.

Quattrone and Hopper (2005) describe how enterprise system integration makes objects visible to top management. Just as any object can be visible to top management, enterprise system integration can also make these objects visible to frontline employees, middle management, and other organizational members. Not surprisingly, Chapman and Kihn (2009) find that enterprise system integration provides greater transparency within and across firm levels. Enterprise systems often require firms to adopt a process orientation, because information from one unit can feed into related units. This process orientation aligns with FCI as it highlights the interdependencies that different functions may have and the relationship to the end result (Sai, et al., 2002; Graham and Follett, 1995). Berreta (2002) details how enterprise system integration and the corresponding process orientation make information available across the firm. Berreta (2002) notes a plant maintenance process that involves the plant manager, the procurement department, and maintenance technicians. The organization developed a maintenance process that interconnected the plant manager's request for information, the procurement department's purchase information, and the maintenance technician's evaluation information. Not only was this information available to managers at all three departments, but the information was also available to other plant managers (Berreta, 2002).

The degree of enterprise systems integration determines the level of information interdependence and transparency between divisions. Although all information does not have to be released to everyone, at the very least relevant information about the completion of preceding

tasks should be available in real time. At the most transparent level, information about the entire process is available to managers from related business units. Mutually observable information gives managers the ability to mutually monitor each other's actions (Rankin, 2004). FCI focuses on sharing information, and the integration of enterprise system provides that capability which is demonstrated in mutual monitoring.

H1: Enterprise system integration increases mutual monitoring of managers.

Enterprise systems require a standard business language (Gattiker and Goodhue, 2004). The creation of this standard language most likely develops through FCI (Follett and Graham, 1995; Beretta, 2002). FCI occurs when two individuals, or organizational entities, with differing perspectives understand an issue from a holistic perspective to develop a solution that is most beneficial to the larger organization (Follett and Graham, 1995). Initially, FCI takes place within the cross-functional implementation teams (Kim et al, 2005) and is transmitted to the larger organization through training. These training sessions occur in a cross functional setting, providing an opportunity for different business units to share function specific goals with each other and personally interact with peers from differing business units (Attaran, 2004).

This sharing of function specific goals is the first step in FCI and is intended to find commonalities (Parker, 1984). As the integration of the enterprise system unveils common goals, it also reinforces the team concept by providing a single set of common information for use by all parties. Additionally, common goals are essential to social identification because social identification entails a person associating themselves with successes and failures of the group or a sub-group associating its successes and failures with those of the larger group (Sluss and Ashforth, 2008; Ashforth and Mael, 1989). The integration of the enterprise system reveals

common goals and provides integrated information that enables managers to understand how they contribute to the overall process (Lee and Lee, 2000). Continuing with the maintenance example from Berreta (2002), the plant manager, procurement department, and maintenance technician were all given the goal to minimize the effect that the maintenance project had on the overall organization. Additionally, the integrated information capabilities of the enterprise system allowed the creation of performance measures that evaluated all three departments on how well that overall goal was achieved (Berreta, 2002). Therefore, the enterprise system facilitated the recognition of a unified goal between the plant manager, procurement department and the maintenance technician.

When responsibilities fit clearly into the big picture, managers can identify with and value their tasks (Randolph, 1995; Sluss and Ashforth, 2008). Common goals, instigated by enterprise system integration, also increase an employee's value among their coworkers as coworkers understand each other's roles better (Lee and Lee 2000). The integrated nature of the business process also requires managers to interact with their counterparts from other divisions. These frequent positive interactions are important to stabilize social identification (Sluss and Ashforth, 2008). In summary, enterprise system integration leads to social identification among peer managers by reinforcing common goals, increasing inter-department interaction, and emphasizing the value of coworkers. The integration of the enterprise system is an intricate part of the process of FCI and social identification is the result of that process being successful.

H2: Enterprise systems integration increases social identification among peer managers.

FCI focuses on cooperation and common goals to motivate individuals' actions. Thus, peer based controls, such as mutual monitoring, may serve as better control mechanisms than traditional principal-agent controls. There are several ways in which mutual monitoring promotes the social identification among peer managers that is expected to develop through FCI. Firstly, mutual monitoring makes the interdependencies between functions very overt. Secondly, mutually visible enterprise information presents the related functions as a single unit. Thirdly, mutual monitoring enhances social pressure to act as a group member (Widener et al., 2008; Sewell, 1998).

Timely completion of tasks in an enterprise system likely requires participation from other functions, forcing cross functional cooperation (Rikhardsson and Kraemmergaard, 2006). The interdependencies of the various units are apparent in the system and key to realizing the benefits of enterprise systems (Gattiker and Goodhue, 2004; Kim et al, 2005). Interdependent business units must coordinate like teams to accomplish their unit goals and team goals. Repeatedly achieving unit goals while coordinating to achieve team goals fosters trust between units (Towry, 2003; Rankin, 2004). The increased visibility of peer managers' activities may make the value of peer managers' contributions more salient. Valuing the various peer manager goals and contributions are attributes of social identification (Janssen and Huang, 2008).

Mutual visibility also brings the performance of all related units into view (Lee and Lee, 2000). Not only is all the information available, but it uses a common language. This common language allows the information from all of the related business units to be presented as information from a single entity (Gattiker and Goodhue, 2004; Lee and Lee, 2000). Presenting the information at a specific level influences the users of that information to think at that specific

level (Cookson, 2000). Therefore, presenting information from various units as information about a single entity should encourage the various units to view their collective units as part of a single entity.

Sewell (1998) explains that mutual visibility does not have to be accompanied by a formal system of reporting in order to create a mutual monitoring control environment. The mere visibility to peers stimulates self-discipline. The knowledge that peers can see the work related activities of others and that peer's performance is dependent upon those actions can result in self-disciplined action to act in accord with peer group expectations (Sewell, 1998; Widener et al., 2008; Towry, 2003). In the Berreta (2002) case, the ability for all plant managers to view maintenance information of other plant managers reduced the number of emergency maintenance requests by plant managers. The transparency of the maintenance request information created a self-disciplined state where plant managers would not escalate a maintenance issue to emergency without just cause. In accordance with the process of FCI, mutual monitoring creates a common set of information and organizational view, facilitates coordination and trust, and informally enforces peer group goals. Thus, mutual monitoring helps instill and maintain an environment of social identification among peer managers.

H3: Mutual monitoring increases social identification among peer managers.

Consistent with Follett's concept of "power with", social identification is expected to affect the psychological empowerment cognition of impact. Impact represents the amount of perceived influence over organizational outcomes (Spreitzer, 1995). Thomas and Velthouse (1990), a seminal work in the empowerment literature, explains that cognitions are feelings of empowerment and not mere reflections of objective reality. One's impact is affected by their

personal locus of control (Thomas and Velthouse, 1990; Conger and Kanungo, 1988). However, feelings of empowerment have been found to predict performance (Hall, 2008; Seibert et al. 2004; Martin and Bush, 2006), probably because they are rooted in confidence and motivation (Thomas and Velthouse, 1990; Conger and Kanungo, 1988).

An empowering control system can be described as a managerial control system that encourages knowledge sharing, transparency, role clarity and goal clarity (Hall, 2008; Seibert et al., 2004; Chapman and Kihn, 2009). Enterprise system integration facilitates the creation of an empowering work climate because enterprise system integration fosters knowledge sharing and transparency. Seibert et al. (2004) distinguish between an empowering climate and empowerment cognitions. An empowering climate describes organizational structures while feelings of empowerment occur at the individual level. Moving from an empowering climate to empowering the individual requires the individual to internalize the climate. This means that employees must trust in the organization and internalize its goals (Randolph, 1995). Follett's concept of "power with" posits that group members must identify with the larger goal to achieve the shared control that empowers members (Follett and Graham, 1995). Thus, social identification, which is characterized by trust and internalization of goals, is the path from an empowering climate to empowered individuals.

Social identification affects impact, in particular, because it can change a person's perceived unit of action from a single person to the group level. In situations of mutual interdependence, identification is the result of cooperation, information sharing, and higher levels of effort (Widener et al., 2008; Rankin, 2004). Repeating a routine of cooperation and coordination with group members builds levels of trust that result in individuals changing how

they perceive their actions. The level at which action is perceived changes from individual to group, and individual influence is exchanged for group influence (Towry, 2003). Social identification theory explains that this happens because members do not just identify themselves with the group, but identify the group with themselves (Sluss and Ashforth, 2008). Social identification is essential to embracing "power with" the group, where the manager intertwines individual influence with group influence (Follett and Graham, 1995). A group of business units that operate as one can influence organizational outcomes to much greater extent than the single business unit that a manager may lead. The Berreta (2002) case demonstrates how related departments identifying with the overall goal can improve the departments' influence over the achievement of organizational goals. As the plant manager, procurement department, and maintenance technician identify with the goal to minimize maintenance activities' impact on the organization, they work together to ensure that plant equipment is offline for the least amount of time. Prior to the enterprise system, the individual department goals did not incentivize the collective management of procedural bottlenecks that would slow the maintenance process (Berreta, 2002). Essentially, social identification among peer managers increases the ability of the manager to affect organizational outcomes and, thus, increases impact.

H4: Social identification increases the impact of managers.

As discussed earlier, social identification is an integral part of translating an empowering work climate into empowerment cognitions. Accordingly, social identification is expected to increase the psychological empowerment construct of competence. Competence refers to an individual's perceived ability to perform their work effectively (Spreitzer, 1995). Although competence can be affected by an individual's self-esteem, it can also be affected by the

employees with whom an individual must work (Thomas and Velthouse, 1990; Conger and Kanungo, 1988).

The Berreta (2002) maintenance case exhibits how identifying with the overall goal can improve a manager's competence. Plant managers would delay or avoid preventative maintenance to reduce the costs to their plant. However, the integrated information revealed that preventative maintenance reduced overall time that equipment was offline, which is the greatest cost to the organization. Thus, the unified goal of reducing equipment offline time helped plant managers reduce overall cost to the organization and consequently improved the plant manager's ability to manage organizational costs (Berreta, 2002).

The need for social identification among peers is particularly salient for managers at the business unit level, where several tasks and required information inputs are performed by personnel from other business units. While these elements may remain out of the manager's direct control, social identification with related business units and their members indicates a level of trust in those who carry out those tasks and input the corresponding information (Randolph, 1995; Sluss and Ashforth, 2008). Since most tasks in an organization can only be effective when all of the related tasks are done properly, unreliable or selfish group members can be detrimental to the performance of one's own work. When related tasks are completed appropriately, the ability to consistently perform one's own task effectively increases. Additionally, social identification stems from group members cooperating over time and is unlikely to be one sided. Therefore, social identification is likely to be group wide, ensuring that all members perform their tasks for the betterment of the group and limiting the likelihood that group members' actions will impede the effective completion of one's own tasks. Simply put, when all group

members trust and know that members responsible for related tasks are performing their tasks for the betterment of the group, each group member possesses that much more control over the ability to complete their task competently.

H5: Social identification increases the competence of managers.

Figure 3-2 displays the research model including the relationship between the five hypotheses.

Research Methodology

This study focuses on the relationship between enterprise system integration, mutual monitoring, social identification, and empowerment. These constructs are unobservable and cannot be measured directly. In order to obtain data on these constructs, this study employs the field survey method. Participants answered Likert style scale items to address the above mentioned constructs as well as demographic questions on themselves and their organization.

Most survey items were adapted from validated constructs. Items were added or eliminated based on discussion with three academic experts that are well published in the area of accounting information systems. Consistent with Dillman (2000) the survey was given to three business unit managers to assess how the item measures would be received by the target population. These business unit managers completed the survey as if they were actual participants. The business unit managers then provided feedback on each item. After receiving feedback, final revisions were made.

A market research firm was employed in order to gain access to the appropriate respondents for this study. This firm specializes in business, rather than consumer, survey

respondents. The survey was presented to respondents in an online format and contained active controls that rerouted respondents who do not meet the following criteria. The criteria included the following questions:

- How many people are employed by your organization? (The organization must employ over one thousand people.)
- How long has your company's current information system been in place? (The company's information system must have been in place for longer than one year.)
- Do you manage a business unit, department, division, or functional area? (The respondent must answer "yes" to this question.)
- Which of the following responsibilities best describes the unit that you manage? (The respondent must indicate that they are managers of business units that participate in value chain activities.)

The online survey was programmed so that any respondent from the same IP address as a previous respondent could not log on the survey. Further, the survey also contained read check questions that instructed the reader to choose specific answers in order to continue. For example, a read check question would state: "I am reading this survey very carefully. Please indicate strongly agree." A respondent who did not mark the answer as instructed was immediately rerouted out of the survey. These read check questions removed 111 respondents in addition to those who did not meet the screening criteria.

The market research firm was able to provide 214 complete responses. Five additional respondents were eliminated from analysis because their answers to the open ended questions were suspiciously identical, although their IP addresses were distinct. Three respondents were

eliminated from analysis because they responded "no basis to answer" for three or more indicators within a single construct. Therefore, the data utilized for this study included 206 usable responses. The constructs for this study required respondents to answer 61 Likert style questions and therefore produces 12,566 data points. Fifty-eight of the 12,566 (0.46 percent) data points indicated the respondent had marked no basis for answering. These data points were treated as missing data and replaced by the series mean.

Demographic information on the respondents is shown in Table 3-1. The sample included 114 males, 91 females and one respondent did not answer. Also, the division between publicly traded and non-traded companies is fairly equal, 53 percent compared to 47 percent respectively. Of the 169 respondents who received training on the current information system, 130 were trained in cross functional groups. Most respondents work in the manufacturing, retail, and services industry sectors, each constituting approximately twenty percent of the sample. In addition, the tenure at the organization varied. One-hundred and seven (52.9 percent) of the respondents have worked in their organization between one and ten years. Ninety-two (44.6 percent) have worked for their organization for more than ten years. Only seven (3.4 percent) of respondents joined their organization less than a year prior to responding to the survey. In summary, the respondents represent various industries and levels of experience.

Operationalization and the Survey Instrument

Enterprise System Integration

All enterprise systems' implementations are not equal; therefore, examining the impact of enterprise systems based on the system characteristics (e.g., extent of system integration) may be

more fruitful than taking a yes or no approach to the presence of an enterprise system. A key characteristic of enterprise systems is their integration. In contrast to the presence of an enterprise system, the level of integration associated with an enterprise system may be conceived as a continuum (Granlund and Malmi, 2002). Although enterprise systems may have varying degrees of hardware integration, the extent of data integration distinguishes enterprise systems from other information systems (Rom and Rohde, 2007). Thus, the enterprise system integration construct is operationalized as the degree to which information is integrated across functions, locations, and hierarchies. Byrd and Turner (2000) developed and validated a construct called IT integration that reflects the ability of an information system to integrate information across functions, locations, and hierarchies. Arnold et al. (2011) applied an adapted version of Byrd and Turner's (2000) IT integration scale. Chapman and Kihn (2009) utilized two different items to measure IT integration in their study. Items in this study are adopted from the Arnold et al. (2011) and Chapman and Kihn (2009). These item measures can be seen in panel A of Table 3-2, along with the corresponding mean and standard deviation.

Mutual Monitoring

Mutual monitoring describes the ability for managers within the same internal supply chain to see the activities of other business units. Sia et al. (2002) developed a scale to measure peer visibility within an enterprise system. The current study adapts this scale slightly because Sia et al's (2002) concept of peer visibility also includes interdependency. Mutual monitoring, as used in this study, refines the concept of peer visibility to capture specifically the ability to see information from related business units. Mutual monitoring within enterprise systems can be controlled through access permissions in the information system. This study expects that this

visibility is a two way street, therefore, the items measure the ability to see information from peer managers' business units as well as the ability for peer managers to see information from the respondent's business unit. This eight item scale can be found in panel B of Table 3-2, along with the corresponding mean and standard deviation.

Social Identification

Social identification occurs when individuals identify themselves with a team or group. Ellemers et al. (1999) validates a scale to measure team identification, which specifies social identification at a team level. Janssen and Huang (2008) utilize this scale in a business setting. Ellemers et al. (1999) find three dimensions of team identification: self-categorization, group self-esteem, and commitment to the group. The self-categorization dimension specifically relates to the internalization of the team identity. This study utilizes the self-categorization scale (Ellemers et al., 1999) and specifies these measures to examine the social identification with peer managers. Panel C of Table 3-2 shows the item measures along with the mean and standard deviation of each item.

Impact- An Operationalization of Empowerment

The amount of perceived influence over their work area determines a person's impact. Impact relates to power over organizational outcomes, other persons' behaviors within the organization, and the organization itself. Impact is a sub-construct of the validated scale of psychological empowerment (Spreitzer, 1995). While Spreitzer's (1995) scale does not specify a particular level of outcomes (e.g. individual, business unit, or organizational), this study adapts the scale to specify influence over organizational outcomes. This scale is appropriate for use in

this study because the concept of "power with" denotes a shared control that provides more control over the organization (Parker, 1984). The item measures along with the mean and standard deviation for each item are shown in Panel D of Table 3-2.

Competence- An Operationalization of Empowerment

Competence represents the confidence a person has in their ability to complete their job effectively. This is indicative of power over personal outcomes within the organization. Competence is also a sub-construct of psychological empowerment (Spreitzer, 1995). Spreitzer's (1995) competence scale is appropriate for this study because "power with" should enhance the ability a person to perform their job effectively (Follett and Graham, 1995). These scale items are shown in panel E of Table 3-2.

Results

Exploratory Factor Analysis

As many items are used to measure one construct, exploratory factor analysis is performed on the 206 usable responses to remove cross loading items and assess unidimensionality of each construct. The initial exploratory factor analysis, as shown in Table 3-3, indicates two issues. First, the third item measure for impact loads on its own construct, as seen in the column labeled impact3. Therefore, this item is eliminated from analysis. Second, mutual monitoring displays two dimensions. To assess the dimensionality of mutual monitoring

more precisely, the mutual monitoring items were assessed separately from other items[8]. The exploratory factor analysis of the mutual monitoring on its own items reveals that the items load onto three factors. Specifically, items MutMon4 and MutMon8 load upon a third factor, while the other items load onto factors that appear to represent mutual monitoring capability inwardly and outwardly. After removing MutMon4 and MutMon 8, all of the remaining mutual monitoring scale items load onto one factor. These six items are included with the rest of the item constructs for subsequent iterations of exploratory factor analysis.

As recommended by Hair et al. (2006), items that do not load with a minimum loading of 0.500 are removed. This is done one item at a time starting at the lowest loading. This resulted in the removal of ES1, ES6, ES7, and Comp2. The exploratory factor analysis results on the remaining items are displayed in Table 3-4 and demonstrate that minimum loadings and maximum cross loadings are at acceptable levels.

Confirmatory Factor Analysis

Confirmatory factor analysis is performed on the remaining items, after the exploratory factor analysis, to evaluate convergent and discriminant validity. Hair et al. (2006) recommends that each construct have an average variance extracted of .500 or higher. MutMon3 and MutMon7 were removed so that the mutual monitoring scale could meet this threshold. Unfortunately, the competence construct could not meet this threshold. The inability to meet this threshold cannot be attributed to a particular item because all three remaining items load at a

[8] In exploratory factor analysis, each factor is affect by all of the items included in the analysis. Therefore, to get a clear picture of what was happening with the mutual monitoring construct, the additional constructs need to be removed.

level below 0.700. Table 3-5 displays the factor loadings from the confirmatory factor analysis. Table 3-6 indicates the average variance extracted and composite reliability for each construct. As shown in Table 3-6, each construct's composite reliability coefficient exceeds the recommended value of 0.700 (Hair et al. 2006). The recommended average variance extracted of 0.500 is exceeded by all constructs except competence. Therefore, all constructs, with the exception of competence, demonstrate appropriate levels of convergent validity. Additionally Table 3-6, which displays the squared inter-construct correlations, confirms discriminant validity as each construct's average variance extracted is greater than its squared inter-construct correlations.

Hypothesis Testing

Given the construct validity issues of competence, the reduced model shown in Figure 3-3 is different from the model that was hypothesized and shown in Figure 3-2. Although the new model is reduced from the hypothesized model (Figure 3-2), it is still consistent with the theoretical model (Figure 3-1). Structural equation modeling is utilized to test all hypotheses simultaneously. The fit statistics are favorable, suggesting that the hypothesized model provides a good explanation of the data. The GFI and CFI are 0.913 and 0.949, respectively. Both exceed their recommended thresholds of 0.90 (Hair et al., 2006). Additionally, the RMSEA is 0.065, which is lower than the recommended upper bound of 0.08 (Hair et al., 2006). The fit statistics explain that the model fits the data and suggests that the overall model is appropriate. Thus, the individual path coefficients can be examined for hypothesis testing. The results of structural

equation model are shown in Figure 3-3 and Table 3-7. All hypotheses are directional; therefore, p-values are calculated as one-tailed.

Hypothesis 1 posits that enterprise system integration increases mutual monitoring of managers. Figure 3-2 shows that the path coefficient for this relationship is 0.449 and highly significant (p-value < 0.001). The enterprise system integration construct is the only predictor of mutual monitoring within this model and it explains 20.1 percent of the variation in mutual monitoring, as displayed by the R^2. This demonstrates that enterprise system integration provides mutual monitoring capability, supporting hypothesis 1.

Hypothesis 2 states that enterprise system integration increases social identification among peer managers. The standardized path coefficient, shown in Figure 3-3 and Table 3-7, is 0.294 (p-value = 0.001). This result provides strong evidence that enterprise system integration encourages social identification between managers of related business units.

Hypothesis 3 states that mutual monitoring increases social identification among peer managers. The path coefficient between mutual monitoring and team identification is 0.180 with a p-value of 0.028. This statistically significant parameter supports hypothesis 3. The R^2 of team identification, shown in Figure 3-3, indicates that enterprise system integration and mutual monitoring, jointly, explain 16.6 percent of the variance in team identification. In total, these results demonstrate that enterprise system integration encourages business unit managers to engage in FCI, where interdependent managers identify with each other.

Hypothesis 4 asserts that social identification increases impact of managers. Figure 3-3 shows that the path coefficient is 0.357 and highly significant (p-value < 0.001). Team

identification explains 12.7 percent of the variation in impact. This result demonstrates that team identification provides managers with increased control and influence over their organizations.

Common Method Bias

All responses for a given organization are provided by the same source utilizing the same method. Thus, common method bias could be a source of common variance that inflates the correlations between constructs. To proxy the effect of the single source single method data collection, a theoretically unrelated construct was also collected. This unrelated construct is referred to as the common method marker. A recent simulation study found that measured common method markers perform better than unmeasured common method constructs that stem from the combination of all indicators in the model (Richardson et al., 2009). This study utilizes the human complexity scale as a common method marker (Wrightsman, 1964). This variable measures the respondents' views on the complexity of human nature. There is no theoretical reason that an individual's personal views on the complexity of human nature should be correlated with organization level characteristics.

If the single source and collection method are causing a significant common method bias, the common method marker will be correlated with each construct. The average correlation between the common method marker and the model constructs is 0.098. If common method variance is the driving force behind relationships between the constructs, including the common method marker as a predictor of all constructs will dampen inaccurate path coefficients (Ronkko and Ylitalo, 2011). Table 3-8 indicates that the path coefficient between the common method marker and mutual monitoring is statistically significant (0.247, p-value < 0.001). However, all

path coefficients remain significant (see Table 3-8). Although common method variance may be present, it does not alter the interpretation of the path coefficients.

Discussion

The results from this study provide evidence that enterprise systems create empowering work climates for middle managers. As enterprise systems increase transparency through integrated enterprise information and mutual monitoring, middle managers increasingly buy into the team concept. Additionally, buying into this team concept is associated with higher levels of control. These results demonstrate that integrating enterprise systems facilitate FCI through mutual monitoring and team identification. This research also indicates that FCI leads to "power with", as team identification is directly associated with increases in perceived ability to influence organizational outcomes, impact. Further, this research shows that FCI and "power with" are relevant concepts that are active in today's work environment.

The results of this study also highlight the role of peer control mechanisms, such as mutual monitoring, in today's organizations. Peer control mechanisms are of interest to the accounting literature. Specifically, Towry (2003) finds that peer control mechanisms increase social identification in the experimental setting. Towry's (2003) experiment demonstrates that team based incentives play an important role in team based control environments and increase social identification. This study examines a similar phenomenon in the field. This study reveals that mutual monitoring plays an important role in team based control environments and also increases social identification. The informal nature of the social pressure induced by mutual monitoring demonstrates that peer controls need not be formal incentive contracts. The different

methods applied by these two studies enhance how they complement each other. Experiments are appreciated for their internal validity and criticized for their lack of external validity, while surveys are appreciated for their external validity and criticized for their lack of internal validity. As this study applies a survey method and reports similar findings as the experiment, the findings of both studies should be considered that much more robust.

Although the constructs of this research do not include performance metrics, theory and prior research indicate that this study possesses strong implications for performance. As previously explained, theory expects that the "power with" generated by FCI will result in better aligned organizational actions (Follett and Graham, 1995; Parker, 1984). Organizational actors that identify with organization goals are more likely to act in the organization's best interest. Additionally, impact is a sub-construct of psychological empowerment that previous studies have found to be related to actual performance (Hall, 2008; Seibert et al., 2004). Thus, enterprise systems should improve performance indirectly through social identification and impact, however future research must examine the veracity of that conclusion.

Limitations

As with any study, there are certain limitations that must be recognized. This study utilized self-reported survey data, which consists of perceptions and may not correlate perfectly with reality. Anonymity is usually a priority when collecting survey information, thus organizational specifics and the use of control variables are limited. Results cannot be generalized to members of support functions, because all respondents were required to participate in value chain activities.

Conclusion

This study reveals some important insights. First, researching the behavioral effects of enterprise systems can aid in thoroughly understanding the how, why, and when of enterprise systems. Specifically, studying specific characteristics of enterprise systems and their impact on behavioral aspects of personnel can provide a more intricate explanation of how enterprise systems improve organizational performance than comparing enterprise system organizations to non-enterprise system organizations. This study focuses on team building characteristics of enterprise systems and finds that mutual monitoring, as well as the integration of enterprise information, generates a team identity among managers. This team identity indicates an increased trust that managers have in each other and the ability to influence their respective organizations. According to social identity theory, managers that identify with their team should be less likely to act selfishly and more likely to act in the best interest of the team. Moreover, the common goals of the team are more likely to be aligned with overall organizational goals than the goal of a single business unit. Therefore, buying into the team identity should be closely linked to buying into the organizational identity. However, that remains to be verified by future research. This study reveals that an increase in team identity is another way in which enterprise systems may empower managers. Thus, management should be intentional about utilizing the transparency capability of enterprise systems to give business unit managers an enterprise level identity.

This study finds that enterprise system integration facilitates the application of FCI within an organization. Additionally, Follett's theoretical lens reveals that social identification is an integral part of translating an empowering work climate into actual empowerment cognitions.

This theoretical revelation is also confirmed by the results. Empowerment research should consider social identification when examining the relationship between work climate and empowerment.

Enterprise systems affect many aspects of the organization, most of which affect the managerial control system in some way. Future research should continue to look for generalizable studies that can increase the understanding of management control systems. Contingency theory is popular among management control research because context is extremely important within this subject area. Therefore, future studies should look for moderating variables that can further refine under what circumstance enterprise systems are likely to induce the empowering usage of peer control mechanisms, rather than competition inducing peer control mechanisms.

Figures

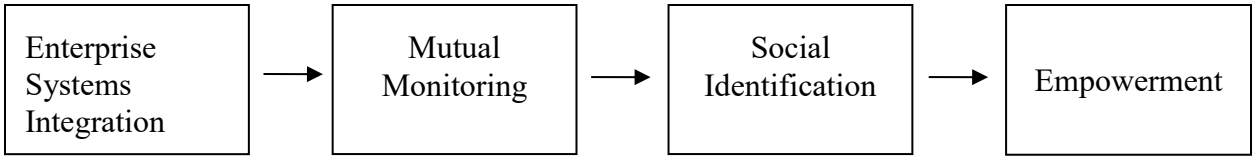

Figure 3-1: Theoretical Model

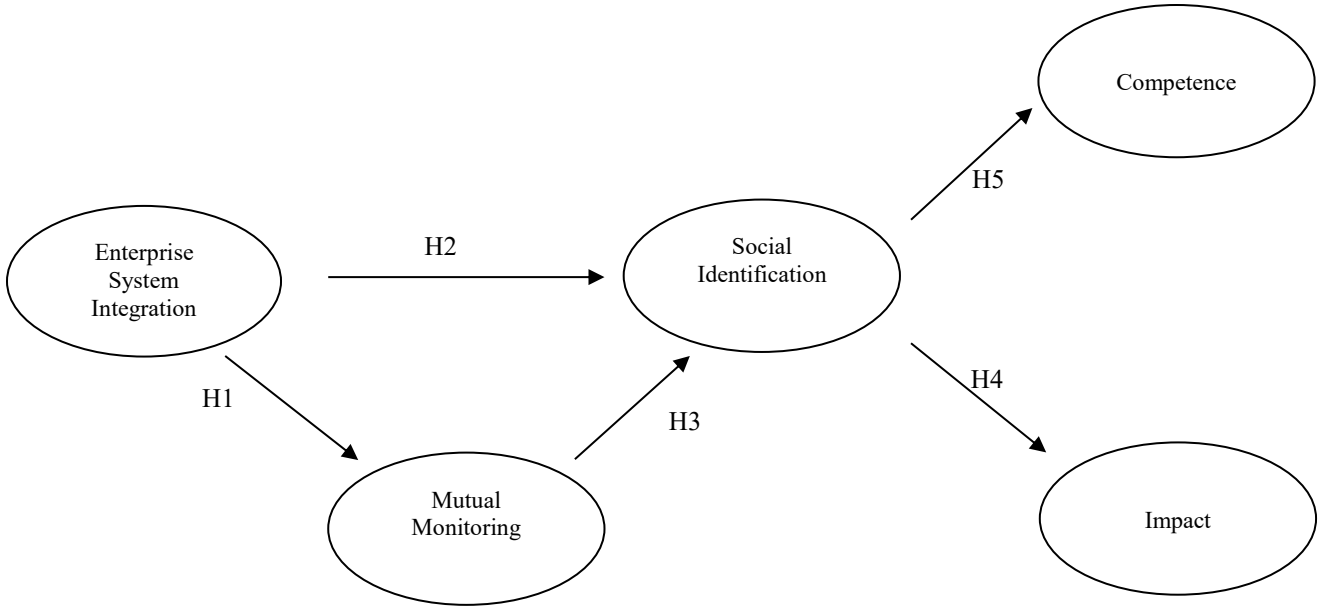

Figure 3-2: Research Model

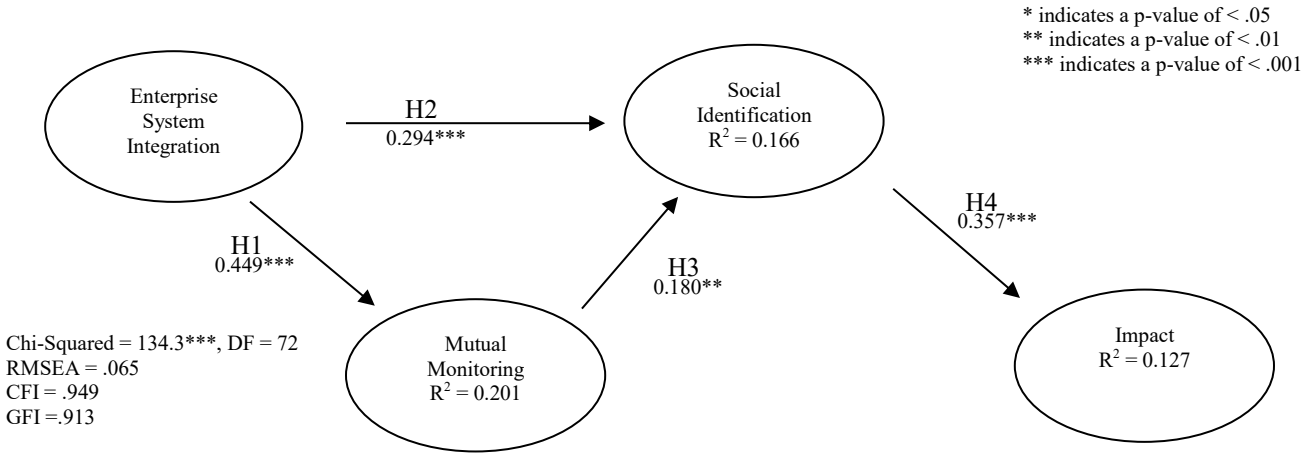

Figure 3-3: Structural Model

Tables

Table 3-1: Demographic Information

Table 3-1 Demographic Information (n = 206)			
Panel A	Gender		
	Male	Female	Did Not Answer
	114 (55.3%)	91(44.2%)	1 (0.5%)

Panel B	Tenure at Current Organization	
	Less than 1 year	7 (3.4%)
	1 to 5 years	42 (20.4%)
	6 to 10 years	65 (31.6%)
	11 to 15 years	38 (18.4%)
	16 to 20 years	19 (9.2%)
	More than 20 years	35 (17.0%)

Panel C	Publicly Traded Organization	
	Publicly traded	Not publicly traded
	109 (52.9%)	97 (47.1%)

Panel D	Training Provided on Current System	
	Training Provided	No Training
	169(82.0%)	37 (18.0%)

Panel E	Training included members from other units, departments, etc…		
	Cross-functional Groups	Not Cross-functional Groups	Did Not Answer
	130 (63.1%)	45 (21.8%)	31[9] (15.1%)

Panel F	Industry	
	Manufacturing	44 (21.4%)
	Services	43 (20.9%)
	Retail Trade	42 (20.5%)
	Finance, Insurance and Real Estate	18 (8.7%)

[9] Six respondents who indicated they did not receive training on the current system also indicated that they did received training in non-cross-functional groups. Their responses were further scrutinized and no other suspicious responses were found. Thus, this discrepancy is deemed a minor reading error.

Panel F	Industry	
	Telecommunications	11 (5.3%)
	Transportation and Public Utilities	10 (4.8%)
	Audit/Consulting	4 (1.9%)
	Construction	4 (1.9%)
	Agriculture Services, Forestry and Fishing	1(0.5%)
	Natural Resource Exploration and Processing	1 (0.5%)
	Wholesale Trade	1 (0.5%)
	Mining	0 (0.0%)
	Other	27 (13.1%)

Table 3-2: Survey Instrument

Table 3-2 Survey Instrument			
Panel A			
Item	Enterprise System Integration Scale	Mean*	SD
ES1	Information in reports produced by our information systems is based on common sources of data (e.g. a common database).	3.88	0.794
ES2	We have an integrated information system that stores both financial and non-financial information.	3.77	0.937
ES3	Information is shared seamlessly across our organization, regardless of the function.	3.20	1.117
ES4	Remote, branch, and mobile offices have easy access to organization wide data.	3.60	0.994
ES5	Information is shared seamlessly across our organization, regardless of the location.	3.35	1.051
ES6	High level managers have easy access to data from all functions.	4.11	0.857
ES7	Information from different functions cannot be easily aggregated.	3.19	1.063

Panel B			
Item	Mutual Monitoring Scale	Mean*	SD
MutMon1	If my unit does not perform our work, my peers can see that in the information system.	3.77	1.046
MutMon2	My peers have access to the status of my unit's work performance through our information system.	3.65	1.097
MutMon3	My peers can detect mistakes in my unit's work.	3.46	1.084
MutMon4	My peers must come to me to obtain information on the progress of my unit's work. (RC)	2.63	1.104
MutMon5	If my peer's unit does not perform their work, I can see that in the information system.	3.86	1.022
MutMon6	I have access to the status of my peers' units' work performance through our information system.	3.73	1.065
MutMon7	I can detect mistakes in my peers' units' work.	3.85	0.895
MutMon8	I must go to my peers to obtain information on the progress of their units' work. (RC)	3.09	1.105

Panel C			
Item	Team Identification Scale	Mean*	SD
TeamID1	I identify with my peer group.	4.02	0.771
TeamID2	I am like my peer group.	3.57	1.007
TeamID3	My peer group is an important reflection of who I am.	3.33	1.147

Panel D			
Item	Impact Scale	Mean*	SD
Impact1	My impact on the performance of my *organization* is large.	3.94	0.884
Impact2	I have a great deal of control over what happens in my *organization.*	3.33	1.175
Impact3	I have significant influence over what happens in my *organization.*	3.88	0.973
Impact4	The overall performance of my *organization* is not affected by my performance. (RC)	3.47	1.163
Panel E			
	Competence Scale	Mean*	SD
Comp1	I am confident about my ability to do my job.	4.67	0.538
Comp2	I am self-assured about my capabilities to perform my work activities.	4.46	0.800
Comp3	I have mastered the skills necessary for my job.	4.44	0.672
Comp4	I cannot perform my job to the level expected by senior management. (RC)	4.43	0.707

* All items were measured on a scale from 1 to 5.
RC = Reverse coded
ES = Enterprise system integration
MutMon = Mutual monitoring
TeamID = Team identification
Comp = Competence

Table 3-3: Exploratory Factor Analysis (initial iteration)

Table 3-3
Exploratory Factor Analysis
(initial iteration)

	ES	MutMonIn	MutMonOut	TeamID	Impact	Comp	Impact3
ES1	**.253**	.280	-.010	.208	-.082	.293	.116
ES2	**.700**	.166	.046	.024	.149	.112	-.146
ES3	**.563**	.003	.233	.037	.073	.149	.206
ES4	**.633**	.091	.083	.160	.042	.033	.009
ES5	**.846**	.127	.002	.106	.110	.061	-.019
ES6	**.461**	.179	.328	.272	-.011	.175	.016
ES7	**.340**	.076	.201	.201	.072	.283	-.178
MutMon1	.114	**.675**	.253	.124	.075	-.023	-.022
MutMon2	.246	**.783**	.103	-.019	-.011	.058	.105
MutMon3	.047	**.593**	.151	.091	.118	-.074	-.029
MutMon4	-.099	**.218**	.165	-.156	-.281	-.050	.218
MutMon5	.235	.451	**.626**	.105	.138	.009	-.083
MutMon6	.324	.399	**.700**	.086	.073	.040	-.086
MutMon7	.104	.281	**.507**	.121	.280	.058	-.047
MutMon8	.032	.041	**.671**	-.048	-.066	.033	.213
TeamID1	.068	.151	-.007	**.758**	.104	.043	.118
TeamID2	.142	-.026	.061	**.799**	.083	.006	-.090
TeamID3	.241	.123	.101	**.629**	.261	.040	-.150
Impact1	.010	.158	-.019	.109	**.586**	.076	.248
Impact2	.124	-.004	.145	.077	**.856**	.021	.022
Impact3	-.018	.040	.063	-.067	**.319**	.122	.680
Impact4	.145	.089	.075	.145	**.797**	-.017	.050
Comp1	.065	-.008	-.011	.028	.077	**.570**	.039
Comp2	.105	-.115	.112	.067	-.017	**.453**	.279
Comp3	.071	.007	-.050	-.065	-.042	**.616**	.072
Comp4	.059	.016	.086	.043	.059	**.579**	-.125

ES = Enterprise System Integration
MutMonIn = Mutual Monitoring (peers monitoring the subject)
MutMonOut = Mutual Monitoring (subject monitoring peers)
TeamID = Team Identification
Impact = Impact
Comp = Competence

Table 3-4: Exploratory Factor Analysis (final iteration)

Table 3-4 Exploratory Factor Analysis (final iteration)					
	ES	MutMon	TeamID	Impact	Comp
ES2	**.695**	.219	.056	.094	.107
ES3	**.516**	.156	.037	.106	.156
ES4	**.604**	.152	.163	.041	.040
ES5	**.889**	.137	.136	.069	.048
MutMon1	.080	**.671**	.096	.082	-.074
MutMon2	.211	**.649**	-.013	-.029	.036
MutMon3	.019	**.585**	.095	.076	-.022
MutMon5	.206	**.756**	.089	.125	.022
MutMon6	.288	**.740**	.072	.070	.040
MutMon7	.094	**.544**	.131	.244	.093
TeamID1	.053	.131	**.710**	.109	.033
TeamID2	.124	.032	**.852**	.070	.016
TeamID3	.227	.214	**.635**	.211	.013
Impact1	.015	.126	.102	**.540**	.089
Impact2	.137	.093	.079	**.902**	.001
Impact4	.145	.130	.153	**.820**	-.013
Comp1	.067	-.007	.031	.067	**.579**
Comp3	.092	-.036	-.054	-.038	**.606**
Comp4	.071	.064	.068	.047	**.605**
ES = Enterprise Systems MutMon = Mutual Monitoring TeamID = Team Identification Impact = Impact Comp = Competence					

Table 3-5: Confirmatory Factor Analysis (final iteration)

Table 3-5 Confirmatory Factor Analysis (final iteration)					
	ES	MutMon	TeamID	Impact	Comp
ES2	0.750				
ES3	0.541				
ES4	0.666				
ES5	0.895				
MutMon1		0.611			
MutMon2		0.569			
MutMon5		0.872			
MutMon6		0.864			
TeamID1			0.736		
TeamID2			0.801		
TeamID3			0.747		
Impact1				0.563	
Impact2				0.903	
Impact4				0.867	
Comp1					0.571
Comp3					0.626
Comp4					0.603
ES = Enterprise Systems MutMon = Mutual Monitoring TeamID = Team Identification Impact = Impact Comp = Competence					

Table 3-6: Convergent and Discriminant Validity

Table 3-6 Convergent and Discriminant Validity					
	Enterprise Systems	Mutual Monitoring	Team Identification	Impact	Competence
Construct Composite Reliability	0.795	0.808	0.811	0.830	0.805
Average Variance Extracted	0.525	0.551	0.580	0.628	0.361
Squared inter-construct correlations					
Enterprise Systems	1.000				
Mutual Monitoring	0.206	1.000			
Team Identification	0.126	0.085	1.000		
Impact	0.077	0.074	0.110	1.000	
Competence	0.049	0.006	0.007	0.005	1.000

Table 3-7: Hypotheses Tests

Table 3-7 Hypotheses Tests					
	Standardized Path Coefficient	Path Coefficient	Standard Error	t-value	p-value (1-tailed)
Hypothesis 1	0.449	0.320	0.066	4.874	<0.001
Hypothesis 2	0.294	0.198	0.063	3.125	0.001
Hypothesis 3	0.180	0.170	0.087	1.942	0.028
Hypothesis 4	0.357	0.316	0.081	3.914	<0.001

Table 3-8: Common Method Bias

Table 3-8 Common Method Bias			
Panel A Common Method Correlations (Between CMM and Model Constructs)			
Enterprise Systems	-0.077		
Mutual Monitoring	0.247		
Team ID	-0.028		
Impact	0.041		
Average (absolute value)	0.098		
Panel B Path Coefficients Corrected for Common Method Bias			
	Corrected Standardized Path Coefficient	Original Standardized Path Coefficient	p-value (1-tailed)
ES → Mutual Monitor (H1)	0.462	0.449	<0.001
ES → Team ID (H2)	0.288	0.294	<0.001
Mutual Monitor → Team ID (H3)	0.189	0.180	0.029
Team ID → Impact (H4)	0.357	0.357	<0.001
CMM → ES	-0.077		0.217
CMM → Mutual Monitor	0.247	--	<0.001
CMM → Team ID	-0.028	--	0.389
CMM → Impact	0.041	--	0.328
ES = Enterprise Systems MutMon = Mutual Monitoring TeamID = Team Identification Impact = Impact CMM = Common method marker. This study utilizes the human complexity construct (Wrightsman, 1964) as the common method marker.			

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CHAPTER 4 STUDY 3: SELF-DETERMINATION THEORY AS A PREDICTOR OF TECHNOLOGY DOMINANCE

Introduction

Decision aid use is increasingly prevalent in the accounting industry and business as a whole (Dowling and Leech, 2013; Dowling and Leech, 2007; Mascha, 2001). Although a decision aid is employed to improve consistency and reduce bias, the consequences of decision aid use are not always positive (Dowling et al., 2008; Seow, 2011; Arnold and Sutton, 1998). Decision aid use may foster a state of technology dominance, where users grant technology primary control in decision making (Arnold and Sutton, 1998). Technology dominance has a negative impact on decision making when it results in inappropriate reliance and reduced knowledge retention, which are outcomes commonly found in the decision aid literature (Dowling et al., 2008; Brody et al., 2003; Glover et al., 1997; Noga and Arnold, 2002). Much of decision aid literature focuses on experience, cognitive load, and cognitive fit to explain technology dominance (Seow, 2011; McCall et al., 2008; Mascha and Smedley, 2007; Hampton, 2005; Mueller and Anderson, 2002; Rose and Wolf, 2000; Rose 2002), however, this study utilizes self-determination theory (Deci and Ryan, 1985; Vallarand, 2000; Ryan and Deci, 2000) as an additional explanation.

Self-determination theory asserts that fulfilling the psychological need to determine one's own actions increases intrinsic motivation (Ryan and Powelson, 1991). Intrinsic motivation entails the desire to participate in an activity solely for the satisfaction of participating in the activity (Ryan and Deci, 2000). Intrinsic motivation does not include the desire to participate in

an activity based on receiving rewards or avoiding consequences. The theory highlights that there is a continuum of motivation from intrinsic to extrinsic, extrinsic being the desire to participate in an activity based completely on the rewards or consequences (Ryan and Deci, 2000). This study focuses on intrinsic motivation because intrinsic motivation is linked to higher quality engagement and learning than more extrinsic forms of motivation (Walker et al., 2006; Osterley and Frey, 2000). Autonomy and relatedness are two factors that increase intrinsic motivation[10] (Ryan and Deci, 2000). Autonomy is the ability to determine one's own actions; while relatedness refers to the extent to which environmental factors, such as peers or superiors, support personal autonomy (Ryan and Powelson, 1991).

Self-determination theory may provide additional insight into technology dominance because individuals possessing less intrinsic motivation are less engaged when completing a task, and the technology may dominate the outcome of the decision process as a result (Assor et al., 2002; Walker et al., 2006; Arnold and Sutton, 1998). A decision aid can reduce intrinsic motivation by enforcing restrictive procedures that force a specific decision process (Dowling 2009, Seow 2011). Prior research concludes that users of a restrictive decision aid are not fully engaged in the decision process which leads to technology dominance in the form of inappropriate reliance (Brody et al., 2003 Glover et al., 1997). Self-determination theory posits that restrictive task structures may reduce intrinsic motivation, which in turn may reduce the level of engagement (Walker et al., 2006; Standage et al., 2005; Assor et al., 2002). The purpose of this study is to examine whether a decision aid with lower levels of autonomy and relatedness

[10] Self-determination theory also identifies competence as a factor that increases intrinsic motivation. However, competence is not explored in this study. Competence denotes a feeling of effectiveness or that the activity is accomplishing something (Deci et al., 1991; Ryan and Powelson, 1991)

reduce the intrinsic motivation to complete the task, which lowers the level of engagement in the task and increases the likelihood of technology dominance.

To examine the impact that decision aid features can have on technology dominance, a 2 x 2 factorial experiment that manipulated autonomy and relatedness was conducted. Eighty-three junior level business students completed a capital budgeting task in a computerized setting. They all received the same decision aid which differed only in regards to its controlling features, the levels of autonomy and relatedness. Both intrinsic motivation and task engagement were measured.

The results of the experiment do not verify the expectations. This study posits that autonomy and relatedness of the decision aid will affect the intrinsic motivation to perform the task. However, the manipulations of autonomy and relatedness fail to impact intrinsic motivation. Intrinsic motivation to perform the task does increase task engagement, but task engagement is unrelated to technology dominance. The results do, however, point out that the intrinsic motivation that students have towards academic work in general reduced the likelihood of technology dominance. Although the manipulations of autonomy and relatedness in this experiment do not impact intrinsic motivation for the task, intrinsic motivation does impact the likelihood of technology dominance. Specifically, the intrinsic motivation to immerse one's self in thought reduces the likelihood of technology dominance.

This study contributes to the technology dominance literature in two ways by: (1) highlighting the presence of additional antecedents for technology dominance and, (2) illustrating direct measurement of technology dominance in an experimental setting. This study highlights the presence of additional antecedents of technology dominance because it finds that

higher levels of intrinsic motivation reduce the likelihood of technology dominance. While prior studies with implications for technology dominance tend to utilize reliance, knowledge acquisition, or performance for dependent variables (McCall et al., 2008; Mascha and Smedley, 2007; Hampton, 2005; Brody et al., 2003; Noga and Arnold, 2002; Glover et al., 1997), this study introduces an experimental methodology that measures technology dominance directly. Overall, this study draws attention to unexplored avenues of examination for the technology dominance literature.

This study is important to practice because decision aids are common in business, including the accounting sector. Recent research documents potential detrimental effects of decision aid use within the accounting sector. Dowling et al. (2008) supports the notion that auditors using a restrictively structured decision aid acquire less expertise than auditors using a less structured decision aid. Additionally, accounting experimental studies show that the use of a decision aid reduces knowledge acquisition in novice accountants (Glover et al., 1997; Brody et al. 2003; Seow, 2011). Collectively these studies provide evidence that decision aid use in the accounting industry may hinder the development of expertise. Therefore, exploring decisions aid features that contribute to this phenomenon is important. This study applies self-determination theory to help explain the negative effects observed in recent research regarding the use of restrictively structured decision aids. The results of this study reveal that intrinsic motivation plays a part in overcoming the detrimental effects associated with decision aid use.

The rest of the paper is organized into four sections. The next section will review the technology dominance literature and will introduce self-determination theory as the theoretical foundation for the link between controlling characteristics of a decision aid and motivation. The

hypothesis development section will then explain and provide support for the individual hypotheses. The methods section will explain the experiment, participants, measures, and statistical techniques.

Literature Review

Technology dominance refers to the relinquishing of primary control over the decision making process to technology (Arnold and Sutton, 1998). Before technology dominance can occur, a decision maker must first rely on the decision aid (Arnold and Sutton, 1998). However, overreliance upon the decision aid occurs when the technology starts to dominate the decision making process and creates the potential for poor decision performance (Glover et al., 1997). Additionally, long term use of a decision aid may deskill or prevent the development of expertise (Rochlin, 1997). The theory of technology dominance posits the conditions for reliance, inappropriate reliance, and deskilling (Arnold and Sutton, 1998).

The theory of technology dominance explains that task experience, task complexity, decision aid familiarity, and cognitive fit determine reliance upon a decision aid (Arnold and Sutton, 1998; Hampton, 2005). In contrast, overconfidence in personal decision making ability contributes to non-reliance and explains why more experienced individuals are less likely to rely on a decision aid (Whitecotton, 1996; Hampton, 2005). Although highly experienced individuals prefer to rely on themselves, there are a few conditions that entice experienced decision makers to rely on a decision aid. The task must be sufficiently complex such that the help a decision aid provides is worth the effort of using the decision aid. If an individual is familiar with a decision aid, the effort required to use that aid is lessened. Thus, the likelihood that the help provided by

the aid is greater than the effort required to use it increases with familiarity. Individuals are also more likely to utilize a decision aid that applies logic that is similar to their own logic, thereby providing a cognitive fit between the decision maker and the decision aid. The impacts of task complexity, decision aid familiarity, and cognitive fit are inextricably linked to each other and have the greatest impact when all three conditions are present (Hampton, 2005; Arnold and Sutton, 1998; Mascha and Smedley, 2007).

Inappropriate reliance leading to poor judgment performance is an early symptom that reliance has transformed into technology dominance. The theory of technology dominance posits that when the decision aid possesses more domain knowledge than the user, the user is likely to be dominated by the technology (Arnold and Sutton, 1998). As a result, novice decision-makers are more likely to succumb to technology dominance. Glover et al. (1997) finds that tax students using a decision aid rely on the aid even when the aid is wrong, while students without the aid are more likely to make the correct assessment. There is also evidence that novice decision makers will over weight evidence highlighted by a decision aid compared to evidence not highlighted by the aid (Kowalczyk and Wolfe, 1998; Seow, 2011). In a series of experiments conducted by Todd and Benbasat (1991, 1992, 1994, and 1999), students adapted their thought process to match that of the decision aid. These studies provide evidence that low expertise individuals are often dominated by technology in various ways.

Interestingly, technology appears to dominate users even when the technology does not display a clear advantage in knowledge. For example, Seow (2011) asked participants to review a case and identify control activities. Some participants utilized a computerized checklist that prompted the search for certain control activities, but many of the lacking control activities were

not included on the checklists. If used properly, the checklist should reduce cognitive effort associated with finding control activities on the list and the decision maker should increase their effort to find more control activities that are not on the list. However, participants with the checklist identified fewer control errors that were not included on the checklist than participants without the checklist. Although the participants in Seow's (2011) study were aware that there were control activities present in the case that were not included on the checklist, the structure associated with the decision aid prompted certain activities and that prompting interfered with the recollection of other possible explanations. Seow's (2011) study demonstrates that technology can alter the decision process and dominate the user even when the technology does not display more domain knowledge than the decision aid user.

The theory of technology dominance also posits negative effects to knowledge acquisition and retention (Arnold and Sutton, 1998). Users may not have to actively engage in the task when using the decision aid and may lose the ability to perform the task without the aid (Arnold and Sutton, 1998; Rochlin, 1997). A rigidly structured decision aid allows the decision maker to focus on the decision aid inputs rather than the task itself (Glover et al., 1997; Brody et al., 2003; Arnold and Sutton, 1998; Rochlin, 1997). In this context, domain knowledge becomes less useful for the performance of daily duties. Novice decision makers have no reason to attain deeper levels of domain knowledge. Over time, the novices gain experience without expertise, while the experts exit the profession due to retirement. Ultimately, this could result in a deskilled profession where the technology possesses more domain knowledge than the professionals (Arnold and Sutton, 1998; Sutton and Byington, 1993).

This study builds upon technology dominance research by proposing additional conditions that contribute to technology dominance. Specifically, the controlling characteristics of a decision aid, which reduce autonomy and relatedness, are expected to reduce motivation to perform the task. Three of the studies that find inappropriate reliance or diminished knowledge acquisition use a restrictive decision aid (Glover et al., 1997; Brody et al. 2003; Seow, 2011). Two of these studies speculate that users of a restrictive decision aid do not engage fully in the task (Glover et al., 1997; Brody et al. 2003). Self-determination theory may explain this lack of engagement. It suggests that controlling task structures will impair intrinsic motivation to perform the task (Deci and Ryan, 1985; Vallarand, 2000; Ryan and Deci, 2000). Lacking motivation for the task, an individual may focus solely on the decision aid rather than engage in the task itself. The theory of technology dominance suggests that technology is likely to dominate individuals that are not actively engaged in the task (Arnold and Sutton, 1998; Rochlin, 1997). Figure 4-1 summarizes the theoretical link between controlling task structures and technology dominance.

Theory

This study utilizes self-determination theory to establish the relationship between controlling characteristics of a decision aid and intrinsic motivation. Intrinsic motivation is defined as the desire to perform a task for its inherent satisfaction (Ryan and Deci, 2000). This means that the individual enjoys performing the activity or attains a sense of personal satisfaction from completing the activity. In general, self-determination theory states that externally generated control reduces intrinsic motivation (Deci and Ryan, 1985; Vallarand, 2000; Ryan and

Deci, 2000; Grolnick et al., 1991; Gagne and Deci, 2005). Specifically, self-determination theory posits that high levels of autonomy and relatedness translate into high levels of intrinsic motivation[11] (Deci and Ryan, 1985; Vallarand, 2000; Ryan and Deci, 2000). Autonomy refers to a sense that oneself is the causal agent of one's actions. Relatedness refers to the supportive nature of the social context (Deci et al., 1991). With respect to self-determination theory, relatedness is primarily concerned with social interactions that support independent thought and actions or indicate a rightful place within the social group (Grolnick et al., 1991; Ryan et al., 1994; Deci and Ryan, 1985). Self-determination theory rests on the assertion that autonomy and relatedness are psychological needs that all beings desire (Ryan and Deci, 2000).

Vallerand's (2000) hierarchical model of intrinsic motivation clarifies some key points related to self-determination theory. Intrinsic motivation is often viewed as a characteristic of a person that does not change from situation to situation (Vallerand, 2000). Yet, self-determination theory asserts that intrinsic motivation is affected by social contexts such as autonomy and relatedness (Ryan and Deci, 2000). The hierarchical model of intrinsic and extrinsic motivation explains that individuals possess a degree of intrinsic motivation in general (global level), a different degree of intrinsic motivation for categories of activities (contextual level), and a different degree of intrinsic motivation for specific activities (situational level, from here forward referred to as task level) simultaneously (Vallerand, 2000). Intrinsic motivation at each level is affected by its own autonomy and relatedness, as well as the intrinsic motivation at the level above it. For example, the intrinsic motivation a person possesses toward completing a

[11] Cognitive evaluation theory is a subset of self-determination theory that focuses on relationship between relatedness and intrinsic motivation. To minimize confusion, self-determination theory is used throughout this study (Deci and Ryan, 1985).

homework task (task level) is affected by the intrinsic motivation that person possesses toward school (contextual level). Using the hierarchical model of self-determination theory to predict technology dominance provides the theoretical model (Figure 4-1).

Hypothesis Development

Self-determination theory suggests that autonomy is the primary driver of intrinsic motivation (Deci and Ryan, 1985). Put simply, individuals like to have a choice. Any act or task characteristic that attempts to influence that choice is regarded as an act of control. Evaluations, restrictive task structures, monetary rewards, deadlines, and punishments are proven acts of control that diminish autonomy (Deci and Ryan, 1985; Vallarand, 2000; Ryan and Deci, 2000; Ryan et al., 1983). Adding external motivators shifts an individual's motivation from intrinsic to extrinsic (Ryan and Deci, 2000).

Some researchers have struggled with the assertion that monetary incentives undermine intrinsic motivation (Kunz and Pfaff; 2002). Deci et al. (2001a) provide meta-analyses to demonstrate the negative effect of external rewards upon intrinsic motivation. Distinguishing between extrinsic motivation and intrinsic motivation is integral to accepting self-determination theory. External rewards can increase extrinsic motivation at a cost to intrinsic motivation (Deci and Ryan, 1985; Ryan and Deci, 2000; Osterloh and Frey, 2000). However, the task must be interesting to begin with or there is no intrinsic motivation to be undermined (Osterloh and Frey,

2000). Thus, a lack of external rewards accompanied by free choice maximizes intrinsic motivation, but minimizes extrinsic motivation[12].

The literature supports the impact of free choice on intrinsic motivation in several different contexts. Students that possess a free range of educational choices exhibit high levels of intrinsic motivation toward learning (Noels et al., 2000; Guay et al., 2000). Adding controlling structures to academic tasks, such as rules, directions, or tests, diminishes students' intrinsic interest in those tasks (Grolnick and Ryan, 1987; Koestner,et al., 1984; Ryan and Grolnick, 1986). Not only do academic choices encourage intrinsic motivation, participation in physical activities increase when students perceive they have choices (Standage et al., 2005). Across age groups, contexts, and levels, the evidence that autonomy fosters intrinsic motivation is compelling.

Autonomy in the form of freedoms built into task structure in an important part of self-determination theory. Koestner et al. (1984) conducted an experiment where they provided elementary students with the opportunity to paint. Some students were required to keep certain levels of neatness whereas other students were given free range without neatness requirements. The students that were given free range maintained intrinsic interest in the task. Additionally, video games that allow freedom of action are associated with greater intrinsic enjoyment (Ryan et al. 2006). At work, the freedom to determine one's own job procedures is associated with higher intrinsic motivation (Van Yperen and Hagedoorn, 2003). These three studies support the

[12] Intrinsic motivation is preferred to extrinsic motivations in tasks that require creativity or work environments that cannot provide incentives for all the aspects of performance (Osterloh and Frey, 2000).

theory and provide evidence that task autonomy embedded in task structure influences intrinsic motivation at the task level.

A decision aid is embedded with certain levels of autonomy; some aids are more restrictive while others are less restrictive (Dowling and Leech, 2007). The extent of restrictiveness embedded within an aid affects task autonomy. Additionally, the use of the decision aid can be mandated by company policy further limiting task autonomy. Research demonstrates that a restrictive decision aid can impede knowledge acquisition and interfere with recall of relevant information and knowledge acquisition (McCall et al., 2008; Brody et al., 2003; Seow, 2011). Self-determination theory suggests that the autonomy embedded within the decision aid directly affects intrinsic motivation at the task level, which may be the explanatory variable between the use of a decision aid and some of the negative outcomes that have been observed. Thus, the following hypothesis is put forth.

H1: Task autonomy embedded within the decision aid positively impacts intrinsic motivation at the task level.

Self-determination research often examines how social interactions affect intrinsic motivation. Self-determination literature refers to different aspects of the social environment as relatedness (Grolnick et al., 1991; Grolnick and Ryan, 1987). Positive relatedness may be better conceptualized as social support for personal autonomy[13] (Ryan and Powelson, 1991; Edmunds et al, 2006; Ryan et al., 1994). This may be created through parents that encourage their children to make their own decisions, teachers that promote independent thought and employers that

[13] The original conceptualization of relatedness referred to a sense of belonging (Deci and Ryan, 1985). However the research has broadened the initial conceptualization to include all social interactions that support autonomous action (Ryan and Powelson, 1991). Some studies still adhere to the original conceptualization and refer to broader concept as autonomy support (Edmunds et al. 2006; Standage et al. 2005)

focus on talent development (Grolnick et al., 1991; Vansteenkiste et al., 2007; Koestner et al., 1984; Edmunds et al., 2006). This social environment can either encourage an individual to take advantage of the choices they possess or focus their attention upon the controlling structures around them.

Although actual autonomy may not differ, the social environment's emphasis on extrinsic sources of motivation can greatly affect an individual's sense of relatedness (Grolnick et al., 1991; Grolnick and Ryan, 1987; Vansteenkiste et al., 2007; Koestner et al., 1984; Edmunds et al., 2006; Guay et al., 2000). Grolnick and Ryan (1987) provided students with a reading passage. They told all three groups of students that they would have to answer questions once they were done reading. However, some students were told that the questions would be graded. The students that were told they would be graded found the passage to be less interesting. Although the questions are the same, the emphasis on performance diminishes the students' intrinsic interest in the passage.

Field surveys verify this experimental finding in a variety of contexts. Standage et al. (2005) find that relatedness directly influences intrinsic motivation in middle school physical education students. Guay et al (2000) also finds a direct relationship between relatedness and intrinsic motivation towards college education. Social support among nurses also bolsters intrinsic motivation and reduces job fatigue (Van Yperen and Hagedoorn, 2003). In general, field surveys verify the experimental findings.

Self-determination literature reveals that interactions with persons in authority greatly influence an individual's relatedness. When parents, teachers, or supervisors overtly exert control, they undermine intrinsic motivations (Grolnick and Ryan, 1987; Vansteenkiste et al.,

2007; Van Yperen and Hagedoorn, 2003; Gagne and Deci, 2005). Emphasizing the controls related to a task reduces intrinsic motivation to complete the task, although the task itself does not change (Grolnick and Ryan, 1987).

Studies on relatedness imply that the way in which a decision aid is introduced can greatly impact the intrinsic motivation of the decision maker. A decision aid is introduced into an organization for various reasons. In general, a decision aid is integrated into an organization to improve efficiency and consistency (Eining and Dorr, 1991; Todd and Benbasat, 1999). Improvements to efficiency may come in the form of greater decision accuracy. Given the various uses, management may frame the purpose of the decision aid in a variety of ways. Management may determine that the primary role of the decision aid is to ease cumbersome computational work and introduce the decision aid as an assistant (Eining and Dorr, 1991; Todd and Benbasat, 1999). In contrast, the decision aid's ability to enforce a particular procedure and record how the process is performed may be emphasized (Dowling, 2009; Lowe et al., 2002). Management may also imply that the decision aid is more accurate than the decision maker, which can lead the decision maker to view the decision aid as a competitor (Whitecotton, 1996). These various applications of decision aid use in conjunction with the findings concerning relatedness and intrinsic motivation imply that the perceived reason, or social context, for implementing a decision aid may impact the decision maker's intrinsic motivation. In other words, the relatedness associated with the decision aid affects the intrinsic motivation to utilize the decision aid. In cases where completing the task and utilizing the decision aid are one and the same activity, the relatedness associated with the decision aid will directly impact the intrinsic motivation to complete the task.

H2: The relatedness associated with the decision aid positively impacts intrinsic motivation at the task level.

The hierarchical model of intrinsic and extrinsic motivation explains that individuals have a general degree of intrinsic motivation at the global level; however, different categories of activities engender different levels of intrinsic motivation. For example, an individual has a general level of intrinsic motivation, but that individual's intrinsic motivation toward sports may be very different than that individual's intrinsic motivation toward academics. Moreover, individuals possess specific levels of intrinsic motivation for each activity within each category. The intrinsic motivation towards a category of tasks must be understood in order to determine how autonomy and relatedness affect intrinsic motivation towards a specific task within that category.

The hierarchical model of intrinsic and extrinsic motivation (Vallerand, 2000) provides a theoretical foundation to view this interplay between the degree of motivation towards a category of similar tasks and motivation for a specific task within that category by highlighting three levels of motivation: global, contextual, and task. Each level is affected by its own autonomy and relatedness. The broadest level of intrinsic motivation is referred to as the global level. Global level intrinsic motivation is an individual's average degree of intrinsic motivation. The global level of intrinsic motivation is unique to the individual and is determined by that individual's personal characteristics and life experiences. Additionally, intrinsic motivation occurs at a contextual level. This refers to an individual's intrinsic motivation for a certain category of activities (e.g. sports, academics, video games, etc.). Individuals also develop intrinsic motivation at the task level, which is specific to each task within a category of tasks. The

hierarchical model also proposes that higher levels of motivation influence lower levels. Specifically, contextual intrinsic motivation influences task level intrinsic motivation. Therefore, the intrinsic motivation at the task level is not only affected by the autonomy and relatedness associated with that task, but the intrinsic motivation at the contextual level as well (Vallerand, 2000).

H3: Intrinsic motivation at the contextual level impacts intrinsic motivation at the task level.

Intrinsic motivation is associated with a host of positive outcomes. Intrinsic motivation is positively associated with learning, memory, self-efficacy, enjoyment, happiness, job satisfaction, and job commitment (Grolnick and Ryan, 1987; Deci and Ryan, 1985; Ryan et al., 2006; Guay et al., 2001; Deci et al., 2001b; Van Yperen and Hagedoorn, 2003). Intuitively, high motivation will produce positive outcomes; however, extrinsic rewards can diminish the personal satisfaction involved with an activity. But why do intrinsic motivations for learning deliver a deeper conceptual understanding than extrinsic motivations (Grolnick and Ryan, 1987)? Why are intrinsic motivations associated with deeper and creative work, while extrinsic motivations are associated with surface and repetitive work (Osterloh and Frey, 2000)? One possible explanation is that these activities require the individual to become cognitively engaged. Cognitive engagement denotes a deep involvement in the task (Kowal and Fortier, 1999).

Intrinsic motivation and engagement share many of the same antecedents (Kowal and Fortier, 1999; Ryan et al., 2006, Deci et al., 2001b). Ryan et al., 2006 find that a video game that provides more autonomy results in higher intrinsic motivation to play that game and greater immersion in the game. Deci et al. (2001b) find that autonomy and relatedness positively

influence engagement in work tasks. Furthermore, there have been direct tests of the relationship between intrinsic motivation and engagement. Intrinsically motivated students engage in deeper cognitive activities, such as integrating new knowledge with existing knowledge structures (Walker et al., 2006). Kowal and Fortier (1999) find that internalized forms of task level motivation are positively associated with task engagement. Additionally, intrinsic motivation is positively associated with concentration (Standage et al., 2005). In summary, prior research shows that intrinsic motivation is associated with deeper cognitive activities, concentration, and task immersion (Walker et al., 2006; Standage et al., 2005; Kowal and Fortier, 1999).The hierarchical model of intrinsic and extrinsic motivation specifies that task specific cognitions and behaviors are particularly affected by task level motivations (Vallerand, 2000); therefore, intrinsic motivation at the task level is expected to increase engagement in the task.

H4: Intrinsic motivation at the task level increases task engagement.

Technology dominance occurs when a decision maker grants technology primary control over the decision making process (Arnold and Sutton, 1998). The role that engagement plays in technology dominance is speculated upon, however it is not clear. The theory notes that a dominated individual may not be aware that the technology is failing (Arnold and Sutton, 1998). This lack of awareness may stem from a lack of knowledge, lack of engagement, or overconfidence in the technology.

Prior research provides some indication that lack of knowledge and overconfidence are likely not the source of technology dominance. Glover et al. (1997) finds that a decision maker that uses a decision aid is more likely to provide an incorrect solution than a non-aided decision maker, when the decision aid is not equipped to incorporate all of the decision cues.

Additionally, research indicates that a decision aid user does not perform as well as a non-user when taking tests that cover material related to the task (Brody et al., 2003; McCall et al., 2008). These studies control for *ex ante* knowledge difference by randomly assigning participants to treatment groups; therefore, knowledge, or lack thereof, does not explain the poorer performance and diminished knowledge acquisition of an aided decision maker. Additionally, Glover et al. (1997) specifically note that participants approximated the accuracy of the decision aid fairly well. Given that the students accurately gauged how well the decision aid worked, overconfidence in the decision aid does not explain the technology dominance observed in that study. Contrarily, lower degrees of task engagement for a decision aid user might explain why the user acquires less knowledge during task completion than the decision maker that does not have the assistance of a decision aid and why the user does not perform as well as the non-user. In concert, these studies indicate that engagement may be an important predictor of technology dominance within the experimental context. This is also supported by Todd and Benbasat's (1991, 1992, 1994, 1999) studies that suggest a user is willing to engage with a decision aid, rather than the task, in order to minimize effort.

H5: Task engagement is negatively associated with technology dominance.

Methodology

This research study employs a 2 x 2 factorial design. The first manipulated construct is autonomy and second manipulated construct is relatedness. Participants complete the experiment in a computerized laboratory environment and are randomly assigned to the four conditions when they log into the experiment. The following sections will discuss the experimental

procedures, the decision task, the decision aid, the operationalization of the variables, and the participants.

Experimental Procedure

The experiment has six stages completed in a single sitting. The first stage provides the informed consent. During the second stage, participants complete the academic motivation scale (Appendix A), which measures motivation at the contextual level. The third stage (Appendix B) explains the decision task, which is a capital budgeting problem. The fourth stage (Appendix C) consists of a tutorial on how to use the decision aid. This tutorial also reiterates management's purpose for the decision aid, which is the manipulation for relatedness. Additionally, the instructions inform the participants whether they *must* use the net present calculator to determine their capital budgeting decision, the autonomy manipulation. The fifth stage consists of three capital budgeting decisions in which participants are asked to complete the decision task using the decision aid. Participants are required to complete the first two capital budgeting decisions to become familiar with the decision aid. The third capital budgeting decision (shown in Appendix D) is used for analysis. All participants utilize the same decision aid. However, some are forced to utilize the net present value calculator, while others are not. During the sixth stage, participants are asked to complete situational motivation and core flow scales (shown in Appendix E), which measure task motivation and task engagement respectively. Lastly, demographic information is captured[14]. The demographic questions are shown in Appendix F.

[14] The experiment was pretested using both graduate and undergraduate managerial accounting students. Feedback and a review of the pretest data initiated some adjustments. The ease at which the students were able to pick up the technical aspects of the decision aid resulted in a streamlining of the decision aid tutorial and an increase from two

The Capital Budgeting Task

Participants are asked to imagine that they are the management accounting member of a cross functional proposal evaluation team. The team includes an engineering member and a marketing member, as well as the management accounting member. When the proposal reaches the management accounting member of the team, it includes five years of financial data plus reports from the engineering team member, marketing team member, Chief Executive Officer (CEO), and Chief Financial Officer (CFO). The financial data provides detailed information on the proposal including yearly cash flows. The marketing report verifies the accuracy of the projected sales, while the engineering report verifies the projected costs. The CEO report shows that the company would like to aggressively pursue new opportunities. The CFO report explains that the company is flush with cash and provides information regarding the internal rate of return for similar projects. Examples of these reports are shown in Appendix D.

The participant, as the management accountant, is responsible for evaluating all of the information and making a recommendation to the team. These reports in conjunction with the yearly cash flow information provide the information needed for the participant to determine an appropriate discount rate, based on the internal rate of return of similar projects, and calculate the net present value (NPV) of the proposal. Specifically, the participant's task is to make a decision to either accept or reject the proposal based on its financial attractiveness. Each participant is also asked to explain the basis for that decision.

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evaluation tasks to three. The pre-test also indicated that the additional information may have been too simple, thus, more complex information was added to the reports.

The Decision Aid

An illustration of the decision aid is shown in appendix D. The first page of the appendix shows the main screen, which contains basic proposal information including five years of cash flow information. Buttons at the top of the page are linked to reports about the proposal from the engineering and marketing members of the proposal evaluation team, and buttons at the bottom are linked to reports about the organization and business environment from the CEO and CFO. By clicking on a link, the decision aid displays the respective report. The four different reports are shown on the second page of Appendix D. The engineering report discusses the technical aspects of proposed product. The marketing report discusses projected demand. The CEO report discusses the strategic direction of the organization and the CFO report discusses the recent financial performance of the organization. The right side of the main screen contains a net present value calculator and buttons to either reject or accept the proposal.

Each participant must go through a training tutorial on how to use the decision aid. The tutorial is embedded in the program, so participants cannot get to the decision task without viewing the tutorial pages. The tutorial consists of five instructional pages that point out and explain where to find information and how to use the NPV calculator. The net present value calculator consists of text boxes for each year's cash flows and one text box for the discount factor. The tutorial specifically states that the participant can use the text boxes in the NPV calculator to enter or change cash flows and the discount factor. The cash flow information is on the main screen, but the participant must view the various reports to determine the appropriate discount factor. Importantly, the tutorial explains to the participant that previous managerial accountants on the team were criticized for not incorporating the information in the reports. Once

the participant inputs the cash flows and potentially changes the discount factor in the NPV calculator, the participant can press the NPV button to generate the net present value. All participants are given the same decision aid.

Operationalization and Manipulated Variables

Autonomy is defined as the ability to determine one's own actions. This is manipulated at two levels. In the high autonomy condition, participants have the freedom not to use the net present value calculator and can submit a decision that does not align with the net present value given by the calculator. In other words, participants can choose if they want to use and rely on the NPV calculator. In the low autonomy condition, participants are required to use the net present value calculator and their decision must align with the net present value given by the calculator. Participants are forced to use and rely on the NPV calculator (e.g. negative NPV must be rejected, positive NPV must be accepted). Thus, autonomy is operationalized as forced or voluntary reliance on the net present calculator.

This experiment also manipulates two levels of relatedness. Relatedness is operationalized with management's purpose for the decision aid. In the negative relatedness condition, participants are told that their "predecessor purchased a Proposal Quality Control System, a decision aid designed to ensure that proper evaluation procedures are taken for each proposal". Additionally, the decision aid title "Proposal Quality Control System" is placed at the top of screen throughout. In the positive relatedness condition, participants are told that their "predecessor purchased a Proposal Evaluation Assistant, a decision aid designed to assist employees in the capital budgeting decision". Additionally, the decision aid title "Proposal Evaluation Assistant" is placed at the top of screen throughout.

In addition to the two manipulated variables, several variables are measured including contextual level intrinsic motivation. The hierarchical model of intrinsic motivation explains that intrinsic motivation occurs at the contextual level in addition to task and global levels (Vallerand, 2000). The contextual level motivation refers to the level of motivation towards a category of tasks. This experimental task is conducted in an academic setting and given to students after they cover the topic of discounted cash flows in the classroom. Therefore, Vallerand et al.'s (1992) academic motivation scale is used to measure the participants' intrinsic motivation at the contextual level. The scale captures participants' motivation towards college education and is administered prior to any experimental manipulations or task instructions. Participation in the experiment is part of a college course which places the task in the college education context. Therefore, the academic motivation scale is appropriate for assessing intrinsic motivation at the contextual level.

Task level intrinsic motivation is also measured. The hierarchical model of intrinsic motivation explains that motivation also occurs at the task level in addition to the contextual and global levels. Task level intrinsic motivation is captured by the situational motivational scale (Guay et al., 2000). This scale asks questions about participant motivation related to the completion of a particular activity or task. This study asks these questions immediately after the task is completed and specifies that the questions relate to performing the capital budgeting task. This study utilizes the four items from the situation motivation scale related to intrinsic motivation to measure task motivation.

Task engagement, which is defined as involvement with the task, is also a measured variable. This study utilizes the state of "flow" as a proxy for task engagement. The state of flow

is defined as total immersion in an activity (Kowal and Fortier, 1999; Martin and Jackson, 2008). Martin and Jackson (2008) validated the "core flow" scale that is indicative of "flow" in a diverse set of contexts and utilize this scale for music, sports, work, and school. The nine item scale asks participants to describe their state of flow while performing a particular activity. This study asks the "core flow" questions directly after the completion of the task and specifies that the questions relate to performing the proposal evaluation.

The proxy for technology dominance, the dependent variable, is the discount factor used by the participant. The NPV calculator uses a default value of 10% for the discount factor. Participants in each condition can easily change the discount factor. If the participant chooses to change the discount factor based on the internal rate of return, which is given in the CFO report, then they are not dominated by the technology. As mentioned earlier the participants complete three proposal evaluations. The participant is expected to get familiar with the task and decision aid while completing the first two capital budgeting decisions, while, the third and final capital budgeting decision is used for analysis.

The decision aid is seeded with a default discount factor of 10%, but the participant must change the default discount factor to determine the correct net present value. In the first two capital budgeting decisions, changing the default discount factor to the internal rate of return (IRR) does not change the sign (positive to negative or vice versa) of the net present value. However in the third capital budgeting decision, changing the default discount factor to the discount rate changes the net present value from negative to positive, thus, changing the recommendation. If the participant uses the default discount factor initially, the NPV calculator will generate a negative net present value, which contradicts the strong support presented in the

four reports. Two of the four pop up screens (engineering and marketing reports) contain information that strongly support the proposal. The CEO's vision, a third pop up screen, explains that the CEO would like to aggressively pursue growth opportunities. The CFO's report explains that the company has plenty of cash to invest and similar projects have an IRR of 7.1%, which is significantly lower than the default discount rate of 10%. Technology dominance occurs when the user accepts the default discount factor and rejects the proposal.

In the two practice proposals, the NPV calculator's output using either the default discount factor or IRR as a discount factor would support the same recommendation. Additionally, that recommendation would be consistent with the recommendations of the marketing and engineering reports. Using either the default discount factor or the IRR, the first practice proposal produces a positive net present value and the second generates a negative net present value. In both cases, the recommendation of the decision aid provides information that is consistent with the engineering and marketing reports. However, in the third proposal, use of the default discount factor creates a discontinuity of evidence, which is critical to creating a situation where technology dominance will become apparent.

As with any task, domain knowledge can impact how well the task is performed. Since the decision task is similar to a finance or accounting class problem, the number of accounting classes and the number of finance classes that the participant has completed are included as control variables. This also controls for differences between accounting and finance majors.

Manipulation Check

There are two manipulation checks embedded in the program. The manipulation checks are administered after the task has been completed (Appendix G). To ensure that the participant

understood the manipulation for autonomy each participant had to answer the question, "Were you required to complete the NPV calculator in order to submit your decision?" To ensure that each participant understood the manipulation for relatedness each participant had to answer the question "What was the title of the software program used in the evaluation of Company ABC's proposals?" Each participant must answer both questions appropriately to be included in the statistical analysis.

Participants

This study used undergraduate students at a large university in the southeastern United States. All of the students were enrolled in a junior level accounting course or a junior level finance course at the time of the experiment. All participants were motivated with extra credit or monetary incentives[15]. Participants were required to complete the task in a supervised computer lab in one sitting. Each participant was randomly assigned to a condition by the software program when they logged into the computer program to begin the experiment. Although 122 responses were collected, only 85 passed manipulation checks. One participant completed the exercise twice, thus his two responses were eliminated. The remaining 83 responses were analyzed for hypothesis testing. Table 4-1 shows the breakdown by condition.

Table 4-2, which provides demographic information for the participants, indicates the sample is fairly diverse. The sample includes 35 females and 48 males. Although Caucasian

[15] Initially participants were given extra credit. Due to a low number of responses, later participants received extra credit and a monetary incentive. Neither incentive was based on performance, just completion. It should be noted that intrinsic motivation is diminished by providing extrinsic rewards. However, the presence of extrinsic rewards is consistent with the real world business context. Although, the certain groups received extra credit and not monetary incentives, there were no differences between groups regarding intrinsic motivation, engagement or technology dominance.

participants represent 55 percent of the sample, African-Americans, Asians, and Hispanics all have fair representations. Sixty-one percent of the sample completed between one and three college accounting courses and 65 percent completed between one and three finance courses. Although 72 percent of the participants have no working experience in the accounting field, the purpose of this experiment is not to examine real world performance but how users react to different characteristics of a decision aid. The students recruited for this experiment were enrolled in a junior level class that covered the topic of discounted cash flows. This is likely the second class in which they have covered discounted cash flows. Therefore, the students should have a reasonable grasp of net present value and its use.

Results

Participants were required to answer multiple Likert style questions about their contextual motivation, task motivation, and task engagement. Prior to hypothesis testing, these multiple indicator constructs must be converted to single factor scores determined through confirmatory factor analysis[16]. Hypothesis testing utilizes the factor scores in a series of ANCOVA, ordinary least squares regression, and logistic regression analyses. The academic motivation scale, situational motivation scale, and core flow scales represent the theoretical constructs of contextual motivation, task motivation, and task engagement, respectively.

[16] Participants were given the option to indicate that they have no basis to answer. Anytime a participant answers "no basis to answer" that data pointed must be treated as missing. Eighty-three participants answered 24 questions to determine their perceived motivations and engagement, providing 1,992 data points. Four of these data points indicated that the participant had no basis to answer. These data points were from two different participants and for different items within the 11 item academic motivation scale. These four data points were treated as missing and replaced with the series mean for that indicator.

Table 4-3 shows the results of the confirmatory factory analysis. The academic motivation scale, which is used to determine the contextual level of intrinsic motivation, has three dimensions: to know, to accomplish, and to stimulate (Vallerand et al., 1992). The "to know" dimension measures the intrinsic motivation to learn more, the "to accomplish" dimension measures intrinsic motivation to achieve goals, and "to stimulate" measures the intrinsic motivation to simulate the mind with immersion in thought and reading. The factor analysis indicated that this scale loaded onto two factors, rather than three. The seven items that measure the "to know" and "to accomplish" dimensions loaded together in this sample. The four items that measure "to stimulate" loaded together, but distinct from the other two dimensions. Both factor scores are retained for analysis. Fortunately, the situational motivation scale items, which measure task motivation, loaded together as expected, as did the core flow scale, which measures task engagement. However, one of the measures of task motivation also loaded onto the task engagement and was therefore eliminated. In order to achieve appropriate levels of convergent validity, three items that measure task engagement were eliminated due to low factor loadings.

Each construct's Cronbach's alpha is above 0.70, as shown in table 4, indicating convergent validity. Discriminant validity is also achieved as the average variances extracted exceed the squared inter-construct correlations, also shown in Table 4-4 (Hair et al., 2006). Thus, the standardized factor scores for two dimensions of contextual level motivation, task level motivation, and task engagement are deemed appropriate for use in hypothesis testing.

Hypothesis Testing

Table 4-5 displays the number of participants who used the correct discount factor and means for the measured variables based on the experimental group. Examination of the means is not particularly insightful in terms of the hypothesized relationships, as there are no statistically significant differences between groups for the correct discount factor, task engagement, task motivation, or contextual motivations. It should be noted that contextual motivation is an independent variable and, as expected, is not different for different experimental groups. The information for the number of participants who used the correct discount factor does highlight the fact that only 15 of the 83 participants (18 percent) chose the correct discount factor.

ANCOVA is utilized to test Hypotheses 1, 2, and 3. Table 4-6 displays the results of the ANCOVA where task motivation is the dependent variable. Relatedness and autonomy are the categorical independent variables, while contextual level intrinsic motivation, the number of accounting classes, and the number of finance classes are the covariates. The model is significant with an F-value of 2.404 and a p-value of 0.023. Hypothesis 1 states that autonomy positively impacts task motivation. This hypothesis is not supported, as the F-value is 1.043 with an insignificant p-value of 0.310. This indicates that forced reliance does not reduce intrinsic motivation in this experiment. Hypothesis 2 states that relatedness positively impacts task motivation; hypothesis 2 is not supported either. As shown in Table 4-6, the F-value is 0.000 (p-value = 0.984) and not statistically significant. This indicates that management's intent to control or assist the participant with the decision aid does not impact the participant's intrinsic motivation for the task in this experiment. Additionally, the lack of main effects is not due the interaction overpowering the main effects. The interaction's F-value is 0.302 with a p-value of

0.585. The third hypothesis states that contextual motivation impacts task motivation. This hypothesis is supported as the "to know/accomplish" dimension of contextual motivation has a significant F-value of 11.829 (p-value = 0.001). Interestingly, the "to stimulate" dimension of contextual motivation is not significantly related to task motivation (F-value = 0.475, p-value = 0.493). Additionally, the number of accounting classes is significantly associated with task motivation (F-value = 4.650, p-value = 0.034). This may have something to do with the participants' imaginary role as a managerial accountant.

Hypothesis 4 states that task motivation positively impacts task engagement. To ensure that the predictors of task motivation are not driving any correlation between task motivation and engagement, the regression model to test hypothesis 4 includes all of variables used in the ANCOVA presented in Table 4-6 as well as the unpredicted portion of task motivation. Specifically, the difference between the estimated value of task level intrinsic motivation and the observed level of task level intrinsic motivation is the unpredicted portion of task level intrinsic motivation. This residual, or unpredicted portion of task level intrinsic motivation, is not correlated with any of task level intrinsic motivation's predictors that were included in the ANCOVA and are now included in the regression. Thus, multicollinearity between task level intrinsic motivation and the independent variables is eliminated by using the unpredicted portion.

Table 4-7 displays the results of task engagement regressed on task level intrinsic motivation, contextual level intrinsic motivation, relatedness, autonomy, and demographic variables. The R-squared shows that the model explains 62.4 percent of the variation in task engagement. The beta coefficient for task motivation is 0.557 (p-value < 0.001) and statistically significant. This finding supports hypothesis 4 and indicates that task level intrinsic motivation

positively impacts task engagement. Contrary to theoretical expectations, higher levels of autonomy decrease the level of task engagement as the beta coefficient is -0.433 (p-value < 0.001). The extra structure provided by lower levels of autonomy may have given participants a false sense of assurance that they are following the correct procedure to get the get the proper result. Interestingly, participants that have taken more finance classes are less engaged in the task (beta coefficient = -0.301, p-value = 0.001). In totality, hypothesis 4 is supported, but autonomy's negative correlation provides evidence contrary to the theory. This implication will be discussed further in the discussion section.

Hypothesis 5 states that task engagement is negatively associated with technology dominance. The proxy for technology dominance is whether the participant input the correct discount factor rather than using the default discount factor. Logistic regression is used to test this hypothesis. As in the previous procedure, the unpredicted portion of task engagement and all of its predictors are used to ensure that the predictors of task engagement do not drive any correlation between task engagement and technology dominance.

Panel A of Table 4-8 displays the overall predictability of the model. The Cox and Snell R-squared is 0.399 and the model correctly predicts which discount factor the participant used 85.5 percent of the time. The model correctly predicts the use of the wrong discount factor 100.0 percent of the time, but only accurately predicts the use of the correct discount factor 20.0 percent of the time. Therefore, the model performs well overall and when predicting technology dominance. However, the model does not perform well when predicting that technology dominance will not occur. This is in part due to the large portion of students who are dominated by the technology. The beta coefficient for task engagement is insignificant (-0.343, p-value =

0.464), indicating that hypothesis 5 is not supported. The only significant variable is the "to stimulate" dimension of contextual motivation, which has a beta coefficient of .780 (p-value = 0.032). This indicates that participants that are intrinsically motivated to stimulate their minds in the academic setting are less likely to allow the technology to dominate them. The following section discusses the implications of the results beyond that of support or lack of support for hypotheses.

Discussion

Taken in totality, the analyses suggest that intrinsic motivation as a predictor of technology dominance is a relevant concept. However, any study wishing to utilize self-determination theory must specify the unique impacts of the different aspects of intrinsic motivation and engagement. The fact that the "to stimulate" dimension of contextual motivation reduces the likelihood of technology dominance demonstrates the potential impact that intrinsic motivation has upon technology dominance. However, the analysis reveals that proper dimensions of task level intrinsic motivation and engagement may not have been appropriately measured or affected by the experiment.

This is initially revealed in the ANCOVA analysis (table 6), where the "to know/accomplish" dimension of contextual level intrinsic motivation is statistically significantly related to task level intrinsic motivation, but the "to stimulate" dimension of contextual intrinsic motivation is not related to task level intrinsic motivation. The task level intrinsic motivation scale does not differentiate between these dimensions; therefore, one would expect that all dimensions of contextual level intrinsic motivation would be positively associated with task level

intrinsic motivation. Since the "to stimulate" dimension of contextual level intrinsic motivation is not related to task level intrinsic motivation, task level intrinsic motivation scale does not likely represent the "to stimulate" dimension of intrinsic motivation at the task level.

This trend continues in the prediction of engagement, where task level intrinsic motivation and the "to know/accomplish" dimensions of contextual level intrinsic motivation are positively related to engagement, and the "to stimulate" dimension of contextual level intrinsic motivation is not. This could be explained by the "to stimulate" dimension of contextual level intrinsic motivation being redundant and not providing additional information in the context of this experiment. However, this possibility is debunked as the "to stimulate" dimension of contextual level intrinsic motivation is the only variable that reduces the likelihood of technology dominance in this experiment. So the "to stimulate" dimension provides additional information with respect to the "to know/accomplish" dimension of contextual level intrinsic motivation. In fact, the "to stimulate" dimension appears to be the most appropriate aspect of intrinsic motivation within the context of technology dominance, but not the appropriate aspect in relation to the measures of task level intrinsic motivation and task engagement utilized in this study. This highlights the possibility that the measures of task level intrinsic motivation and engagement utilized in this study may not be appropriate in the context of technology dominance. The fact that autonomy decreases engagement may provide further evidence that the appropriate aspect of engagement is not being measured. Quite possibly, the lack of results is due to a slight model misspecification, in that certain aspects of task level intrinsic motivation and engagement are measured, but not the aspects that relate to technology dominance. In spite of the failed model specification, the impact that the "to stimulate" dimension of contextual level intrinsic

motivation has upon technology dominance provides limited evidence that self-determination theory should be considered as an additional predictor of technology dominance.

Limitations

As with all research, this study has limitations that must be acknowledged. The limitations of this study stem from the short time period of the experiment and the use of novice participants. The experiment occurs for a brief period of time in a single session. Therefore, the effects of autonomy and relatedness sustained over a longer period may not have been appropriately observed in this experiment. Additionally, the short experimental time period prohibits the observation of long term effects. The use of novice participants limits the generalizability of the study. Further, the "to stimulate" dimension of intrinsic motivation may be more important in the initial performances of a task and less important as task specific expertise is acquired or vice versa. Therefore, the findings of this study cannot be generalized to the entire population.

Conclusion

This study applies the self-determination theory as a predictor of technology dominance. Although this study failed to establish autonomy and relatedness as factors that affect intrinsic motivation, the results do establish a dimension of intrinsic motivation as a predictor of technology dominance. Thus, this study does provide limited evidence that self-determination theory should be incorporated as a predictor of technology dominance. The failure to support hypotheses one, two, and five leaves much room for future research. Specifically, developing an

operationalization of the "to stimulate" dimension of intrinsic motivation at the task level may yield results that this study did not. Additionally, this study approached self-determination theory as a completely different set of antecedents for technology dominance. However, these antecedents may interact with, predict, or be predicted by the established antecedents of technology dominance. These relationships should be explored in more detail.

This study contributes to the technology dominance literature in several ways. Firstly, this study provides a theoretical contribution related to the impact of intrinsic motivation on technology dominance. This highlights the need to understand how motivation impacts technology dominance. Secondly, while many studies use the theory of technology dominance to predict decision aid reliance or performance, this study operationalizes and tests the inappropriate reliance aspect of technology dominance specifically. Creating scenarios where decision aid users have the option to use default values provided by the technology or change those values is a unique approach to operationalizing the inappropriate reliance aspect of technology dominance that can be recreated in several settings. Overall, this study fails to support the hypothesized model, yet still provides support for the underlying theoretical premise that intrinsic motivation affects technology dominance.

Figures

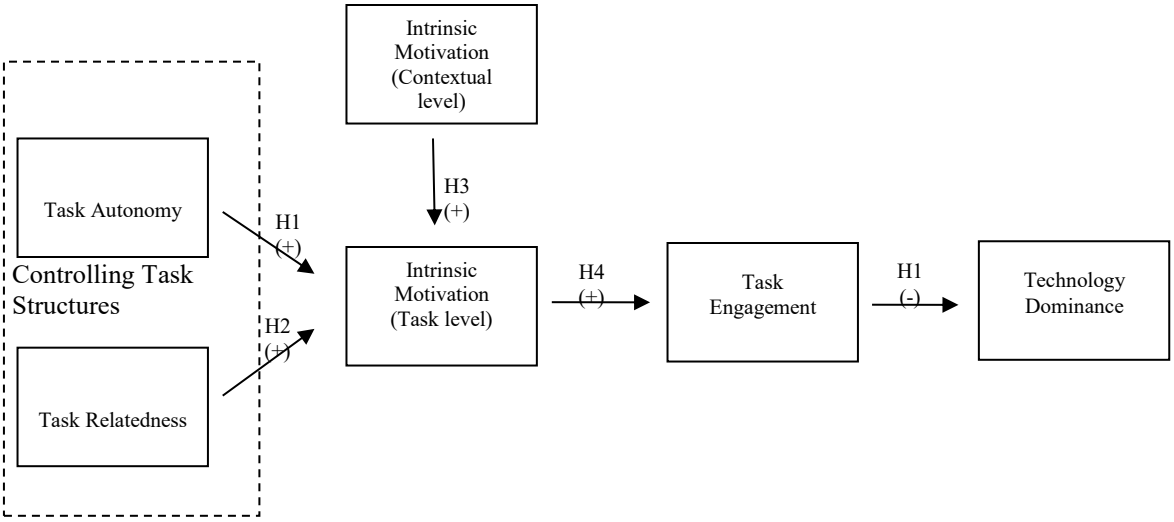

Figure 4-1: Theoretical Model

Tables

Table 4-1: Manipulation Checks by Condition

Table 4-1 Participants that Passed Manipulation Checks (Completed) by Experimental Conditions				
		Autonomy		Totals
		Hi	*Low*	
Relatedness	*Hi*	22/28	17/29	39/57
	Low	16/29	28/34	44/63
	Totals	38/57	45/63	83/120

Table 4-2: Demographic Information

Table 4-2 Demographic Information (n=83)						
Panel A: Gender	Female	Male				
	35 (42%)	48 (58%)				
Panel B: Age	18 - 22	23 - 25	26 plus			
	51 (61%)	10 (12%)	22 (27%)			
Panel C: Race	African-American	Asian	Caucasian	Hispanic	Middle Eastern	Other
	13 (16%)	8 (9%)	46 (55%)	12 (15%)	1 (1%)	1 (1%)
Panel C: Accounting Courses	0	1-3	4-6	7-9	10 plus	
	2 (2%)	51 (61%)	25 (30%)	1 (1%)	4(5%)	
Panel D: Finance Courses	0	1-3	4-6	7-9	10 plus	
	7 (8%)	54 (65%)	17 (21%)	3 (4%)	2 (2%)	

Table 4-3: Confirmatory Factor Analysis

Table 4-3 Confirmatory Factor Analysis				
Scale Item	Contextual Level Intrinsic Motivation (to know and to accomplish)	Contextual Level Intrinsic Motivation (to stimulate)	Task level Intrinsic Motivation	Task Engagement
AMS1	.789			
AMS2	.798			
AMS3	.830			
AMS4	.798			
AMS5	.630			
AMS6	.746			
AMS7	.786			
AMS8		.582		
AMS9		.927		
AMS10		.926		
AMS11		.791		
SMS1			.793	
SMS2			.855	
SMS3			.865	
SMS4			Discarded[a]	
CFS1				Discarded[b]
CFS2				.660
CFS3				.870
CFS4				.869
CFS5				.769
CFS6				.849
CFS7				Discarded[b]
CFS8				.785
CFS9				Discarded[b]

Table 4-3 legend

AMS = Academic Motivation Scale
SMS = Situational Motivation Scale
CFS = Core Flow Scale
Indicates that the item was discarded due to cross loading
Indicates that the item was discarded due to a factor loading less than .500

Table 4-4: Convergent and Discriminant Validity

Table 4-4 Convergent and Discriminant Validity				
	Contextual Level Intrinsic Motivation (to know and to accomplish)	Contextual Level Intrinsic Motivation (to stimulate)	Task level Intrinsic Motivation	Task Engagement
Cronbach's Alpha	.908	.878	.869	.927
Average Variance Extracted	.593	.670	.703	.684
	Squared inter-construct correlations			
Contextual Level Intrinsic Motivation (to know and to accomplish	1.00			
Contextual Level Intrinsic Motivation (to stimulate)	.223	1.00		
Task level Intrinsic Motivation	.130	.053	1.00	
Task Engagement	.233	.071	.476	1.00

Table 4-5: Average Score by Condition

Table 4-5 Average Score by Experimental Condition					
	Low Relatedness Low Autonomy (n = 28)	High Relatedness Low Autonomy (n = 17)	Low Relatedness High Autonomy (n = 16)	High Relatedness High Autonomy (n = 22)	Total (n = 83)
	n (%)	n (%)	n (%)	n (%)	n (%)
Participants Selecting Correct Discount Factor	3 (10.71%)	5 (29.41%)	3 (18.75%)	4 (18.18%)	15 (18.07%)
	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)
Task Engagement	2.28 (0.94)	2.22 (0.74)	2.02 (0.62)	2.00 (0.54)	2.14 (0.74)
Task Level Intrinsic Motivation	2.06 (1.03)	2.03 (0.41)	1.88 (0.61)	1.92 (0.68)	1.98 (0.76)
Contextual Level Intrinsic Motivation 1 (to know and to accomplish)	1.64 (0.46)	1.59 (0.71)	1.74 (0.61)	1.65 (0.64)	1.65 (0.59)
Contextual Level Intrinsic Motivation 2 (to stimulate)	2.50 (0.78)	2.53 (1.08)	2.96 (0.88)	2.58 (0.60)	2.62 (0.83)

Task Engagement = Average of the six items from the core flow scale (excludes the discarded items)
Task Level Intrinsic Motivation = Average of the three items from the situation motivation scale (excludes the discarded item)
Contextual Level Intrinsic Motivation 1 = Average of seven items from the academic motivation scale that measure "to know" and "to accomplish" dimensions
Contextual Level Intrinsic Motivation 2 = Average of four items from the academic motivation scale that measure "to stimulate" dimension

Note: All items were measured on a scale of 1 to 5.

Table 4-6: Test of Hypotheses 1, 2, and 3

Table 4-6 Test of H1, H2, and H3 ANCOVA Analysis, Dependent Variable: Task Level Intrinsic Motivation				
Source of Variance	Type III SS	df	F-value	P-values
Overall Model	19.004	8	2.404	0.023
Independent Variables				
Autonomy	1.030	1	1.043	0.310
Relatedness	0.000	1	0.000	0.984
Autonomy * Relatedness	0.298	1	0.302	0.585
Covariates				
Contextual Level Intrinsic Motivation 1	11.689	1	11.829	0.001
Contextual Level Intrinsic Motivation 2	0.470	1	0.475	0.493
Accounting Courses	4.597	1	4.653	0.034
Finance Courses	0.393	1	0.398	0.530
Error	74.109	75		

Autonomy= 0 if participant is forced to use and rely on decision aid; 1 if participant has the freedom disagree with recommendation or not use decision aid.
Relatedness= 0 if decision aid is designed to control; 1 if decision aid is designed to assist.
Contextual Level Intrinsic Motivation 1= Standardized factor score for "to know" and "to accomplish" dimensions of Academic Motivation scale
Contextual Level Intrinsic Motivation 2= Standardized factor score for "to stimulate" dimension of Academic Motivation scale
Accounting Courses= Number of undergraduate accounting courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.
Finance Courses= Number of undergraduate accounting courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.
Task Level Intrinsic Motivation= Standardized factor score Situational Motivation scale

Table 4-7: Test of Hypothesis 4

Table 4-7 Test of H4 Regression Analysis Dependent Variable: Task Engagement		
Overall Model	R-squared= 0.624 F-test = 17.772, p-value < .001	
Independent Variables	Beta Coefficients	P-values
Task Level Intrinsic Motivation	0.556	<0.001
Autonomy	-0.433	<0.001
Relatedness	-0.048	0.961
Contextual Intrinsic Motivation 1	0.374	<0.001
Contextual Intrinsic Motivation 2	0.054	0.516
Accounting Courses	-0.031	0.720
Finance Courses	-0.391	0.001
Constant	1.362	<0.001

Task Level Intrinsic Motivation = the unpredicted portion of task level intrinsic motivation from the ANCOVA in Table 4-6

Autonomy= 0 if participant is forced to use and rely on decision aid; 1 if participant has the freedom disagree with recommendation or not use decision aid.

Relatedness= 0 if decision aid is designed to control; 1 if decision aid is designed to assist.

Contextual Level Intrinsic Motivation 1= Standardized factor score for "to know" and "to accomplish" dimensions Academic Motivation scale

Contextual Level Intrinsic Motivation 2= Standardized factor score for "to stimulate" dimension of Academic Motivation scale

Accounting Courses= Number of undergraduate accounting courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.

Finance Courses= Number of undergraduate accounting courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.

Task Engagement = Standardized factor score for Core Flow scale

Table 4-8: Test of Hypothesis 5

Table 4-8
Test of H5
Logistic Regression Analysis
Dependent variable: Technology Dominance

Panel A Overall Model Fit	-2 log likelihood	Cox & Snell R-squared	Overall Correct Predictions	Predictions of incorrect discount factor	Predictions of correct discount factor
	72.736	0.399	71/83 (85.5%)	68/68 (100%)	3/15 (20.0%)
Panel B					
Independent Variables	Beta Coefficients	Wald Statistic	p-value		
Task Engagement	-0.343	0.535	0.464		
Task Level Intrinsic Motivation	-0.167	0.211	0.646		
Autonomy	-0.346	0.336	0.562		
Relatedness	0.588	0.966	0.326		
Contextual Level Intrinsic Motivation 1	-0.406	1.258	0.262		
Contextual Level Intrinsic Motivation 2	0.780	4.593	0.032		
Accounting Courses	-0.102	0.071	0.789		
Finance Courses	-0.675	02.286	0.131		

Task Engagement= the unpredicted portion of flow from the regression in table 7.
Task Level Intrinsic Motivation = the unpredicted portion of task level intrinsic motivation from the ANCOVA in table 6.
Relatedness= 0 if decision aid is designed to control; 1 if decision aid is designed to assist.
Autonomy= 0 if participant is forced to use and rely on decision aid; 1 if participant has the freedom disagree with use or not use decision aid.
Contextual Intrinsic Motivation 1= Standardized factor score for "to know" and "to accomplish" dimensions Academic Motivation scale
Contextual Intrinsic Motivation 2= Standardized factor score for "to stimulate" dimension of Academic Motivation scale
Accounting Courses= Number of undergraduate accounting courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.
Finance Courses= Number of undergraduate finance courses completed. Categorized: 0, 1-3, 4-6, 7-9, and 10 or more.
Technology Dominance = Correct Discount Factor measured as 1 if correct discount factor; 0 if incorrect discount factor.

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CHAPTER 5 GENERAL CONCLUSION

This dissertation is comprised of three interrelated studies that are designed to provide an inter-paradigm examination of the impact that workplace technology and management control have upon organizational decision makers. Current workplace technologies, such as enterprise systems, business intelligence systems, and knowledge management systems, all affect how decision makers perform their jobs. At first glance, workplace technology appears to be a great boon to society. Mechanical technology galvanized the industrial revolution and initiated mass production; however the skilled industrial worker has been replaced by technology or less skilled workers in many cases (Braverman, 1974; Rochlin, 1997). Information workers, such as accounting clerks, have also been devalued and reduced in number as the computer enhanced the collection, dissemination, and aggregation of data (Burris, 1998). Information technology enables multinational organizations to coordinate activities and employees worldwide, and is revolutionizing the way decision-makers perform their job (Rochlin, 1997; Freidman, 2005). Management control played a key role in each evolution of workplace technology. This dissertation focuses on the degree of control exhibited by workplace technologies and the impact of that control on the decision maker. While varying perspectives posit that workplace technologies are utilized to increase managerial control, the paradigms disagree on whether those managerial control techniques are beneficial to the decision maker (Adler and Borys, 1996; Lewis and Grimes, 1999).

The first two studies apply theories from opposing paradigms to examine the impact of enterprise systems, which are information systems that span across the enterprise, upon managers. The first study applies labor process theory to explain that enterprise system

integration increases management control techniques in order to degrade middle management work by limiting their autonomy (Prechel, 1994; Grey, 1999). The findings partially support this view, as enterprise system integration expedites the degradation of management work that has been highly routinized. The second study explores the team building capabilities of enterprise systems through the application of Mary Parker Follett's concepts of empowering management techniques (Follett and Graham, 1995; Lee et al., 2003). In totality, the data provide more support for the empowering utilization of enterprise systems, as enterprise system integration facilitates social identification and increased influence of managers, but only contributes to the degradation of management work under specific circumstances. Interestingly, the fact that these findings co-exist within the same data demonstrates that the alternate perspectives are not mutually exclusive. More specifically, enterprise system integration affects individual aspects of psychological empowerment uniquely.

The third study merges self-determination theory with the theory of technology of dominance to posit that a lack of autonomy could lead to technology dominance, which is a form of deskilling and degradation of work (Deci and Ryan, 1985; Arnold and Sutton, 1998; Rochlin, 1997). The theory posits that a lack of autonomy and relatedness reduces intrinsic motivation and ultimately leads to technology dominance. Although the manipulations of task autonomy and task relatedness in this experiment do not impact intrinsic motivation for the experimental task and the intrinsic motivation at the task level does not affect technology dominance, intrinsic motivation for academic tasks in general reduces the likelihood of technology dominance. This finding alone supports the notion that intrinsic motivation should be considered as an additional predictor of technology dominance.

This dissertation also provides numerous implications for future research. Studies one and two provide the groundwork for inter-paradigm debate on the effect of information technology on the decision maker. The use of organizational behavior constructs to operationalize scientific management and the degradation of work creates a rich space for studying labor process theory. Specifically, a contingency theory approach can be applied to labor process theory that elucidates the organizational features that foster the degradation of work. While this study indicates that routinization's role may have been understated or understudied in previous research, future research must reexamine routinization's degrading role in contexts other than managers within large organizations. Specifically, routinization's strong direct relationship with degradation of work, in combination with its moderating impact upon the relationship between performance measurement and degradation of work, indicate that routinization is the key aspect of scientific management in relation to labor process theory. Determining whether this remains to be true in contexts other than middle management in large organizations is the logical next step in developing a contingency theory approach towards labor process theory.

Furthermore, the lack of a correlation between formalization and routinization requires further examination. Logically, a documented set of standard procedures is a necessary characteristic of a routinized job, yet the correlation is lacking. Routinization, as operationalized in the first study, refers to performing the same tasks every day, rather than performing a task in the same way (Bacharach et al., 1990). The resulting specialization may help to create expertise and improve decision making. However, the findings from studies one and three paint a different picture. Study one finds that specialization, in the form of routinization, negatively impacts

autonomy, and self-determination theory research establishes that autonomy increases intrinsic motivation (Deci and Ryan, 1985). As study three finds that intrinsic motivation has an inverse impact upon technology dominance, routinization's negative impact on autonomy may indirectly contribute to poor decision making in the form of technology dominance.

Additionally, enterprise systems' conflicting impact upon psychological empowerment constructs indicates that the effect of the organizational characteristics on empowerment may need to be studied utilizing each aspect of psychological empowerment as a separate dependent variable. This is especially true while furthering the debate between the degradation and upskilling of work. Studies one and two demonstrate that these theories have expectations upon two distinct aspects of psychological empowerment. Studies one and two also find that elements of both narratives are driven by the same technology. Enterprise systems lead to the standardization and measurement of middle management work, which are elements of the labor process narrative; yet, enterprise systems also foster team work rather than isolate middle managers, which is an element of the upskilling narrative. This dissertation finds evidence that in today's middle management environment these narratives are interwoven, rather than mutually exclusive. Future research should endeavor to determine if these narratives ever were mutually exclusive and, if so, determine what factors contribute to the intertwining of the alternative narratives within the currently studied context.

Future research should also consider enterprise system integration's impact upon budgetary slack and incentive schemes. The mutual monitoring provided by enterprise system integration may reduce the use of budgetary slack by individual managers. Additionally, it is possible the mutual monitoring is accompanied by group level incentives. The use of group level

incentives may moderate the relationship between mutual monitoring and social identification with the peer group. Specifically, group level incentives may counteract the potential of mutual monitoring to create an atmosphere of competition. Thus, mutual monitoring may have a very different effect upon social identification in the absence of group incentives. The research reported here can be followed up with a more detailed examination of the intricate behavioral effects of mutual monitoring between managers.

This dissertation provides specific contributions to the accounting and management control body of knowledge. Enterprise system integration increases the formalization of management job procedures, the measurement of manager activity, and the extent of mutual monitoring between managers. Mutual monitoring encourages managers to identify with each other as a team and increase their control, whereas the role of performance measurement as a tool of empowerment or degradation may hinge on the routinization of job tasks. Routinization's key role in the degradation of work in this dissertation may prove to be a substantial refinement to labor process theory. The inclusion of social identification as a key element in the translation of an empowering work climate to empowered individuals contributes the empowerment literature. Recognizing and evidencing intrinsic motivation's role in technology dominance provides an additional path for technology dominance research. The use of novices in the experiment unintentionally verified the theory of technology dominance's assertion that novices are likely to be dominated by technology (Arnold and Sutton, 1998). Overall, this dissertation reveals that new workplace technologies increase the degree of management control, but that control does not have to isolate and undermine the worker. This study provides evidence that

workplace technology is not inherently empowering or degrading, rather the empowering or degrading ability of technology depends upon the context and the individual.

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APPENDIX A: EXPERIMENT STAGE 2

Academic Motivation Scale
(Motivation at the contextual level)

Please indicate your level of agreement or disagreement with the following statements about the reasons you attend college.

Intrinsic- to know	I attend college because I experience satisfaction while learning new things.
	I attend college for the satisfaction that I experience in broadening my knowledge about subjects which appeal to me.
	I attend college because my studies allow me to continue to learn about many things that interest me.
Intrinsic- Accomplish	I attend college for the satisfaction I experience while surpassing myself in my studies.
	I attend college for the satisfaction that I experience while I am surpassing myself in one of my personal accomplishments.
	I attend college for the satisfaction I feel when I am in the process of accomplishing difficult academic activities.
	I attend college because college allows me to experience a personal satisfaction in my quest for excellence in my studies.
Intrinsic- Stimulation	I attend college for the intense feelings I experience when I am communicating my own ideas to others.
	I attend college for the satisfaction that I experience when I read interesting authors.
	I attend college for the satisfaction that I experience when I feel completely absorbed by what certain authors have written.
	I attend college for the "high" feeling that I experience while reading about various interesting subjects.

APPENDIX B: EXPERIMENT STAGE 3

Experimental Task

Introduction

Imagine that you are a managerial accountant for ABC Company, a manufacturer of high tech components for small communication devices. You were recently promoted to the capital budgeting team. ABC company credits its cross functional approach to capital budgeting as the reason for its success. The team is tasked with approving and denying proposals. The team consists of an industry marketing expert, an engineer, and a managerial accountant. The industry marketing expert evaluates the proposal's assertions regarding product sales and prices; the engineer evaluates the proposal's assertions regarding the cost of producing the product to required specifications. After the numbers are approved by these two, their reports and proposal are sent to the managerial accountant to evaluate the financial attractiveness of the proposal.

As the managerial accountant, it is your job to accept or reject the proposal based on financial attractiveness. In the past, the CEO has emphasized the importance of the proposal review process to the success of the firm. "Therefore, your predecessor purchased Proposal Evaluation Assistant, a decision aid designed to assist employees in evaluating proposals." "Therefore, your predecessor purchased a Proposal Quality Control System, a decision aid designed to ensure that proper evaluation procedures are taken for each proposal"[17]

Proposals are submitted via the Proposal Evaluation Assistant (Proposal Quality Control System), where each member of the capital budget team submits their response. Proposals originate in the research and development department. The proposal specs are evaluated by the engineering member of the proposal evaluation team first. After the engineering verifies the technical possibility and cost estimates, the proposal is sent to the marketing expert with the engineering report. After the marketing expert verifies the sales estimates, the proposal is sent to you with the marketing and engineering reports. Both reports are available via buttons at the top of the proposal screen. Two buttons at the bottom of screen provide the CEO's vision as well as a company performance summary from the CFO. Consistent with ABC Company's traditional decision process, the proposals include expected cash outflows (costs) and inflows (sales) needed for the evaluation of net present value.

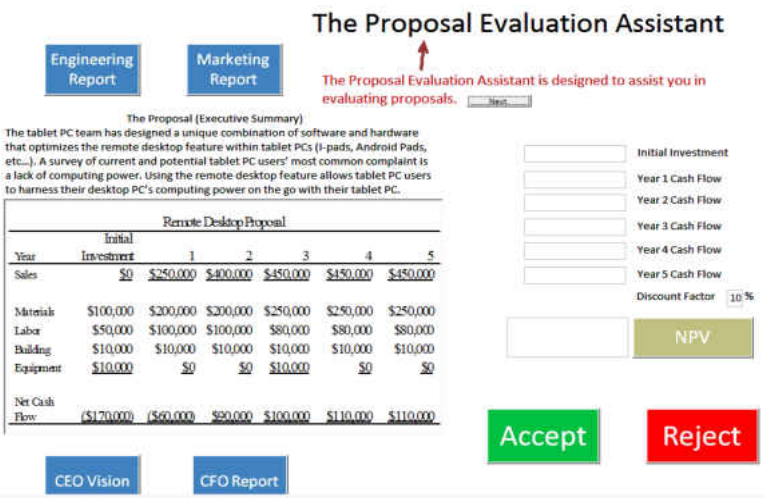
[17] Yellow highlighted portion represents the high relatedness manipulation; while the blue highlighted portion represents the low relatedness manipulation.

APPENDIX C: EXPERIMENT STAGE 4

Sample Tutorial Screenshot 1

Low Autonomy/Low Relatedness

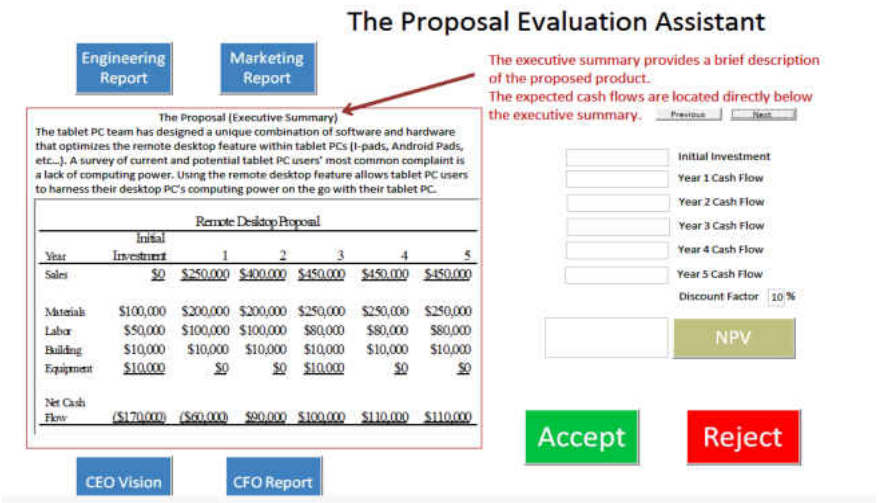
Hi Autonomy/Hi Relatedness



Sample Tutorial Screenshot 2

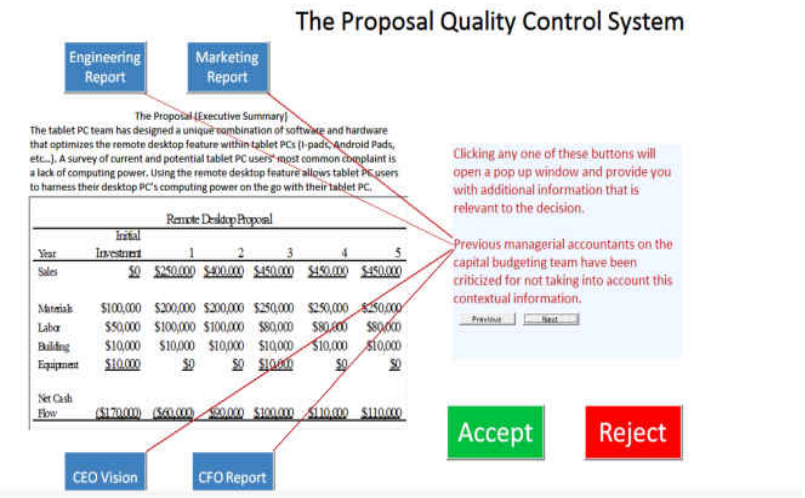
Low Autonomy/Low Relatedness

Hi Autonomy/Hi Relatedness

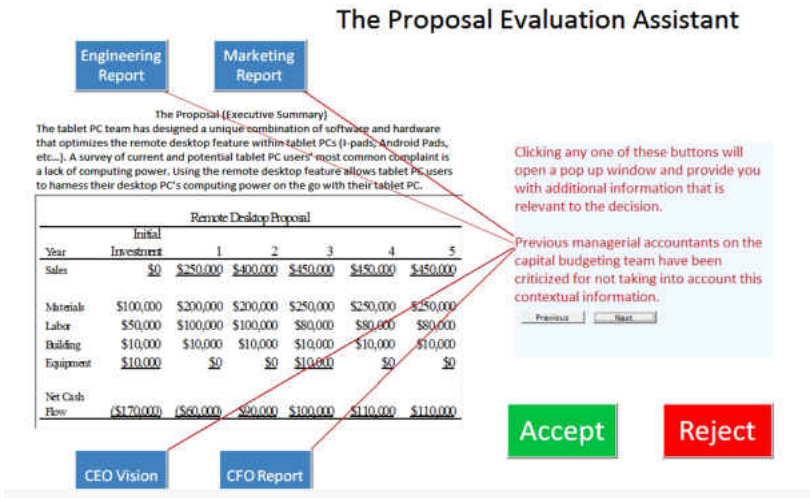


Sample Tutorial Screen Shot 3

Low Autonomy/Low Relatedness



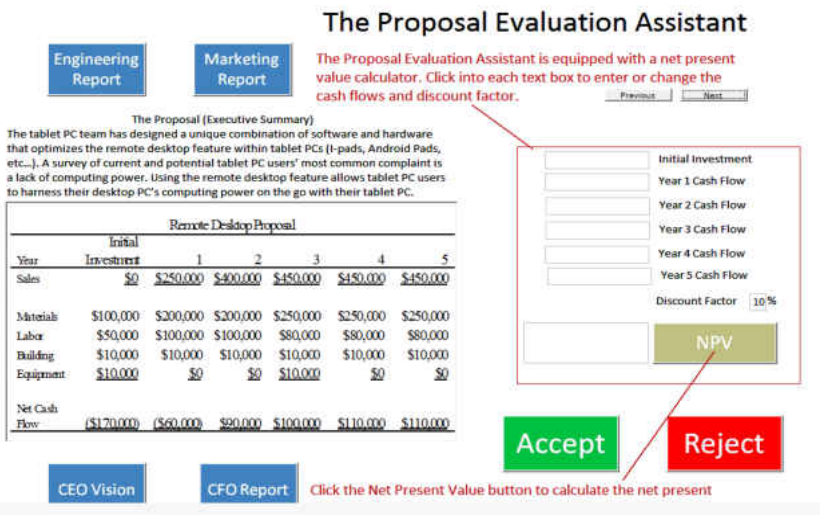
Hi Autonomy/Hi Relatedness



Sample Tutorial Screenshot 4

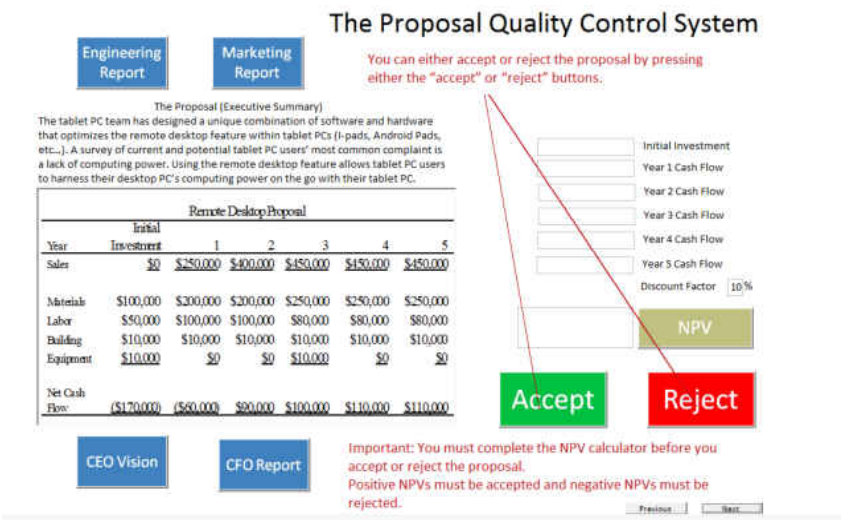
Low Autonomy/Low Relatedness

Hi Autonomy/Hi Relatedness

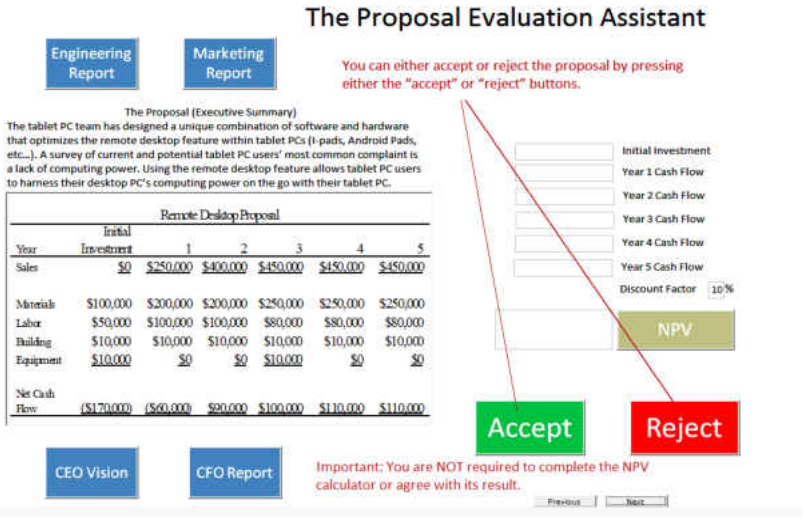


Sample Tutorial Screenshot 5

Low Autonomy/Low Relatedness

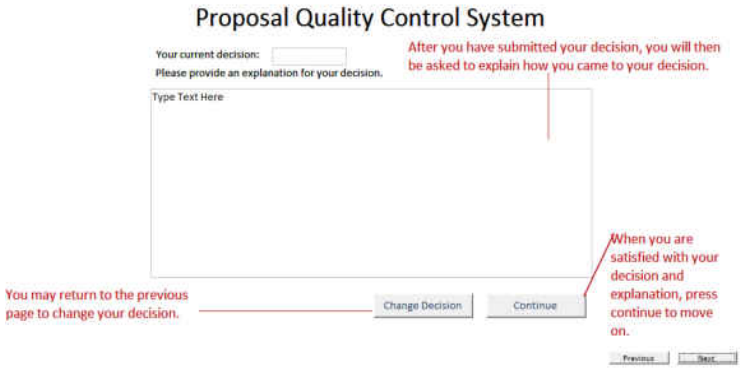


Hi Autonomy/Hi Relatedness

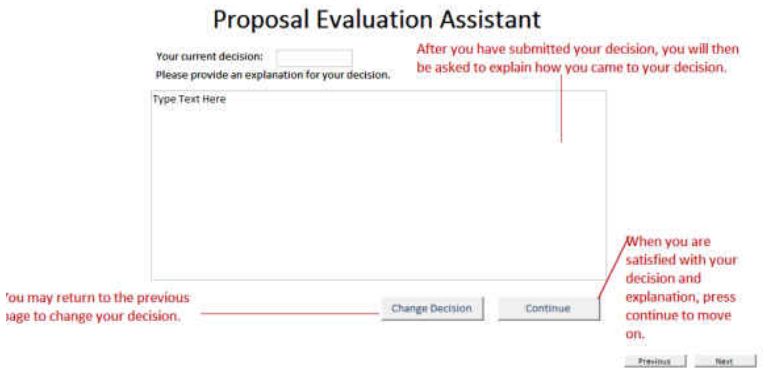


Sample Tutorial Screenshot 6

Low Autonomy/Low Relatedness



Hi Autonomy/Hi Relatedness



APPENDIX D: EXPERIMENT STAGE 5

Sample of Task screen

Report Information

Marketing Report

After reviewing the sales forecasts, I find that the product pricing and demand are appropriate. The forecasts displayed are consistent with the shortening of product life cycles that we have experienced in recent years. The product is one that appeals to several of our traditional customers and pricing is appropriate. If our product can deliver as promised, I consider the current sales forecast to be conservative.

Engineering Report

After reviewing the specifications of the product, I am sure that we can manufacture the product at the cost specified. The new transmitter requires software upgrades to our satellites in order for the desired gps location improvements to take place. That explains why the equipment cost in the initial year is so much higher than following years. This provides some protection against reverse engineering because our competitors may have access to our transmitters but not our satellites. The product matches our core competency and should be a great addition to our brand.

CEO Vision

First I would like to applaud our continued profitability during trying financial times. During the 90's, our innovations spurred tremendous growth. However, since the economic downturn we have not seen much growth. I declare that the economy is no longer an acceptable excuse. Our corporate economy is great. Our profits are strong, our balance sheet is healthy, and our brand is impeccable. We need to seek out opportunities aggressively, while our competitors wait for the economy to rebound. I believe in our business motto. Great ideas make great products!

CFO Report

Our ROI has fallen to 9%. Earnings per share have fallen to an average of $0.09 per share over the last four quarters. Our fiscal outlook remains strong. Our quick ratio is 1.6. Our financial investments are yielding an average of 5.9%. We are extremely solvent. We have issued a cash dividend once a year for the past three years. Our project performance exceeds our financial investments as the average internal rate of return on similar projects for the last 5 years is 7.1%. Our debt covenants are far from default and our creditors indicate that we have access to credit at a 3.3% interest rate.

APPENDIX E: EXPERIMENT STAGE 6

Situational Motivational Scale
(Motivation at the task level)

Please indicate your level of agreement or disagreement with the following statements about proposal evaluation task.

Intrinsic Motivation	I think the proposal evaluation task is interesting.
	I think the proposal evaluation task is pleasant.
	I think the proposal evaluation task is fun.
	I felt good when completing the proposal evaluation task.

Core Flow Scale
(Task Engagement)

Please indicate your level of agreement or disagreement with the following statements about how you felt while participating in the proposal evaluation task.

Core Flow Scale	I was totally involved
	It felt like "everything clicked"
	I was "tuned in" to what I was doing
	I was "in the zone"
	I felt in control
	It felt like I was "in the flow" of things
	It felt like nothing else mattered
	I was "in the groove"
	I was "totally focused" on what I was doing

APPENDIX F: EXPERIMENT STAGE 7

Demographic Questions

What is your gender?

What is your age?

What is your race/ethnicity?

How many college or university UNDERGRADUATE accounting courses have you completed?

How many college or university GRADUATE accounting courses have you completed?

How many college or university UNDERGRADUATE finance courses have you completed?

How many college or university GRADUATE finance courses have you completed?

Do you have work experience in the accounting field? If so, how much?

Do you have work experience in the finance field? If so, how much?

What field do you plan to enter upon graduation?

APPENDIX G: MANIPULATIUON CHECK

Manipulation Check Screen

Answer the following questions to the best of your ability.

What was the title of the software program used in the evaluation of Company ABC's proposals?

- Proposal Evaluation Assistant
- Proposal Quality Control System
- Online Proposal System

What was the stated purpose of this software program?

- To ensure that proper procedures are taken.
- To improve the marketing of products.
- To assist employees in evaluating proposals.

Were you required to complete the NPV calculator in order to submit your decision

- Yes
- No

APPENDIX H: INSTITUTIONAL REVIEW BOARD

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Joseph G. Canada**

Date: **January 18, 2011**

Dear Researcher:

On 1/18/2011, the IRB approved the following activity as human participant research that is exempt from regulation:

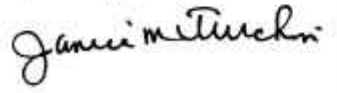
Type of Review:	Initial Review Submission Form
Project Title:	The Impact of Technology on Management Control: Taylorism, Empowerment, or Dominance?
Investigator:	Joseph G Canada
IRB Number:	SBE-10-07291
Funding Agency:	None

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 01/18/2011 04:33:17 PM EST



IRB Coordinator

University of Central Florida

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Joseph G. Canada**

Date: **March 03, 2011**

Dear Researcher:

On 3/3/2011, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	Self Determination Theory as a Predictor of Technology Dominance
Investigator:	Joseph G Canada
IRB Number:	SBE-11-07501
Funding Agency:	Institute of Management Accountants- Foundation for Applied Research(IMA)
Grant Title:	Doctoral Student Grant Program
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 03/03/2011 12:36:19 PM EST

IRB Coordinator