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Knowledge Worker Behavioral Responses and Job Outcomes in Mandatory Enterprise System Use Contexts

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**KNOWLEDGE WORKER BEHAVIORAL RESPONSES AND JOB OUTCOMES IN
MANDATORY ENTERPRISE SYSTEM USE CONTEXTS**

BY

Robert G. Hornyak

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

Of

Doctor of Philosophy

In the Robinson College of Business

Of

Georgia State University

GEORGIA STATE UNIVERSITY
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ACCEPTANCE

This dissertation was prepared under the direction of *Robert G. Hornyak's* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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ABSTRACT

**KNOWLEDGE WORKER BEHAVIORAL RESPONSES AND JOB OUTCOMES IN
MANDATORY ENTERPRISE SYSTEM USE CONTEXTS**

BY

Robert G. Hornyak

April 19, 2011

Committee Chair: *Dr. Arun Rai*

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The three essays that comprise my dissertation are drawn from a longitudinal field study of the work process innovation of sourcing professionals at a large multinational paper products and related chemicals manufacturing firm. The focus of this study is an examination of how characteristics of the work process innovation context impact enterprise system (ES) acceptance, rich ES use behavior and the resulting individual-level job outcomes realized by knowledge workers in a strategic business process. The ES, an enterprise sourcing application, was introduced to innovate the work processes of employees who perform the sourcing business process.

Over a period of 12 months, we collected survey data at four points in time (pre-implementation, immediately following training on the new system; following six months of use; and, following 12 months of use) to trace the innovation process as it unfolded. The three essays that comprise my dissertation focus on three key gaps in understanding and make three corresponding key contributions.

The first research essay focuses on the transition from an emphasis on behavioral intention to mental acceptance in mandatory use environments. This essay contributes to the technology acceptance literature by finding that work process characteristics and implementation characteristics are exogenous to beliefs about the technology and that these beliefs are important to understanding mental acceptance as well in mandatory use contexts. The second and third research essays emphasize the transition from lean use concepts to conceptualizing, defining and measuring rich use behaviors and show that use must be captured and elaborated on in context. This is pursued through the development of two rich use constructs reflective of the sourcing work context and the complementary finding of countervailing factors in the work process that may impede the positive impact of rich use behaviors on job benefits.

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I am particularly grateful to my dissertation advisor and friend, Arun. I cannot imagine anyone going through the demands of this process without a great advisor. I cannot imagine myself having gone through it without a truly outstanding advisor. Although there is a great deal of what I have learned reflected in the pages of this dissertation, there is far more that I take with me reflected in my approach to research, teaching and service.

I cannot express the contribution of my wife, Sapna, who has experienced with me this process. Thank you for all of your love and support and for picking up so many of my responsibilities and duties, particularly in raising Nathan and Hannah.

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Chapter 1: Introduction

Business Problem

Recently, analysts have noted that corporations have entered into a second phase of enterprise system implementations, where these systems are being rolled out to different groups of employees who perform a range of business processes (e.g., Davenport, 2004). Previously, the focus had been on back-office processes, e.g., payroll, accounting, human resources functions, that were performed largely by administrative employees. More recently, firms have been turning their attention to highly complex business processes (e.g., sourcing, product development, sales management) where specialized, knowledge workers communicate, coordinate and transform knowledge and information to perform the business process.

Firms may be attracted to implementing ES in a widening scope of business processes because these systems enable employees to access integrated, credible information and knowledge about the business process. The implementation of these systems has been linked to performance benefits at the organizational level (e.g., Gattiker and Goodhue, 2005; Ranganathan & Brown, 2006). Although the enterprise systems implementation literature has identified top management commitment and support (Sarker and Lee, 2003), training (Robey et al, 2002), consultant selection and relationship (Willcocks and Stykes, 2000), change management (Nah et al, 2000) and user involvement (Ross and Vitale, 2000) as crucial to ensuring positive outcomes, firms have realized mixed levels of success. Despite some realization of benefits, many enterprise system implementations fail to achieve the anticipated payback and a significant number of these projects are also qualified as failures. (e.g., Liang et al., 2007).

Several recent enterprise system implementation failures indicate that the challenges organizations face in successfully implementing these systems go beyond the implementation

process (King, 2007; Krigsman, 2010) or the technology itself (e.g., Regan, 2004; Kanaracus, 2010a) to a mismatch between the technology and employee work processes (e.g., Kholief et al, 2007). For example, Lumber Liquidators CEO, Jeffrey Griffiths, attributed his company's 45% decrease in Q3 earnings in 2010 to lost productivity related to moving from a "flexible, easy to manipulate system" to a "more structured...more stable" system and "...a few things that were unique to our business that we didn't see well ahead of time" (Kanarcus, 2010b). The impact of the work process context on employee reactions to and job outcomes from the use of an enterprise is underexplored in management practice.

Research Problem

Several prominent streams of research in the information systems literature can provide a foundation for investigating how the innovation process of knowledge workers evolves over the course of an enterprise system implementation. Prior research on technology acceptance has identified the important beliefs about the information system that lead to the intention to use an information system as well as characteristics of successful implementation contexts (e.g., Robey, 2002; Gefen and Ridings, 2002; Venkatesh et al., 2003). However, there are several important gaps in understanding related to this stream in explaining how the innovation process of knowledge workers evolves over the course of an enterprise system implementation.

Specifically, we identify three sets of gaps that span employees' pre-implementation response to the ES, their post-implementation system use behavior and the related job outcomes and information benefits they realize which motivate the three corresponding essays in this dissertation.

Knowledge Workers' Pre-implementation Appraisals of ES

First, there has been little research that has sought to incorporate the employee's work process context into models of technology acceptance (Sykes et al., 2009). Second, we are not aware of

any work that has examined the joint impact of characteristics of the work process and characteristics of the implementation environment on important beliefs about the new ES. Third, because much previous research has focused on the *intention to use* new IS in voluntary or quasi-voluntary contexts, there is a gap in understanding how to assess the *mental acceptance* of a new technology in mandatory-use contexts (Karahanna, 1999; Brown et al., 2002).

Knowledge Workers' Post-Implementation ES Use and Job Outcomes

Prior research has identified IS use as a key intervening variable between investments in IT and beneficial outcomes (e.g., Devaraj and Kohli, 2003) and has provided a framework for conceptualizing and measuring usage behavior for a given system and usage context (Burton-Jones and Straub, 2006). Despite this foundation, several key gaps in understanding remain. First, few studies in the IS literature have theorized richly about the use construct and most studies have not defined and conceptualized use in context (Burton-Jones and Straub, 2006; Jaspersen et al., 2005). As such, there is the need to elaborate the system use construct in the context of knowledge workers engaged with ES use in the post-implementation context. Although managers frequently mandate the use of an enterprise system (Brown et al., 2002), there may still be wide differences in how employees are using the technology. For example, one employee may be working from a spreadsheet or word processing file and only entering information into the ES right before a reporting deadline while another employee may be taking advantage of standardized templates or negotiation tools to support their work processes. Much previous research which has employed lean system use measures (Burton-Jones and Straub, 2006) has been unable to assess these differences in how employees use a complex ES to perform complex work processes. While elaborating our conceptualization of system use by knowledge workers is important, it is also important to examine how ES use influences job outcomes in interdependent work processes. This is an important gap to address as there has

been little research that has investigated the work process contingencies that may impact the relationship between system use behavior and important job outcomes.

Knowledge Workers' Post-Implementation ES Use and Information Benefits

ES are oftentimes implemented because it is assumed that these systems will increase the value of information in the business process (Davenport and Brooks, 2004). Information accessibility and credibility are two principle benefits supported by ES capabilities. Despite this, it is not clear if increasing patterns of ES use lead to corresponding increases in information benefits across work process contexts. For example, it is unclear how to integrate the emergent work processes of knowledge workers with the rigid workflows prescribed by the system to increase information benefits. To examine this, we draw on the IS success literature (e.g., DeLone and McLean, 1992, 2003; Rai et al., 2002) which has investigated the individual-levels benefit from information system use. Despite the advances in this stream in theorizing the antecedents and outcomes of system use, we address the gap in understanding the effects of ES use on information benefits under different work process contexts that differ in whether or not those work processes are repetitively performed. An investigation of context may provide insight into why these inconsistencies occur (Johns, 2006) and extend understanding from whether or not ESS use is effective to an understanding of the specific contexts where ESS use is effective or ineffective.

Research Approach

We follow a longitudinal research design in order to understand how the innovation process of knowledge workers evolves over the course of the implementation of the new enterprise system (e.g., Makus and Tannis, 2000). In doing so, we pursue three related research studies that focus on how the work process context impacts how knowledge workers appraise and use a mandated technology innovation and the related job outcomes and benefits they realize. The first

essay of this dissertation contributes to the literature by identifying important characteristics of the employee's work process context and by examining how the implementation environment moderates the impact these characteristics have on performance expectations. Additionally, it identifies and validates a context-appropriate construct (i.e., mental acceptance) for assessing initial acceptance of an ES innovation by knowledge workers in mandatory use environments. In the second essay, we contribute a context-rich understanding of how knowledge workers use enterprise systems to perform their work processes and the related job performance benefits they realize. By examining use behavior in a particular process context, we better understand how one salient characteristic, work process interdependence, moderates the effects of enterprise system use on job outcomes and the mechanisms through which job performance gains are realized by knowledge workers. The third essay examines how enterprise system use leads to information benefits for employees in the post-implementation phase. This essay examines the joint impact of system use and routine or idiosyncratic work on individual-level information benefits in the business process. Taken together, the essays that comprise this dissertation trace the innovation processes of knowledge workers by considering the work process context as they appraise, use and realize job outcomes from the mandated use of an enterprise system.

Empirical Approach

We conducted a longitudinal field study over 18 months at a large multinational paper products and related chemicals manufacturing firm. The firm manufactures and markets a range of tissue, pulp, paper, packaging and building products to other businesses and consumers around the globe. The company operates approximately 300 manufacturing facilities across North America, South America and Europe, which range from large pulp, paper and tissue operations to gypsum plants, box plants and building products complexes. The firm is organized around both product divisions and functional business units. To support this, the sourcing and

procurement organization is under the direction of a chief purchasing officer who oversees the procurement function for both the administrative headquarters and the manufacturing facilities of each division.

We investigated the implementation of an enterprise sourcing system intended to innovate the work processes of sourcing professionals located at both headquarters and field locations. The sourcing enterprise system was implemented to reduce variance in sourcing professional work processes, to increase sourcing professional effective and to improve sourcing project governance and reporting. As part of the data collected for our study, we interviewed senior business managers, IT managers and sourcing managers; we also observed training sessions for the system and attended steering committee and staff meetings. We collected survey data at four points in time (T₀-T₃): immediately before training on the new system; immediately following training; following six months of use and following 12 months of use.

Figure 1: Longitudinal Data Collection

Pre-Implementation (Immediately Before Training) T ₀	Post-Implementation (Immediately Following Training) T ₁	Post-Implementation (T ₀ + 6 months) T ₂	Post-Implementation (T ₀ + 12 months) T ₃
<ul style="list-style-type: none"> • Control Variables • Work Context • Work Process Characteristics • Job Outcomes • Information Benefits 	<ul style="list-style-type: none"> • Implementation Environment • Job Performance Expectancy • Mental Acceptance 	<ul style="list-style-type: none"> • Control Variables • Use Behavior • Work Context • Work Process Characteristics • Job Outcomes • Information Benefits 	<ul style="list-style-type: none"> • Control Variables • Work Context • Work Process Characteristics • Use Behavior • Job Outcomes • Information Benefits



The response rate for our questionnaires was greater than 85% across all studies (essay1: N = 68 (of 78), includes data from T₀ and T₁; essay 2: N = 125 (of 141), includes data from T₀ and T₃; essay 3: N = 125 (of 141), includes data from T₀, T₂, and T₃). The focus of the three essays in this dissertation is primarily based on the analysis of quantitative data collected through survey questionnaires. Figure 1 describes the study variables collected at each wave of data collection.

We describe how we leveraged our research design for predictive validity in a particular research model in the corresponding methodology section for each essay.

Examining the Role of Work Process and Implementation Characteristics on the Cognitive Adoption of Enterprise Systems

Abstract

We extend models of technology acceptance to understand the acceptance of enterprise systems by knowledge workers involved in strategic business processes by explicitly considering the IT innovation context in three ways: by incorporating work process interdependence, identity, and standards; by examining the interactive effects of these characteristics with implementation characteristics, social influence and facilitating conditions, and by addressing how mental acceptance by employees can be gauged when use is mandated. We empirically test our model using data collected during a field study of the adoption of an enterprise sourcing system by knowledge workers performing the sourcing process. We find that the knowledge worker's pre-implementation work process characteristics and the implementation characteristics, individually and jointly, influence employee perceptions of the performance benefits of adopting the new enterprise system. These findings provide greater understanding of the innovation process for enterprise systems and suggest opportunities for managers to intervene to drive employee acceptance of enterprise systems in the context of employees' work processes.

Keywords

Enterprise systems, innovation context, work process characteristics, strategic business process, implementation characteristics, cognitive adoption, use mandates

Chapter 2: INTRODUCTION

The implementation of enterprise-wide systems has been one of the most prominent change initiatives undertaken by firms in the last decade, and spending projections indicate that this pattern will continue (Morris and Venkatesh, 2010). Despite initially implementing these systems to automate and enable the redesign of back office processes, firms have been focusing their efforts more recently on implementing enterprise systems to innovate the work processes of knowledge workers performing strategic business processes (Davenport et al., 2004) (Sykes et al., 2009). Knowledge workers are those employees who rely on information in order to make decisions (Davis, 2002); strategic business processes are those processes where there is an expectation of, and opportunity for, high value creation (Davenport et al., 2004). Despite over a decade of collective experience with ES-enabled work process innovation and managers' recognition that these systems enable strategic initiatives, both the industry and the research literature report poor results in firms' ability to garner the benefits from these systems (e.g., Karimi et al., 2007a, Karimi et al 2007b, Brown et al., 2007; Sykes et al., 2009).

One prominent explanation for these lackluster results is a lack of employee buy-in and the underutilization of the implemented system by employees (Venkatesh and Bala, 2008; Hsieh et al., 2007; Jaspersen et al., 2005). Despite this problem, there has been little research designed to guide managers in making decisions about how to intervene during the pre-implementation stage of the innovation process—when employee perceptions are anchored to existing work activities—to drive acceptance of these complex systems in the context of the business processes where employee work is situated (Venkatesh et al., 2007; Venkatesh and Bala, 2008).

Despite the success of the technology acceptance literature that has investigated how beliefs about the IS and the implementation environment impact an employee's decision to use a new technology, managers are still challenged to understand *why* different employees perceive the job performance benefits of using the new system in their work activities differently. We suggest that the context of the employees' work process can provide critical insights into why job performance expectations regarding

the system differ across employees in the same organization *and* involved in different aspects of the same business process. We argue that the pre-implementation work process is an important part of the enterprise system implementation because it represents the context of the employees' job activities (Harris et al., 2006; Davenport, 1998).

More specifically, we identify the following gaps in understanding. First, there has been little research incorporating the employee's work process context into technology acceptance models (Sykes et al., 2009). This is an important omission because ES implementations are known to have a large impact on work activities, and the established work process context is the baseline against which perceptions about the new ES are judged. That is, the usefulness of the technology is gauged against the work routines the employee is familiar with. Thus, it's important to identify the salient pre-implementation work process characteristics and to understand their interaction with other key constructs that determine acceptance (Venkatesh, 2006). To guide our selection of work process characteristics, we identified several pertinent attributes of enterprise systems: modularity, rules-based workflow coordination and embedded process standards (e.g., Ross and Vitale, 2000; Davenport, 1998). Second, although previous research has considered the implementation context (e.g., Robey, 2002; Gefen and Ridings, 2002), the impact of these characteristics in moderating the relationship between the work process context and the perceptions about the new ES has not been addressed. This is important because the enterprise system, no matter how well configured, is unlikely to be aligned with the employee's work process context. The implementation context is where managers can have an impact on that alignment. In order to do so, there needs to be an understanding of the interactions among perceptions about the ES, the work process context and the implementation environment. Third, ES implementations typically take place in mandatory-use environments, yet prominent models of initial technology acceptance have not adequately considered the impact of mandatory-use contexts on how acceptance by knowledge workers arising as a consequence of performance expectancies, among other considerations, can be meaningfully assessed (Karahanna, 1999; Rawstone et al., 1998; Brown et al., 2002). In order to address these gaps in understanding the following research questions guide this study:

- What are the characteristics of the employee's pre-implementation work process context that shape their perceptions of the performance benefits of the ES?
- How does the implementation context influence the relationship between the employee's perceptions of their pre-implementation work process context and their perceptions of the performance benefits of the ES innovation?
- How do the employee's pre-implementation work process context, implementation characteristics, and perceptions of the performance benefits of the new technology determine an employee's mental acceptance of an ES innovation in a mandatory use context?

This study contributes to the literature by identifying the salient characteristics of the employee's work process context that shape their job performance expectations for the new ES. It also explains how the implementation environment moderates the relationship between important work process characteristics and job performance expectations. Finally, it identifies and validates a context-appropriate construct for assessing initial acceptance of an ES innovation by knowledge workers in mandatory use environments.

THEORETICAL FRAMING

An objective of this study is to assess knowledge worker mental acceptance of an enterprise system to perform their job in a strategic business process. IS use by knowledge workers in strategic business processes is often voluntary and consists of the use of several fragmented applications (e.g., spreadsheets, databases and other applications; Davenport, 2005). When an organization implements an ES to replace standalone applications, it expresses strong mandates on use, especially when the ES is required to perform one or more work activities in the business process (see e.g., Brown et al., 2002).

This study contributes to and extends the stream of research that has applied belief-attitude-behavior theories (e.g., TRA) to understand how individuals formulate the decision to engage in the use of technology innovations at work (e.g., Davis 1989; Davis et al., 1989; Mathiesson 1991; Taylor and Todd 1995; Karahanna and Straub 1999; Venkatesh and Morris 2000; Venkatesh et al., 2003). A critical

objective of this research stream is to predict and understand how employees will use technology innovations on the job. Because of the difficulties associated with measuring actual behavior in the field, behavioral intention (BI) is frequently used in information systems and other fields such as organizational behavior, marketing and psychology to predict behavior. BI represents an individual's consciously formed plan to perform a specific behavior (Ajzen, 1991). Recently, Venkatesh et al. (2008) evaluated alternative constructs that predict use under certain theoretical and practical conditions based on their review of the use literature. Venkatesh et al. (2008) in evaluating alternatives to the behavioral intention construct note the importance of understanding the differences in predictors that drive the different conceptualizations of system use.

In mandatory use contexts involving complex technology and complex work processes, as theorized here, the use of behavioral intention to predict use has been critiqued (Karahanna, 1999; Rawstorne et al., 1998). The main thrust of this critique is that behavioral intention represents the formulation of a plan to use the technology in the future; in a mandatory environment what would be assessed is compliance with the mandate (Bagozzi et al., 1990), not necessarily acceptance of the new technology.

In order to make a context-appropriate assessment of acceptance, we draw on the work of Klonglan and Coward (1970) who distinguished between the "idea" component and the "object" or physical component of the decision to adopt an innovation. In this approach, the individual is confronted with two decisions: the first is to mentally accept the innovation as a good idea, and the second is to physically use the artifact. An important implication is that in a voluntary use context, mental acceptance would necessarily precede—although not guarantee because of impediments that might arise--physical use. For example, a salesperson might be offered access to an electronic organizer which they are eager to integrate into their contact management activities. However, they soon learn that the application is not compatible with their mobile phone operating system and do not enter any contact information although they have accepted the idea. In a mandatory use context, as theorized here, however, mental acceptance is not necessary for physical use to occur. Continuing this example, managers might mandate that each salesperson enters client contact information into the application; a salesperson might reject the idea

because they do not want to share this information with management and only enter enough cursory information so as to be compliant with the mandate.

Building on and extending the Klongan and Coward conceptualization, Karahanna (1999) described this concept as the mental acceptance of an innovation and implicitly developed the concept as reflective of a heightened motivational state where the user is enthusiastic about the technology and is willing to invest time and effort in overcoming obstacles to use. One implication here is that the construct, which we label as *cognitive adoption* captures an individual's *enthusiasm* for performing a behavior distinct from their self-assessed or mandated goals for performing the behavior. Thus, our assessing cognitive adoption of the ES would give insight beyond compliance with the mandate, which may simply lead to cursory use, but the *propensity* of the knowledge worker to engage in rich use behaviors as they integrate the system with their work process.

Technology acceptance research has contributed a strong understanding of the beliefs that affect an individual's acceptance of a new IS. Researchers have focused on assessing these factors as perceptions because of the positive impact of beliefs on the ability to predict behavior (Venkatesh, 2000). Among the beliefs about the information system, perceptions that using the system will lead to an increase in performance have consistently been among the strongest determinants of usage behavior (e.g., Agarwal et al., 1998; Davis, 1992; Venkatesh et al., 2000a; Brown et al. 2002). Recently, researchers have also investigated the factors that shape perceptions that system use will lead to performance benefits (Venkatesh, 2000). In the present study, we focus on the belief that using the ES will increase job performance as the salient mediator between the pre-implementation work process and implementation characteristics and the acceptance of the new ES, or its cognitive adoption.

Despite the importance of performance perceptions on acceptance, it is unclear how the joint effects of characteristics related to the work process and implementation impact these perceptions. We theorize the work process context, where the knowledge worker will use the system, and so where the employee expects performance benefits from using the system, to be important in determining performance expectations. We reviewed the discussion of work process characteristics through several related

literature streams: IS (e.g., Ross, 1999; Ang and Slaughter, 2000; Robey 2002; Sharma and Yetton 2003; Morris and Venkatesh, 2010), Operations (e.g., Crosby, 1979; Tatikonda and Montoya-Weiss, 2001); Management (e.g., March, 1991; Dean and Bowen, 1994) and Organizational Behavior (e.g., Hackman and Oldham, 1976; Morgeson and Humphrey, 2006; Humphrey et al., 2007). We also reviewed the ES literature (e.g., Ross and Vitale, 2000; Davenport, 1998) and identified modularity, rules-based workflow coordination and embedded process standards as three pertinent characteristics of these systems. Given our objective to relate the work process context to beliefs about the ES, we identified work process characteristics that corresponded to these salient characteristics of ES. From the work process characteristics literature, we identified work process identity as corresponding to modularity, interdependence to rules-based workflow coordination and work process standards to embedded process standards.

During implementation, the alignment of work processes and features of the new ES needs to be addressed (Sykes et al. 2009). Characteristics of employees' work processes are those situational factors that influence whether employees perceive the ES as improving their job performance. Managers can influence the alignment through organizational and technical interventions as well as social support. Here we theorize that perceptions of existing work processes and beliefs about the implementation interact to jointly determine knowledge worker expectations that the new ES will increase job performance. Figure 1 illustrates these relationships.

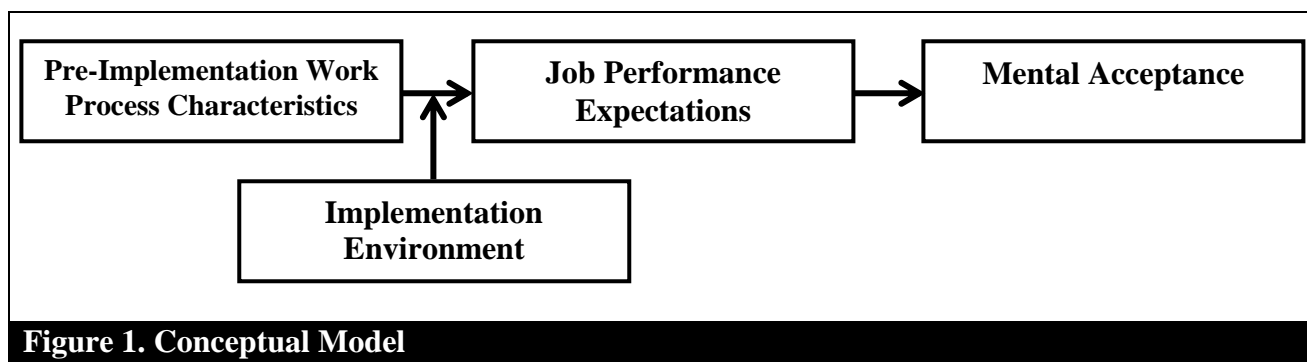


Figure 1. Conceptual Model

RESEARCH MODEL & HYPOTHESES

In order to understand knowledge worker acceptance of new ES, we draw on three sets of beliefs: about job performance, about existing work processes and about the characteristics of the implementation. The specific constructs examined and the relationships among them are illustrated in Figure 2.

Job Performance Expectations

Performance Expectancy is the degree to which an individual believes that using the system will lead to performance gains (Venkatesh et al., 2003). A significant body of research studies has related perceptions about the instrumental benefits of a technology to acceptance, adoption and usage behaviors (e.g., Davis et al., 1989; Aggarwal and Karahanna, 2000; Venkatesh et al., 2008). The dominant thread of reasoning in technology acceptance research has been to view usefulness perceptions as an external motivator for use (e.g., Davis et al., 1992; Venkatesh and Davis 2000). According to motivational theory, extrinsic motivation refers to the state in which people complete tasks in order to gain benefits such as money or other rewards, beyond those related to merely performing the activity (Deci and Ryan 2000). The motivation for usage behavior is that in an organizational context, individuals are usually rewarded for job performance with raises, bonuses, promotions or other rewards (Pfeffer, 1982). Employees would typically want to improve their job performance since this is tied to additional benefits such as promotions, bonuses and raises (Davis et al. 1989; Venkatesh and Speier, 1999). Knowledge workers who perceive that using the ES will lead to job performance gains, most likely will be enthusiastic about the prospect of using the technology to perform their work activities.

H1: High Job Performance Expectancy is related to high Cognitive Adoption of the new enterprise system.

Pre-Implementation Work Process Characteristics

The work design literature has examined how work characteristics are related to job outcomes such as performance and satisfaction (e.g., Hackman and Oldham 1976; Morgeson and Humphrey, 2006). Past studies have largely examined individual workers doing their jobs in isolation. In a strategic business

process context, however, work characteristics related to coordinating and communicating with others, maintaining visibility over the span of one's work activities, and adhering to established standards for inputs, outputs and the sequencing of activities are important to job performance and should be important for employees' perceived performance benefits from the ES because of the important attributes of the ES that correspond to and support the work process. That is, rules-based workflow supports the coordination needed in interdependent workflows, modularity enables visibility into and control over information in identifiable stages in the business process and embedded standards support the information inputs, outputs and processing in knowledge work. Accordingly, from the work design literature, we draw on concepts related to work process identity and work process interdependence (e.g., Hackman and Oldham, 1976) and conceptualize work process standards as a characteristic that is especially important when it comes to the benefits and costs that accrue from ES implementation (Bala and Venkatesh, 2007).

Main Effects of Pre-Implementation Work Process Characteristics on Job Performance Expectations

Task identity is the degree to which an individual's job involves completing a whole, identifiable unit of work (Hackman and Oldham, 1976). In a strategic business process context, the knowledge worker might be involved in the development of a new product or service, the delivery of a professional service or the sourcing of a good or service. In this context, task identity would reflect the degree of involvement in the stages of the business process. For example, the sourcing process, which establishes the purchasing framework, can be modeled as including three stages: demand determination, the specification of the characteristics of the good or service to be sourced; supplier selection, the identification and evaluation of qualified suppliers and supplier governance, the creation of an agreement, contract or the relational structures governing the exchange. A sourcing professional reporting high task identity may be actively involved in decision making in all stages of the business process; a sourcing professional reporting relatively lower task identity may simply receive the demand specification, a supplier listing and a template specifying the commercial and legal terms of an agreement. Given that business processes

extend across functional areas and oftentimes across organizational boundaries, knowledge workers need access to integrated information entered and stored across disparate locations. Our viewpoint is that knowledge workers whose work processes support greater engagement in the stages of the business process (higher task identity) require greater access to information that is integrated across the business process to complete their tasks effectively. The modular design of an ES application ensures an integrated module where information pertinent to performing an identifiable aspect or stage of the business process is visible. As a key capability of the ES is to integrate information across steps in the business process (e.g., Markus and Tanis, 2000), knowledge workers with high task identity should have higher performance expectancy from using an ES than those with low task identity, because they have a higher need for integrated information because of greater decision making responsibility in the business process.

The rationale for this position is supported by fit theory. As developed in the IS literature, fit theory, provides a theoretical rationale linking the needs of the task environment, the capabilities of the information system and performance (e.g., Goodhue, 1995; Goodhue and Thompson, 1995). The fundamental premise of fit theory is that the capabilities of the technology should meet the demands of the task; capabilities that meet task needs should lead to beliefs that the IS is more useful or confers a relative advantage (Goodhue and Thompson, 1995). Beliefs about the usefulness of an IS are likely to be developed from a rational assessment of the capabilities of the system and the tasks for which it can be used (Dishaw and Strong, 1999).

H2: Pre-implementation Work Process Identity is positively related to Performance Expectancy associated with ES implementation.

Task Interdependence reflects the degree to which a knowledge worker's job depends on the job of others for completion. (See e.g., Morgeson and Humphrey, 2006). In order to perform their job, the knowledge worker may need to exchange information and to coordinate specialized work roles. As interdependence increases, requirements for coordination and communication also increase (e.g., Malone et al. 1999). For example, in the strategic sourcing process, when creating sourcing agreements with

suppliers, the sourcing professional may need to negotiate commercial and legal terms, depending on the characteristics of the good or service and market conditions. Internal departments in both the buyer organization —e.g., the requesting department, production, legal—and the external supplier may be involved in negotiating terms and approving drafts of the agreement. To support interdependent work processes, a key characteristic of ES is rules-based workflows. Enabled by the ES, the knowledge worker has a centralized location for accessing and managing information to coordinate the activities of participants in the business process. An ES also provides alerts and cascade exceptions across the business process (e.g., sudden market changes or a supplier lawsuit against the company may have implications for a sourcing decision). As an ES provides capabilities to share information and achieve shared understanding, to cascade changes and promote mutual adjustment, and to embed compliance rules to ensure consistency in the coordination of the process (Davenport, 2005), we suggest that knowledge workers with high task interdependence will expect greater performance gains from an ES implementation than those with low task interdependence. The notion of correspondence or fit between the requirements of the task and the capabilities of the enterprise system should create the necessary mental conditions for the belief that the ES will lead to work performance gains (e.g., Goodhue and Thompson, 1995).

H3: Pre-implementation Task Interdependence is positively related to Performance Expectancy associated with the ES implementation.

Work process standards reflect the degree to which work process inputs, outputs and the sequencing of activities are standardized. The effect of work process standardization should be to increase performance through a reduction in variance in the conduct of activities (March, 1991). For knowledge workers, standards reflect the application of rules and procedures to how work processes are performed. Standards can lead to increased job performance because they reduce errors, facilitate communication and embed best practices for how work process activities should be performed (e.g., Davenport, 2005; de Toni and Panizzolo, 1993; Ramakumar and Cooper, 2004; Phelps, 2006).

Standardized work practices and procedures can be a part of the pre-implementation environment where they might be introduced through training, supported by personal productivity software (e.g., spreadsheet templates) and enforced through managerial controls (e.g., staff meetings, regular reporting). It is reasonable that knowledge workers might recognize the performance benefits of work process standards. For example, in the sourcing process, following standardized work processes for repetitively sourced goods or services may reasonably lead to cycle time reduction for these sourcing projects. Thus, knowledge workers might recognize the benefits of and the need for standardized work processes. ES can establish standards for information inputs (e.g., document templates), work process activities (e.g., project management procedures), communication (e.g., information sharing protocols based on workflow definitions and event sequences), and outputs (e.g., document templates). During the implementation of an ES, knowledge workers may understand the performance benefits of standards in their work practices and that work practice best practices are embedded in the ES without minding the gap between the two. Thus, a knowledge worker who follows standards in their work processes should perceive that the ES's emphasis on standards "fits" with what is required in their work process, leading them to have higher performance expectancy from the ES implementation. Those who report low standardization of their work processes may view the standards embedded in the ES as constraints on their ability to be responsive and creative in their work processes. In the sourcing process, for example, those performing projects for repetitively sourced goods or services may embrace the efficiency benefits in standardized information and practices, whereas those sourcing innovative or unique projects may abjure standards as constraining their ability to be creative and effective.

H4: Pre-implementation Work Process Standards are positively related to Performance Expectations.

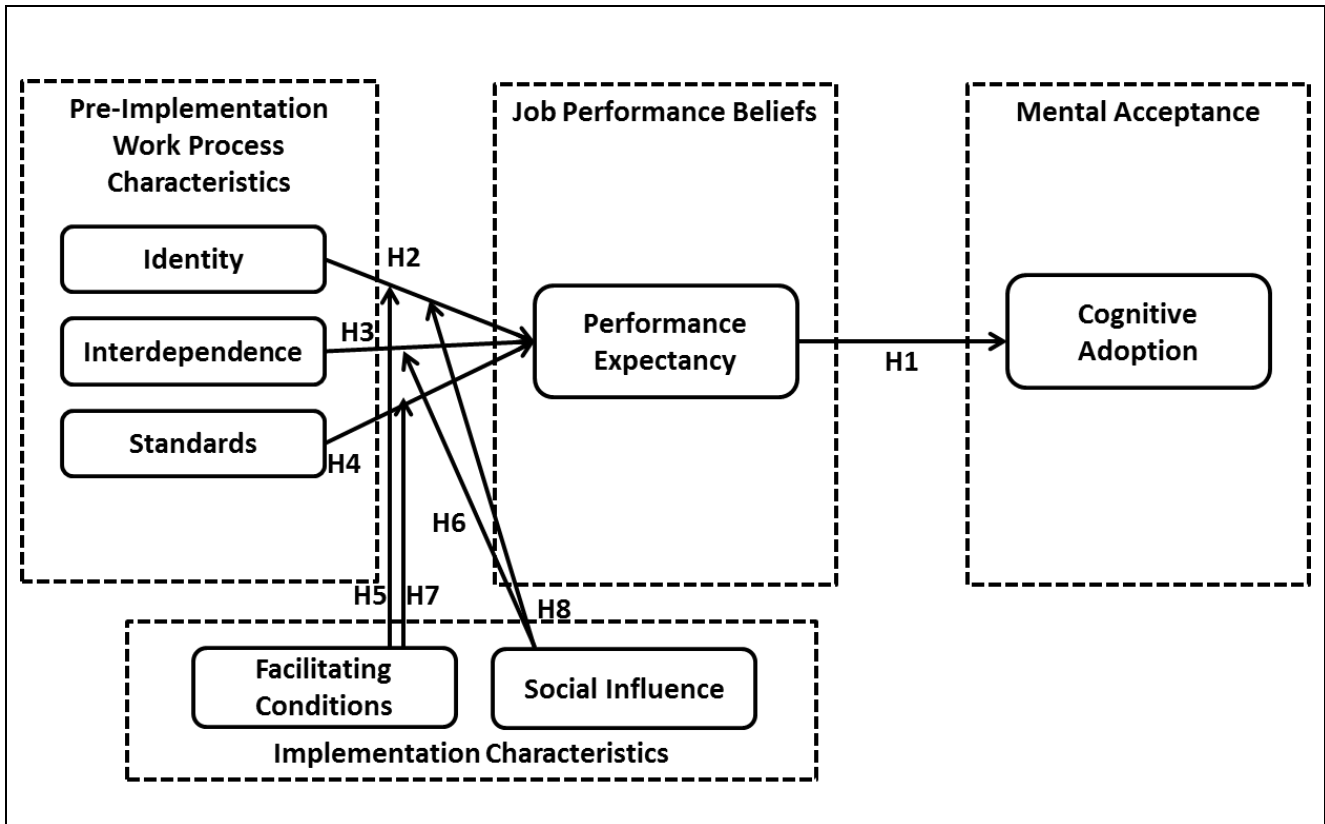


Figure 2. Research Model

Implementation Characteristics

In an implementation context, existing work processes are the baseline from which users judge whether the new ES will improve their job performance. Aligning existing work processes and features of the new ES is worked out during the implementation process. The literature identifies organizational and technical interventions as well as social support as implementation characteristics that affect user appraisals of a new system. Facilitating conditions reflect the degree to which an individual believes that a supporting technical and organizational infrastructure exists for using the new system (Venkatesh et al., 2003; Thompson et al., 1991). This includes support and knowledge of both the business process and the system. Social influence reflects the degree to which an individual believes that important others in the organization believe that he or she should use the new system (Venkatesh et al., 2003; Thompson et al., 1991). The direct effects of these implementation characteristics on performance beliefs are well established in prior research on technology acceptance. (For a review, see Venkatesh et al., 2003). As

such, we expect these direct effects to be salient in our context as well and do not hypothesize the direct effects in our model. We do hypothesize, as described in the next section, that these beliefs interact with knowledge workers' beliefs about their existing work processes to shape their job performance expectations for the new ES. The rationale here is that the capabilities of an ES do not align perfectly with the needs of the work process (e.g., Goodhue and Thompson, 1995) and to close this gap and influence performance expectations for the new ES, managers may rely on social and organizational interventions.

Interaction of Pre-Implementation Work Process Characteristics and Implementation Characteristics

We argue that the relationship between task identity and performance expectancy may be moderated by perceptions of facilitating conditions. As argued in H2 above, task identity reflects the knowledge worker's job involving an identifiable aspect or stage of the business process. Reasonably, however, there will be a gap in the alignment between the characteristics of the employee's work process and the characteristics of the ES (Goodhue and Thompson, 1995). We theorize that employees whose work processes involve an identifiable aspect or stage of the business process need to align this characteristic with the modular aspect of the ES. Facilitating conditions provide the organizational and technological resources to remove barriers to using the new technology (Venkatesh et al., 2003; Venkatesh and Bala, 2008) and thus reducing the gap between the requirements of the work process and the information integration capabilities of the system. An employee who perceives that resources (e.g., knowledge about using the appropriate ES module to complete their work processes; training on module features) are available, most likely will perceive tighter alignment between their information needs with regard to the identity aspect of their work processes and the module aspect of the system leading to increased performance expectancy. Therefore, knowledge workers who perceive that their job involves completing an identifiable aspect or stage of the business process likely perceive greater opportunity for performance benefits from adopting the system when they can also mitigate the challenges of using the new system; employees who perceive high levels of support in terms of system and process knowledge and/or system

training most likely also believe that they will appropriate greater performance gains from the ES because barriers to successful use will be removed.

H5: Pre-implementation Work Process Identity has a stronger, more positive relationship with Performance Expectancy when Facilitating Conditions is higher rather than lower.

Knowledge workers who perceive high Work Process Identity believe that their job involves completing an identifiable aspect or stage of the business process, and as argued in H2 above, this perception is positively aligned with the belief that adopting the new system will lead to job performance gains. Social Influence beliefs indicate that important others believe that the knowledge worker should use the new ES in their work processes (Venkatesh et al. 2003). Venkatesh and Davis (2000) suggest and describe internalization as a mechanism through which social influences can impact usefulness perceptions. Internalization (Kelman, 1958; Warshaw, 1980) is at play when an individual believes that an important other (e.g., colleague, manager) believes that a system is useful or can enhance job performance and the individual, accepting this social information as evidence of reality (Deutsch and Gerard 1955), in turn incorporates the referent's belief into their own belief structure. In the present context, a colleague with recognized expertise in the business process and knowledge of the ES may suggest or emphasize that a particular ES module corresponding to a stage of the business process the knowledge worker performs is useful. Venkatesh and Davis (2000) argue that even in mandatory use contexts beliefs about the usefulness of a system may still increase based in response to this shared social information about the system. Therefore, we expect that persuasive social information regarding the performance benefits of using a certain system module to perform an identifiable stage of the business process will increase the performance beliefs related to using the system to perform an identifiable stage of the business process.

H6: Pre-implementation Work Process Identity has a stronger, more positive relationship with Performance Expectancy when Social Influence is higher rather than lower.

Work Process Standards means that the information used and the activities performed in the business process are structured, and as argued in H3 above, there is a positive relationship between perceptions of the need for standards in the business process and the capabilities of the ES. Facilitating Conditions means that the knowledge worker believes that there is support (e.g., knowledge, resources) available to assist in using the system in the business process (Venkatesh et al., 2003; Venkatesh and Bala, 2008). In the context of the business process these support structures might include formal training or other resources related to the ES or the business process. Beliefs that additional support structures are available to support the transition from pre-implementation work process standards to those embedded and supported by the new ES should lead to greater belief that using the ES will lead to greater job performance. Therefore additional training and support should contribute positively to the relationship between work process standards and performance expectancy.

H7: Pre-implementation Work Process Standards has a stronger, more positive relationship with Performance Expectancy when Facilitating Conditions is higher rather than lower.

As argued in H4 above, Work Process Interdependence should be positively related to perceptions that using the system will lead to gains in job performance. Social Influence means that the knowledge worker believes that people whose opinions matter to them think that they should use the ES to perform their work activities (Venkatesh and Davis, 2000; Venkatesh et al. 2003). Venkatesh and Davis (2000) delineate identification, distinct from internalization (Kelman, 1958), as a mechanism through which social processes can impact usefulness. The essential idea described by Venkatesh and Davis (2000) is that in highly interdependent work environments, behaviors compliant with group norms leads to elevated status and increased power and influence which forms the basis for greater productivity. Consistent with this line of reasoning, a knowledge worker may believe that using the ES will lead to higher job performance above and beyond the belief that the system attribute rule-based workflows supports their interdependent work processes.

H8: Pre-implementation Work Process Interdependence has a stronger, more positive relationship with Performance Expectancy when Social Influence is higher rather than lower.

METHODOLOGY

We conducted a longitudinal field study at a large multinational paper products and related chemicals manufacturing firm. The focus of this study examines the predictors of performance expectancy and mental acceptance of an e-sourcing enterprise system by sourcing managers to perform the strategic sourcing business process. As part of the data collection for our study, we interviewed senior business managers, IT managers and sourcing managers; we also observed training sessions for the system and attended steering committee and staff meetings. The focus of the present study is on the analysis of quantitative data collected through survey questionnaires. Below, we describe the firm where our study took place and provide background information about the sourcing managers and the particular e-sourcing application under study.

The Firm

The firm manufactures and markets a range of tissue, pulp, paper, packaging and building products to other businesses and consumers around the globe. The company operates approximately 300 manufacturing facilities across North America, South America and Europe, which range from large pulp, paper and tissue operations to gypsum plants, box plants and building products complexes.

The company is organized around both product divisions and functional business units. To support this, the sourcing and procurement organization is under the direction of a chief purchasing officer who oversees the procurement function for both the administrative headquarters and the manufacturing facilities of each division. The strategic sourcing and procurement department, located at the company headquarters, employs sourcing managers who are responsible for eight sourcing categories: Capital, Chemicals, Direct Materials, MRO, Marketing, Services, Energy, and Transportation.

The Knowledge Workers - Sourcing Managers

Sourcing managers are prototypical knowledge workers because their work activities involve using information technology to collect, analyze, make judgments about and take action on the information and

knowledge they receive about the business context. Each sourcing manager is responsible for a primary sourcing category, but within that category, he or she may be working on one or multiple sourcing projects depending on the complexity of the good or service sourced. The lifecycle for a sourcing project, depending again on complexity, can last from several weeks (e.g., office printers) to a couple of years (e.g., capital equipment). Sourcing managers must coordinate their work activities with peers, (e.g., if multiple sourcing managers are working on the same project), the sources of demand (e.g., product engineers, administrators, plant managers), internal functional areas (e.g., legal, finance) and external suppliers. The sourcing managers typically entered the profession having completed a formal education in business, science or engineering, but they nonetheless receive extensive, formal on-the-job training on the sourcing process and on how the company manages the acquisition of goods and services.

The Enterprise System for Sourcing

The e-sourcing system is an application that can be used by sourcing managers to execute and manage sourcing projects. Two of the principle benefits of the application are that it standardizes the activities of and the information available about a project and that it makes this information visible to collaborators. It was expected that the functionality of this system would replace multiple existing applications for collecting, analyzing and sharing project information.

The application was configured, using templates, to facilitate various stages of the strategic sourcing process. For example, the project management template tracks project scheduling, collaborator access and project savings; while a second template facilitates creating, scheduling, scoring and awarding agreements as part of the request for information, price or quote activities; and, as a third and final example, a template for supplier agreements was created for the activities related to creating, reviewing and approving supplier agreements.

Measurement of Constructs

All survey items were measured on Likert-type scales anchored at (1) = strongly disagree, (4) = neutral, and (7) = strongly agree. Whenever possible, existing measures were adapted to the current

context. The constructs in this study were measured using reflective measures. The decision process for determining whether to model the measures for each construct as formative or reflective followed the guidelines suggested by (Petter et al. 2007) and based on (Jarvis et al. 2003). Table 1 describes the measurement items for the research variables in our model.

Table 1: Measurement Items		
Construct	Item	Informing Source(s)
Pre-Implementation Work Process Characteristics		
Task Identity	My job involves completing work that has an obvious beginning and end.	Hackman & Oldham, (1976); Morgeson & Humphrey (2006)
	My job is arranged so that I can do an entire job from beginning to end.	
	My job provides me the chance to completely finish the pieces of work I begin.	
	My job allows me to complete work that I start.	
Work Process Standards	The sourcing process standardizes the sequence in which activities are to be performed by me.	Created in present study.
	The sourcing process establishes standards for the inputs to my work process.	
	The sourcing process establishes standards for the outputs of my work process.	
Task Interdependence	My job cannot be planned without coordinating with others.	Morgeson & Humphrey (2006)
	It is usually required to obtain information from others to complete my job.	
	My job requires frequent coordination with the effort of others.	
Implementation Environment Characteristics		
Facilitating Conditions	I will have the resources necessary to use the eSourcing system.	Venkatesh et al., (2003)
	I will have the knowledge necessary to use the eSourcing system.	
	A specific person or group will be available for assistance with eSourcing system difficulties.	
Social Influence	People who influence my behavior think that I should use the eSourcing system.	Venkatesh et al., (2003)
	People who are important to me think that I should use the eSourcing system.	
	The senior management of [Company] will be helpful in my use of the eSourcing system.	
	In general, [Company] will support the use of the eSourcing system.	
Mental Acceptance		
Cognitive Adoption	I am excited that I will be able to use the eSourcing system.	Klongan & Coward (1970);

	In my mind, I am convinced that the eSourcing system will be an important technology.	Karahanna, (1999)
	If I can choose what I use, I will choose the eSourcing system.	
	Learning to use the eSourcing system will be worth the effort that I put in.	
	Job Performance Beliefs	
Performance Expectancy	I will find the eSourcing system useful in my job.	Venkatesh et al., (2003)
	Using the eSourcing system will enable me to accomplish tasks more quickly.	
	Using the eSourcing system will increase my productivity.	

Data Collection Procedure

The data collection procedure for this study is shown in Table 2. We received a schedule for the system implementation, training sessions and a list of participating employees from the project manager. During the initial training session, the employees were made aware of the aims of the survey and were requested to participate. Prior to the training session, we had requested the business unit manager to send a customized email to each employee, containing a unique survey link. When an employee clicked on the link, the survey software was able to detect the employee and create a unique ID for the employee. We then used this unique ID to track responses across subsequent surveys. Each survey link was introduced with a cover letter reiterating the purpose of the study and details regarding anonymity and confidentiality. A reminder was sent to each participant within the following seven days.

Table 2: Data Collection Procedure	
Pre-Implementation (T0) Immediately before Training	Post-Implementation (T1) Immediately after Training
<p>Controls</p> <ul style="list-style-type: none"> • Organizational Tenure • Job Experience • Percent of time spent on sourcing activities • Percent projects repetitively sourced <p>Work Process Characteristics</p> <ul style="list-style-type: none"> • Interdependence • Standards • Identity 	<p>Implementation Environment Characteristics</p> <ul style="list-style-type: none"> • Social Influence • Facilitating Conditions <p>Job Performance Expectations</p> <ul style="list-style-type: none"> • Performance Expectancy <p>Mental Acceptance</p> <ul style="list-style-type: none"> • Cognitive Adoption

A total of 78 employees participated in a three-day training program that was lead by a team of internal consultants supplemented by consulting staff from a firm with expertise in ES implementations. We invited these 78 employees to participate in both surveys. We received a total of 68 (87%) usable responses from both points of measurement.¹ Although we are cautioned by what may be perceived as a relatively small sample size for detecting interaction effects, we note the contribution of the number of reflective measures per construct (see Table 1) and the high reliability of these measures (see Table 3) to statistical power (e.g., Hair et al., 2009; Chin et al. 2003).

When questionnaires are used to measure independent and dependent variables from the same participants, common method bias may be a concern. However, to address this issue we followed the procedural safeguards recommended by (Podsakoff et al. 2003). First, we created temporal separation between our assessment of the independent variables and our measurement of cognitive adoption. More specifically, the independent variables were assessed in the morning survey at the start of training, and cognitive adoption was assessed in the afternoon after participants had received training on the system. We also used unique identifiers to match both parts of the survey to ensure respondent anonymity and to encourage respondents to answer as honestly as possible. Finally, we relied on construct measures that were established in the literature as far as possible in constructing our questionnaires; these were pre-tested with representatives from the research site to ensure that the concepts and wording would not be ambiguous, unintelligible or otherwise misleading to our participants.

¹ We conducted a two part post-hoc analysis: (a) for Performance Expectancy as the dependent variable, and (b) for Cognitive Adoption as the dependent variable. Applying $\alpha = .05$ in both instances, and $R^2 = 0.39$ and $R^2 = 0.47$, respectively, power levels greater than 0.9 were obtained in both cases, consistent with Marcoulides and Saunders (2006).

ANALYSIS & RESULTS

The measurement model and the structural model were analyzed using SmartPLS 2.0 (Ringle et al., 2005) because it does not require multivariate normality of data and is suitable for the theory-building orientation of our research (Patnayakuni et al., 2006; Rai et al., 2009).

Measurement Model Assessment

First, using the recommended procedure for PLS (Gefen and Straub, 2005), item-construct loadings were evaluated (Appendix A). Although the loadings derived from this method will be higher than from those usually derived from exploratory factor analysis (Gefen and Straub, 2005), each item loaded higher on its principal construct than on the other constructs by at least the suggested level of 0.10 (Gefen and Straub, 2005). Moreover, convergent validity, which reflects the extent to which the items for a given construct are in reality related, was assessed through Cronbach's alpha and internal consistency reliability (ICR), which uses item loading within the nomological network of the constructs (Fornell et al., 1981). The values for these statistics yielded results above 0.707 (Nunnally and Bernstein, 1994) for all constructs (Table 3). The average variance extracted for all constructs was above the 0.50 threshold, thus the items explain more variance than their error terms (Fornell et al., 1981). In addition, discriminant validity, which reflects the extent to which measures of a given construct differ from measures of other constructs in the same model, was assessed by examining the square-root of the average variance extracted in relation to its zero-order correlations with other constructs. These relationships differed by at least a 0.10 difference, illustrating discriminant validity (Straub et al., 2004). We conducted a marker variable analysis to evaluate common method bias (Appendix C); the results suggest that common method bias should not be of concern.

Table 3: Descriptives, Correlations, Convergent, Discriminant Validity											
	Mean	s.d.	CR	α	WPI	WPS	WPIN	FC	SI	PE	CA
WPI	5.13	1.19	0.93	0.90	0.77						
WPS	5.34	1.01	0.91	0.85	0.19	0.77					
WPIN	6.04	0.81	0.83	0.76	0.07	0.09	0.63				
FC	5.66	0.80	0.83	0.75	0.23	0.05	0.26*	0.77			
SI	5.53	0.86	0.84	0.74	0.30*	0.17	0.26*	0.73**	0.87		
PE	5.26	1.17	0.95	0.91	0.57**	0.19	0.08	0.34*	0.34	0.85	
CA	5.44	0.91	0.92	0.88	0.36*	0.24	0.09	0.46**	0.46**	0.66**	0.84

Notes: WPI – Work Process Identity; WPIN – Work Process Interdependence; WPS – Work Process Standards; FC – Facilitating Conditions; SI – Social Influence; PE – Performance Expectancy; CA – Cognitive Adoption; Square root of AVE on diagonal; *= $p < .05$; **= $p < .01$ (two-tailed).

Structural Model Assessment

As PLS does not calculate path significance directly, 500 bootstrapping samples were used to estimate the standard errors and to test the statistical significance of the structural paths (Rai et al., 2009). Table 4 reports the path coefficients between constructs and R^2 values. The R^2 value of 0.47 for Cognitive Adoption indicates that the model explains a substantial amount of variance in our model of mental acceptance.

The results of a hierarchical PLS analysis and the incremental change in R^2 values for cognitive adoption are shown in Table 4. Performance expectancy directly determined cognitive adoption ($\beta = 0.52$; $t = 6.26$), thus H1 was supported. H4 proposed that employee perceptions of work process identity would positively affect the employee's expectations for how the new ES would affect their job performance; this hypothesis was also supported ($\beta = 0.48$; $t = 5.46$). H2 and H3 which posited on the direct effect of work process interdependence and work process standards, respectively, on performance expectations were not supported.

To uncover the interdependent impact of characteristics of the work process and characteristics of the implementation environment on performance expectancy, we pursued a several step analysis. First, we tested each moderation hypothesis in a hierarchical process to discover the relative impact. We found statistically significant albeit weak empirical support for each proposed effect as reported in Table 4. We then examined the concurrent impact of all four hypothesized moderation hypotheses and achieved disappointing results. To control for the impact of outliers in our data that may be obscuring our ability to

detect the moderation effects when entered concurrently, we winsorized our data (Tukey, 1977) and uncovered that when the interaction effects were entered pairwise (i.e., when *both* hypothesized effects for *each* moderator were entered concurrently) we were able to uncover significant results (Table 4). This finding, supported by the high correlation between the moderators ($r = .7$) indicated that multicollinearity may be negatively affecting our ability to uncover the proposed interaction effects. We then orthogonalized (Aiken and West, 1991) each moderation term and entered all four hypothesized effects concurrently. We found strong statistical and empirical support for H5 H6 and H7 and moderate support for H8 (Table 4). Interaction plots are shown in Appendix B; we also conducted a simple slope analysis at two levels (i.e., $Z=1$; $Z=-1$) of the moderator for each interaction as suggested by Aiken and West (1991) in order to determine the values of the moderator where the interaction is significant.² We found the interaction between work process standards and facilitating conditions ($t=-1.79$) to be significant at $Z=1$ and the interaction between work process interdependence and social influence ($t=-2.47$) to be significant at $Z=-1$. We discuss the implications of these results for our empirical context in the discussion section below.

² The formula we used to calculate significance for the simple slope of each interaction is

$$t = \frac{b_1 + b_3Z}{\sqrt{\text{var}(b_1) + 2Z\text{COV}(b_1b_3) + Z^2\text{Var}(b_3)}}$$

, where b_1 represents the coefficient for the independent variable and b_3 represents the coefficient for the interaction term.

Table 4: PLS Analysis Results			
	Direct Models		Moderation Model
	1	2	3
	CA	PE	PE
Controls	β	β	β
OT	0.17**	0.17**	0.03
JE	-0.13*	-0.13*	0.01
EE	0.16**	0.17**	0.31***
%Re	0.08	0.08	0.57***
%So	0.05	0.05	0.19*
Main Effects			
PE	0.52***		
FC	0.22**	0.16**	0.44***
SI	0.02	0.14*	0.26**
WPS		0.07	0.13*
WPIN		-0.05	0.17*
WPI		0.48***	0.18**
Interactions			
FC * WPS			0.26***
FC * WPI			0.14*
SI * WPIN			0.45***
SI * WPI			0.17*
R²	0.64	0.38	.49
ΔR^2			.11
<i>p-value</i> ΔR^2			.02

Notes: *= $p < .10$; **= $p < .05$; ***= $p < .01$

PE = Performance Expectancy; FC=Facilitating Conditions; SI=Social Influence; WPS=Work Process Standards; WPI=Work Process Identity; WPIN=Work Process Interdependence; CA=Cognitive Absorption

Testing Mediating Effects

We tested each variable in the three sets of mediating relationships suggested by our research model. For one, we compared whether the effect of each work process characteristic on cognitive adoption is fully or partially mediated by performance expectancy. We also examined whether the impact of the implementation characteristics on cognitive adoption is fully mediated by performance expectancy. Finally, we examined whether each moderation effect proposed by our model is fully mediated by performance expectancy. We examine the impact of these relationships in two complementary ways (Subramani 2004). One approach is to compare the research model which implies full mediation by performance expectancy with a partially mediated model that includes a direct link between each independent variable and cognitive adoption (e.g., work process standards \rightarrow cognitive adoption).

Because the two models being compared are nested, we used PLS results to make statistical conclusions about model fit (Baron et al. 1986); (Hoyle et al. 1999). The results of these tests (Table 6) suggest that the additional direct path added to form each partially mediated model did significantly increase the variance explained in the dependent variable for the work process identity and the moderator relationships (work process interdependence and social influence, work process identity and social influence and work process identity and facilitating conditions) suggesting that these relationships are partially mediated by performance expectancy.

Table 5: Nested Model Comparison				
Direct Path	R² in Full Mediation	R² in Partial Mediation	f² Value¹	Pseudo F² F(1, 60)
WPI → SA	.64	.65	0.028	1.69*
WPS → SA	.64	.64	0.000	0.00
WPID → SA	.64	.64	0.000	0.00
FC → SA	.64	.68	0.125	7.38**
SI → SA	.64	.66	0.058	3.47**
WPI * SI → SA	.64	.65	0.028	1.69*
WPS * FC → SA	.64	.64	0.000	0.000
WPID * SI → SA	.64	.66	0.058	3.47**
WPID * FC → SA	.64	.67	0.090	5.36**

Notes: 1. f^2 is calculated using the following formula: $(R^2 \text{ partial mediation} - R^2 \text{ full mediation}) / (1 - R^2 \text{ partial mediation})$. 2. Pseudo $F = f^2 * (n-k-1)$, with 1, (n-k) degrees of freedom, where n is the sample size and k is number of constructs in model. * = $p < 0.05$; ** = $p < 0.01$

The second approach examines the magnitude and the standard error of the paths among the independent (IV), dependent (DV), and mediator variables (MV) to assess the significance of the mediation effects in our research model (Hoyle et al. 1999). The magnitude of the mediated effect is computed as the product of the paths between the IV and the MV and between the MV and the DV; the standard error of the mediated path can be computed using the magnitude and the variance of the paths among the IV, MV and DV (Hoyle et al. 1999). To assess the significance of the mediation effects we used the bootstrapping procedure (MacKinnon et al. 2002) and the results derived from PLS. As a complement to the analysis of the nested models above which found a significant increase in R2 for cognitive adoption when direct effects from facilitating conditions and social influence are included in the model, Table 6 presents the results of the mediation analysis regarding the significant mediated paths.

Table 6: Significance of Mediated Paths		
Mediated Paths	Path Magnitude	z-statistic¹
WPI→PE→SA	.32	5.39***
WPS→PE→SA	.05	0.87
WPID→PE→SA	-.20	-0.01
FC→PE→SA	.35	6.41***
SI→PE→SA	.35	6.96***
WPI*SI→PE→SA	-.05	-0.99
WPS*FC→PE→SA	.06	1.14
WPID*SI→PE→SA	.09	1.82**
WPID*FC→PE→SA	.14	2.83***

Note: 1. $z = P_1P_2 / \sqrt{P_1^2\sigma_2^2 + P_2^2\sigma_1^2 + \sigma_1^2\sigma_2^2}$

* = p<0.10; ** = p<0.05

DISCUSSION

This study theorizes a specific context of IT innovation (e.g., Johns, 2006) involving a complex information system, whose use by knowledge workers to perform their individual work processes is mandated. In doing so, this research makes several contributions to our understanding of the impact of work processes on enterprise system implementations (e.g., Peppard and Ward, 2005; Davenport et al., 2004).

Pre-Implementation Work Process Characteristics and Performance Expectancy of the Enterprise System

The work process context is the environment in which the knowledge worker will use the enterprise system so it is reasonable to examine how these characteristics shape the performance benefits they expect from the system. To identify these characteristics we drew on the work design and ES literatures (e.g., Morgeson and Humphrey, 2006; Ross and Vitale, 2000). We found that individuals whose work purview extends over an identifiable segment of the business process also believe that using the enterprise system will lead to job performance gains. This suggests the perceived ability of the enterprise system to provide an integrated information environment and in doing so to enable visibility into the business process. On the other hand, we did not find that perceptions of interdependence and standards in the existing work process context directly shape job performance expectations. One reason for this may be that the knowledge workers did not see how the coordination routines and work process standards that

were part of their pre-implementation work environment would align with those enabled by the enterprise system. Although enterprise systems are expected to standardize work processes and to improve coordination between work activities, previous research on ES implementations has found these systems to be disruptive to established work routines (e.g., Boudreau et al., 2005). Although enterprise systems are expected to provide benefits of coordination and standardization, that the work process context exhibits these characteristics may be inhibiting their effect on performance expectations. These findings extend previous research that has examined the work process context for ES implementations (e.g., Davenport et al., 2004; Arif et al., 2005) by identifying specific conceptualizations of the work process context: standards, identity and interdependence.

Complementary Effects of Work Process Characteristics and Implementation Characteristics

We also examined characteristics of the implementation environment, which previous research has found to be important in shaping the adoption of IS (Taylor et al., 1995; Karahanna et al., 1999; Venkatesh, 2000). We found that that social support during the implementation joined with work process interdependence and identity have a complementary effect on job performance expectations. Similarly, the availability of technical support during the implementation combined with work process standards and identity to jointly impact job performance expectations. This is likely because the availability of technical knowledge and social influence provide important resources during the implementation to make the mutual adjustments to the ES and work processes and achieve alignment between the technology and work system. These findings suggest that an understanding of why knowledge workers accept new technology extends beyond either the existing work process context or the implementation environment to a consideration of the complementary effects of both sets of characteristics

Importance of Cognitive Adoption for Assessing Acceptance of Enterprise Systems

We also validated the use of the cognitive adoption construct in gauging the mental acceptance of the new ES in mandatory usage contexts. This is an important finding because most enterprise systems are deployed in mandatory use environments because of the collective benefits of using the system. Previous research that has examined the intention to perform a behavior in a mandated context has essentially measured compliance with the mandate (Bagozzi et al., 1990; Sheppard et al., 1988). In assessing acceptance of a complex information system, it seems evident that a measure of behavioral intention is inadequate because there is a difference between adopting the system to be in compliance with the mandate and accepting the system to be used in a deep, non-cursory way. This is particularly important in contexts where knowledge workers are performing strategic business processes because these workers are recognized to be experts in how their work activities are performed. Thus, by gauging their mental acceptance of the new ES, the degree to which they are enthusiastic about the prospect of using the system to perform their work activities, managers can better understand their usage behavior in relation to the usage mandate and design appropriate interventions earlier, rather than later, in the innovation process.

Central Role of Performance Expectancy in Promoting Cognitive Adoption

Interpreting the mediation analysis, we found that performance expectancy plays an important role in understanding how work process characteristics impact mental acceptance of the ES. Performance expectancy is well established as a significant predictor in the adoption process, and this study extends this insight by finding support to suggest that performance expectancy plays an important role as a linkage between the work process context, implementation characteristics and mental acceptance of the ES. One insight is that the effects of facilitating conditions and social influence on cognitive adoption are partially mediated by performance expectancy. This analysis also suggests that the impact of work process identity on cognitive adoption is fully mediated by performance expectancy. In addition, our

analysis suggests that the complementary effect of work process identity and facilitating conditions on cognitive adoption is mediated by performance expectancy. These effects highlight the importance of the joint effects of characteristics of the work process and of the implementation environment through performance expectations on cognitive adoption.

Implications for Practice

The findings from our study have several practical implications for how the innovation context affects how knowledge workers accept IT innovations. It is important for managers to recognize that the existing work process context influences the way that the performance benefits from using the new ES are perceived. In addition, as the moderation graphs describing the interaction effects between work process standards and facilitating conditions (Figure B-1) and between work process interdependence and social influence (Figure B-3) show, not providing high levels of systems support and training and high levels of social support can lead to lower job performance expectations for knowledge workers experiencing moderate to high levels of these work process characteristics in their pre-implementation work activities. Therefore, it is important for managers to be aware that emphasizing the work process benefits of the new enterprise system should be complemented with activities in the implementation related to providing high levels of technical and social support for aligning existing work processes to those enabled by the new ES.

Limitations and Future Research

This research study has a couple of limitations that should be noted. First, our ability to detect a significant direct effect in the relationship of work process interdependence on performance expectancy may be obscured by the high average value and low standard deviation measured in this study. Although this high average value may accurately reflect the nature of the sourcing business process, it may also lead to inaccurate identification of predictor variables (Kennedy, 1998). Although we were able to control for differences in organizations by testing our theoretical model within a single organization, our empirical test is limited to knowledge workers within the sourcing process of a large, global manufacturing firm,

which may limit generalizability. This approach also constrained our available sample size although our post-hoc power analysis indicates that we had reasonable power to detect medium effect sizes.

Future research may extend this work by identifying and validating other work process characteristics that are theorized to be important in determining job performance expectations for enterprise system implementations. This research may also be extended through the incorporation of other constructs important to the IT innovation context that may be theoretically important to particular business process (e.g., concerns about privacy or anonymity might be heightened in certain contexts). Future research may also extend the model beyond mental acceptance to a measure of usage behavior such as deep structure use, which assesses both the task structure and the system features (Burton-Jones et al., 2006). Our research model can also be extended to evaluate its impact on the relationship between mental acceptance and usage behaviors.

CONCLUSION

We extended research examining the impact of the work process context during ES implementations (Boudreau and Robey, 2005; Arif et al., 2005; Davenport et al., 2004) and specifically technology acceptance research (e.g., (Venkatesh et al., 2003)) by showing how the work process context and implementation environment influence the mental acceptance of IT innovations by knowledge workers in mandatory-use, business process contexts. Drawing on the work design and the enterprise systems literatures, we identified work process identity as having a direct effect on job performance expectations. In addition, we identified how technical and social support in the implementation environment interact with the work process context to influence job performance expectations. We also found support for the argument that job performance expectations play a key role in understanding how characteristics of the work process context impact mental acceptance of the ES. Further, we validated the use of the cognitive adoption construct for assessing the mental acceptance of new ES in mandatory usage contexts. For managers, these findings indicate the importance of jointly focusing on both the implementation context

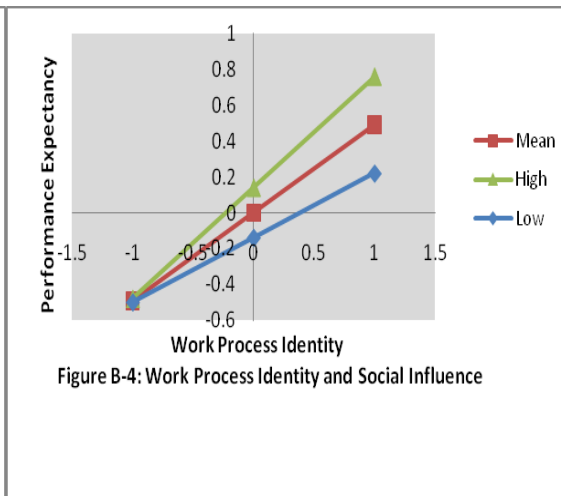
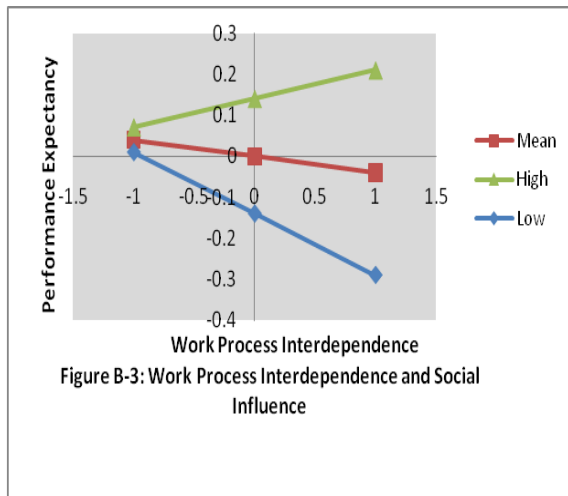
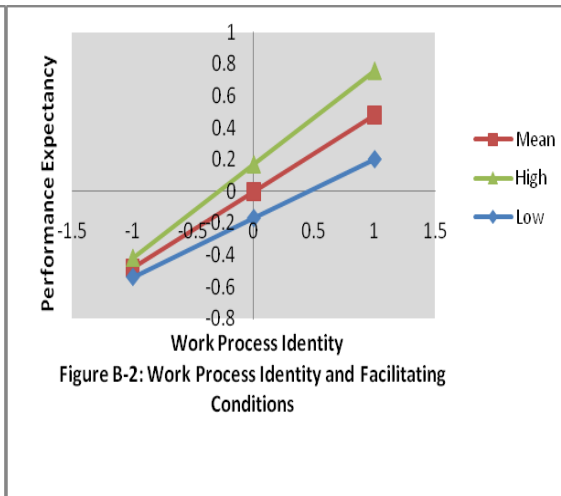
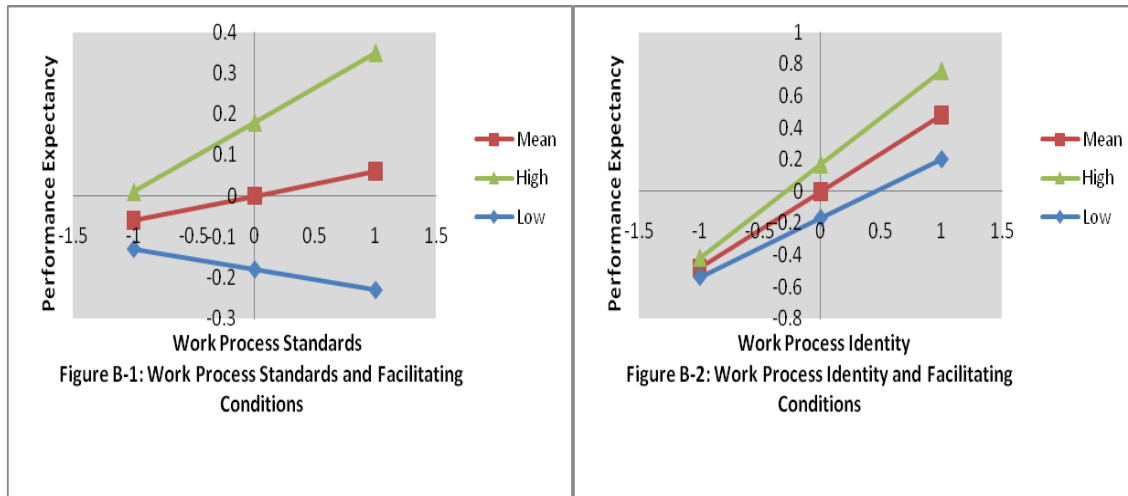
and the pre-implementation work process context to promote the acceptance of technology innovations in contexts where use is mandated.

APPENDIX A: Item Loadings and Cross-Loadings

	WPID	WPS	WPI	SI	FC	PE	SA
WPID1	0.81	0.33	-0.07	0.31	0.13	0.37	0.23
WPID2	0.91	0.16	0.10	0.30	0.18	0.62	0.40
WPID3	0.92	0.12	0.10	0.31	0.24	0.51	0.34
WPID4	0.86	0.07	0.18	0.17	0.23	0.41	0.26
WPS1	0.11	0.90	0.06	0.12	-0.03	0.19	0.21
WPS2	0.25	0.87	-0.06	0.10	0.04	0.14	0.15
WPS3	0.15	0.87	0.05	0.23	0.07	0.15	0.23
WPI1	0.06	0.06	0.81	0.23	0.24	0.03	0.10
WPI2	0.07	0.04	0.92	0.19	0.19	0.07	0.08
WPI3	-0.03	0.19	0.51	0.01	0.09	-0.01	0.03
SI1	0.14	0.02	0.29	0.76	0.23	0.17	0.29
SI2	0.21	0.16	0.28	0.84	0.24	0.17	0.39
SI3	0.34	0.20	0.04	0.87	0.39	0.37	0.43
SI4	0.14	0.04	0.33	0.47	0.41	0.17	0.25
FC1	0.28	0.06	0.35	0.43	0.85	0.31	0.46
FC2	0.21	-0.03	0.22	0.35	0.86	0.28	0.21
FC3	0.08	0.03	0.04	0.32	0.76	0.26	0.36
PE1	0.40	0.15	0.15	0.33	0.28	0.84	0.60
PE2	0.57	0.15	0.01	0.35	0.26	0.93	0.60
PE3	0.57	0.18	0.03	0.29	0.33	0.96	0.61
SA1	0.11	0.17	-0.13	0.25	0.48	0.35	0.65
SA2	0.29	0.33	0.13	0.45	0.41	0.61	0.92
SA3	0.32	0.19	0.11	0.41	0.29	0.60	0.92
SA4	0.44	0.11	0.14	0.48	0.30	0.63	0.91

Note: WPID – Work Process Identity; WPI – Work Process Interdependence;
WPS – Work Process Standards; FC – Facilitating Conditions; SI – Social Influence;
PE – Performance Expectancy; CA – Cognitive Adoption

APPENDIX B: Moderating Effects of Implementation Characteristics



APPENDIX C: Marker Variable Analysis to Evaluate Common Method Bias

We applied the marker variable method described by Lindell and Whitney (2001) and used by Malhotra et al. (2006) to test for method bias among our study constructs. Following this procedure, we identified the lowest correlation marker variable collected during survey administration (R_{MI}). (See Table C-2.)

In Table C-1, we present the correlations after correcting for R_{MI} :

- Adjusting for R_{MI} , *all* correlations among the substantive variables dropped by only .01.
- In addition, we computed the average correlation of the marker variable with the study variables ($R_{MI_{avg}}$). Here, we observed no decrease in correlations.

Table C-1 Corrected Correlations					
Factors	Uncorrected	M1	t	$M1_{avg}$	t
r(WPI,WPS)	0.19	0.20	3.68	0.19	3.48
r(WPI,WPIN)	0.07	0.08	1.45	0.07	1.23
r(WPI,FC)	0.23	0.24	4.46	0.23	4.26
r(WPI,SI)	0.30	0.31	5.88	0.30	5.69
r(WPI,PE)	0.57	0.57	12.78	0.57	12.60
r(WPI,AA)	0.36	0.37	7.17	0.36	6.99
r(WPS,WPIN)	0.09	0.10	1.81	0.09	1.60
r(WPS,FC)	0.05	0.06	1.08	0.05	0.86
r(WPS,SI)	0.17	0.18	3.30	0.17	3.10
r(WPS,PE)	0.19	0.20	3.68	0.19	3.48
r(WPS,AA)	0.24	0.25	4.65	0.24	4.46
r(WPIN,FC)	0.26	0.27	5.05	0.26	4.86
r(WPIN,SI)	0.26	0.27	5.05	0.26	4.86
r(WPIN,PE)	0.08	0.09	1.63	0.08	1.41
r(WPIN,AA)	0.09	0.10	1.81	0.09	1.60
r(FC,SI)	0.43	0.44	8.82	0.43	8.64
r(FC,PE)	0.34	0.35	6.73	0.34	6.54
r(FC,AA)	0.46	0.47	9.58	0.46	9.40
r(SI,PE)	0.34	0.35	6.73	0.34	6.54
r(SI,AA)	0.46	0.47	9.58	0.46	9.40
r(PE,AA)	0.66	0.66	16.15	0.66	15.96

Notes: WPI = Work Process Interdependence; WPS = Work Process Standards; WPIN = Work Process Interdependence; FC = Facilitating Conditions; SI = Social Influence; PE = Performance Expectations; AA = Cognitive Adoption; CA(MI) = Cognitive Absorption, Marker Variable: degree to which individual is mentally engaged while using a technology

Table C-2 Marker Variable and Study Constructs								
	WPI	WPS	WPIN	FC	SI	PE	SA	CA(M1)
WPI	1.00							
WPS	0.19*	1.00						
WPIN	0.07	0.09	1.00					
FC	0.23*	0.05	0.26*	1.00				
SI	0.30*	0.17*	0.26*	0.43*	1.00			
PE	0.57*	0.19*	0.08	0.34*	0.34*	1.00		
AA	0.36*	0.24*	0.09	0.46*	0.46*	0.66*	1.00	
CA(M1)	0.03	-0.05	0.18	0.06	0.02	-0.16	-0.06	1.00

Notes: WPI = Work Process Interdependence; WPS = Work Process Standards;
 WPIN = Work Process Interdependence; FC = Facilitating Conditions; SI = Social Influence;
 PE = Performance Expectations; CA = Cognitive Adoption; CA(M1) Marker Variable: degree
 to which an individual is mentally engaged while using a technology; *= $p < .05$ (two-tailed)

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The Impact of Sourcing Enterprise System Use and Work Process Context on Sourcing Professional Job Outcomes

Abstract

We examine the role of context in conceptualizing sourcing enterprise system use and in developing constructs reflective of the system and its usage setting. Through a field study of the system usage behaviors of sourcing professionals, we identify use for supplier selection and use for supplier governance as two distinct types of sourcing enterprise system use. We also identify work process interdependence as a salient contextual factor that moderates the impact of both types of sourcing enterprise system use on job satisfaction: interestingly, the impacts of both types of system use are negative when work process interdependence is high and positive when it is low. Our results also reveal that the impacts of both types of sourcing system use on job performance are mediated by job satisfaction. We discuss the implications of our findings for the interstice between IT and operations management and for the effective use of enterprise systems in the sourcing process.

Keywords

Sourcing enterprise system use, job satisfaction, job performance, work process interdependence

Chapter 3 Introduction

Sourcing enterprise systems are introduced into organizations to innovate the work processes of sourcing professionals who are responsible for sourcing products and services. There is an important distinction between the emergent perspective of sourcing and the traditional perspective of purchasing. The traditional view of purchasing activity has centered largely on transaction processing, where the purchasing agent receives a purchase request from another department, completes the purchase order, and expedites and resolves transactional discrepancies as necessary (e.g., Sollish and Semanik, 2011). To complete the work process, the purchasing agent may rely on an exchange of emails, faxes and telephone calls supported by personal productivity software (e.g., spreadsheets, word processing). Given the expectation for the purchasing function to align with the overall business strategy and to deliver on an increasing set of organizational benefits (e.g., cost reduction, risk management, product and service innovation) (cf. Simchi-Levi et al., 2003), the procurement business process is being transformed to take a more strategic “sourcing” role. New decision-making responsibilities (e.g., selecting and governing a global supply base) are now part of the sourcing professional’s job. In response, organizations are introducing complex, integrated, enterprise-level technology to facilitate decision-making and to support the selection and governance of suppliers as part of sourcing work activities.

However, there has been little systematic investigation of how sourcing professionals use enterprise systems in the context of their work processes and the job performance consequences that result. As with all enterprise systems and other complex IT investments, managers need to justify the costs and risks incurred with an assessment of benefits. In the context of complex information systems, this assessment is seldom done, and when it is, it is frequently idiosyncratic

and lacking in credibility and comparability (Gable et al., 2008). It is important to understand the impact of sourcing enterprise systems use not only on the organization but also on individual sourcing professionals given the impact enterprise systems have had on job outcomes in other contexts (e.g., Morris and Venkatesh, 2010). We note two important considerations that pertain to the role of *context* in conceptualizing system use and evaluating its impact. First, IS use is a key intervening variable between IT investments and performance (Devaraj and Kohli, 2003), making it critical to conceptualize IS use and define appropriate constructs for it in a given system and usage context (Burton-Jones and Straub, 2006). Second, it is important to surface the salient contextual factors that change the impact of enterprise system use on key outcome variables of interest (Johns, 2006), as contextual factors can influence the strength and even invert the nature of relationships among constructs, i.e., a positive relationship becomes negative under certain conditions and vice versa. We focus on conceptualizing the use of enterprise systems in the context of the sourcing process and on understanding the influence of contextual characteristics of the sourcing process in affecting the benefits that accrue from the use of enterprise systems. This focus of our work responds to the Call for Papers for this Special Issue to address knowledge gaps at the interstice of IT and operations on how IT can generate business value in supply-chain processes.

Our study builds on prior operations management research on sourcing and behavioral operations (e.g., Bendoly and Schoenherr, 2005; Schoenherr and Mabert, 2011), IS success research, particularly that which has examined the impact of technology use on individual and job outcomes (Delone and McLean, 2003; Morris and Venkatesh, 2010; Rai et al., 2002; Sykes, 2009), as well as on research that has examined the impacts of enterprise systems in business process contexts (e.g., Seddon et al., 2010; Sykes, 2009). Despite research on how enterprise

systems and e-purchasing systems generate value (e.g., Morris and Venkatesh, 2010; Mishra and Agarwal, 2010; Rai et al., 2009; Rai et al., 2006), a review of related information systems literature suggests important knowledge gaps related to the deployment of enterprise systems in the sourcing context and the realization of business value from the implementation. Few studies in the IS literature have theorized *richly* about the use construct and most studies have not defined and conceptualized use in context (Burton-Jones and Straub, 2006; Jaspersen et al., 2005). While recent work on enterprise systems has examined the use of enterprise systems and its impacts on key performance outcomes (e.g., job outcomes), these studies have used a lean conceptualization (e.g., duration of use) and have not considered the contextual characteristics of the process and technology in conceptualizing, defining and measuring the use of enterprise systems (Morris and Venkatesh, 2010; Morris et al., 2005; Sykes et al., 2009; Venkatesh et al., 2000; Venkatesh et al., 2003). Such lean conceptualization of enterprise system use (e.g., frequency and duration of use) does not consider the situational characteristics of the task-technology-user interactions in conceptualizing and defining enterprise system use in complex work processes. Specifically, we did not identify studies that have accounted for enterprise sourcing system features and sourcing process activities that sourcing professional engage in while conceptualizing usage behavior of enterprise systems in the sourcing context. In addition, system use has been measured in different ways (e.g., frequency of use, duration of use, use or non-use), and, in general, with limited theoretical rationale for how use is measured and related to performance outcomes (Burton-Jones and Straub, 2006).

Beyond the gaps related to conceptualizing system use behavior in the sourcing context and relating that behavior to job performance outcomes, there have been few studies that have investigated the work process contingencies that may impact the system use-to-job performance

relationship in the sourcing context. Focusing on this gap also responds to the call for research in behavioral operations to develop our understanding of behavioral responses to interventions (e.g., implementation of enterprise systems) in core operational processes (e.g., Bendoly et al., 2006b).

In order to respond to these gaps in the literature and to address the business need of creating benefits from investments in enterprise systems in the sourcing context, we pursue the following objectives in this study:

- To conceptualize and measure sourcing enterprise system use behavior by considering how sourcing professionals engage with the technology in performing their work activities;
- To relate sourcing enterprise system use behavior to job performance outcomes; and,
- To develop our understanding of how contextual characteristics of the sourcing work process impact the relationship between sourcing enterprise system use and job performance outcomes.

This research contributes a context-rich understanding of how sourcing professionals use sourcing enterprise systems to perform their work processes and the related job performance benefits they realize. By examining use behavior in the sourcing process context, we better understand how one salient work process characteristic (interdependence) moderates the effects of sourcing enterprise system use on job outcomes and the mediation mechanisms through which job performance gains are realized by sourcing professionals.

RESEARCH CONTEXT – BUSINESS PROCESS AND ENTERPRISE SYSTEM

Sourcing Business Process

The sourcing process is a particular segment of the procurement process. The set of activities performed by a company to obtain the goods and services necessary for its primary and secondary operations comprises the procurement process. We conceptualize the sourcing process

as a multi-stage business process that links sourcing with a strategic perspective, rigorous analysis, supplier collaboration and continuous evaluation in to order to create the highest total value for the firm from its sourcing activities. The sourcing process creates the framework (e.g., supplier identification, evaluation, selection, negotiation and contracting) that guides both capital expenditures and the tactical purchasing of goods and services over a specified period of time.

Although the granular internal activities that a company may consider as part of the sourcing process have not been standardized across companies, the process can be generalized in most instances to include: requirements determination, supplier selection, and supplier governance (Weele, 2002). Indeed, the process of supplier selection entails evaluating the ability of suppliers to meet sourcing requirements, leading the key functionalities of sourcing enterprise systems to be concentrated on activities related to supplier selection and supplier governance as we now elaborate.

Figure 1: Sourcing Business Process



Sourcing Enterprise System

Enterprise systems typically are comprised of integrated software modules, supported by a common database, that enable various departments in an organization to share information and to communicate with each other and external collaborators in order to perform a business process (Davenport, 1998; Klaus et al., 2000; Shang and Seddon, 2002). A sourcing enterprise system is an enterprise-level application suite whose functions and features are designed to support the work activities of personnel performing the sourcing process. Aligned with the objectives of the sourcing process, sourcing enterprise systems typically are comprised of modules representing high level sourcing functions

(e.g., managing a sourcing project; selecting and evaluating suppliers; and, negotiating, creating and managing contracts and agreements). Once a sourcing project has been defined, the major activities pertain first to evaluating and selecting suppliers and then to governing suppliers. The sourcing enterprise system can thus be conceptualized as consisting of functionalities for supplier selection and for supplier governance, above and beyond the baseline functionality of documenting sourcing projects. As in other enterprise systems contexts, organizations implementing sourcing enterprise systems may install one or a combination of available core modules in the suite.

THEORETICAL BACKGROUND

Rich Use Conceptualization of Sourcing Enterprise Systems

In order to realize the benefits from investments in enterprise systems, employees need to interact with the system (DeLone and McLean, 1992; Devaraj and Kohli, 2003). One of the most common approaches for assessing technology use has been to take an atheoretical approach to conceptualizing the construct and to use lean measures. Lean measures are described as compilations that try to capture the entire content of the activity (Burton-Jones and Straub, 2006). Common examples of this approach are frequency of use, which may be measured by the number of system log-ins, duration of use, which may be measured by the amount of time a user is logged-in to the system and intensity of use, reasonably measured by the number of times a particular feature is used.

However, as Burton-Jones and Straub (2006) note, a problem with this approach is that it considers usage behavior at a level that obscures what is actually happening in a complex behavior. Applying their critique, frequency of use may actually indicate using the same system feature or limited feature set over and over; duration of use may indicate that the user is struggling to use a particular feature as they spend an extended period of time interacting with the system; and, intensity of use gives limited insight into whether or not the chosen features are relevant in a particular usage context (cf, Burton-Jones and Straub, 2006). It is reasonable to expect that these examples of use may not lead to the same positive outcomes in the employee's job context as might be implied.

Arguing that system use behavior does not have a single conceptualization or set of measures but will vary across use contexts, Burton-Jones and Straub (2006) suggest an approach for “systematically developing conceptualizations of usage for specific contexts and selecting usage measures in a theoretically rigorous way” (p.231). Burton-Jones and Straub (2006) recommend a two-step approach for defining system use in a particular study context and for selecting usage measures. In the definition stage the researcher defines the distinguishing characteristics and assumptions of use. In the selection stage, the researcher selects the best measures for the part of the usage activity that is of interest. The selection stage is further decomposed into two steps: (1) the selection of usage elements that are most relevant for the research model and context, and (2) the selection of measures for the chosen elements that tie the other elements in the nomological network (Burton-Jones and Straub, 2006).

In applying this approach to our context, we define rich use of a sourcing enterprise system as involving the sourcing professional’s use of one or more features of the strategic sourcing system to perform a work activity in the sourcing process. This conceptualization of usage behavior is closely linked to the performance of the work process activities and stages of the sourcing process and the corresponding sourcing system application.

The first step in operationalizing the sourcing enterprise system use construct is to select the elements of usage most relevant to the research context. Because our research context involves the application of a complex technology to a complex work process, we apply a rich usage measure that combines features of the enterprise system and elements of the work process. Depth and contextual awareness are important to examining system use across organizations and processes (Devaraj and Kohli, 2003; Subramani, 2004).

Given the complexity of the usage construct, Burton-Jones and Straub (2006) note that the researcher can justify what parts of the usage construct they are measuring based on the context of the study. In our research context, we identify two distinct usage constructs—use for selection and use for governance—that correspond to the two primary stages of the sourcing process once requirements have been identified as described in Figure 1; Table 1 describes key use behaviors for each construct.

This approach to conceptualizing and measuring use has two advantages. One advantage is that it allows researchers to examine usage behaviors as they correspond to distinct stages of the business process. For example, use behaviors for supplier governance may complement use for electronic auctions, giving insight into which suite applications should be installed and in what order. Another advantage is that researchers can focus on the usage behavior for applications that have been implemented in a particular research context. That is, if only functionality for supplier selection and evaluation has been implemented, as opposed to the entire application suite for example, this may lead to both different use behaviors and job outcomes.

In section 4.2 below, we describe the particular measures selected to reflect use for selection and use for governance and to relate these constructs to job outcomes (satisfaction and performance), the key job outcome constructs in our nomological network.

Table 1: Examples of Sourcing Enterprise System Use by Sourcing Professionals

Use for Supplier Selection	Use for Supplier Governance
Automating the creation of requests for information, proposals, and quotations.	Automating rebidding, auditing, renewing and renegotiating activities.
Creating a repository where supplier profiles, updated files and internal discussion records about the suppliers are kept.	Defining metrics and creating supplier performance scorecards.
Analyzing bids using collaborative scoring, weighted scoring, cost calculations, side-by-side comparisons or pricing and savings reports.	Creating unique portals where suppliers can participate in collaborative discussions, view scorecard performance and view active contracts.

Job Performance

Job performance refers to the accomplishment of prescribed activities that directly support the accomplishment of the organization’s “technical core” (Borman and Motowidlo, 1997; Campbell, 1990). Activities that support these central responsibilities are well known and accepted within the job context (Ilgen and Hollenbeck, 1991). We focus on the aspects of sourcing professional job performance that are prescribed and directly relate to their core job responsibilities. We reviewed the literature on sourcing (Chopra and Meindl, 2001; Mentzer, 2004; Rai et al., 2009; Simchi-Levi et al., 2003), and as described in the empirical section, we also interviewed sourcing professionals and sourcing category managers to identify the dimensions of prescribed job performance that are most salient for sourcing professionals. We

identified cost savings and avoidance, cycle-time and inventory reduction as salient dimensions of prescribed job performance for sourcing professionals.

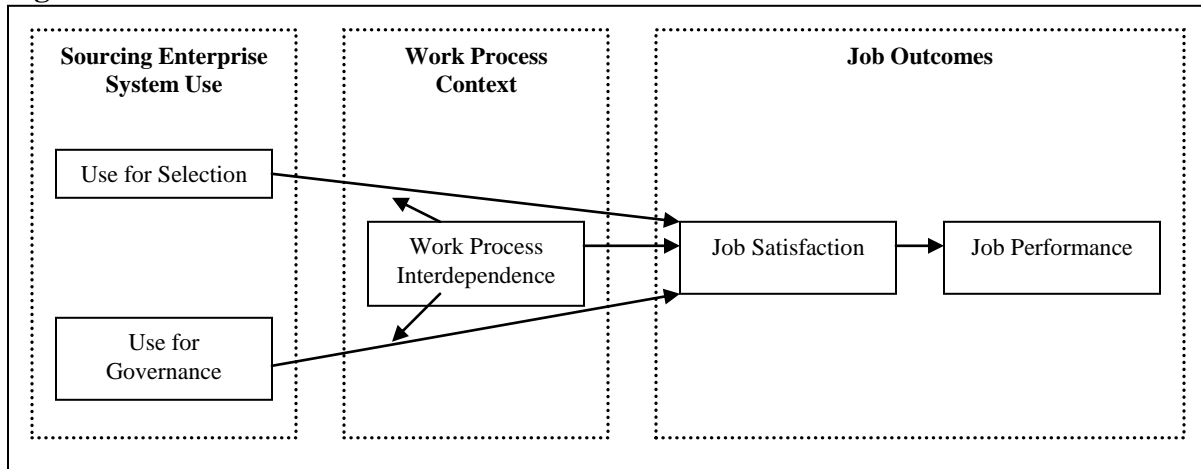
Job Satisfaction

Job satisfaction can be defined as the affective responses to the substance and results of work activities (Janssen, 2001). Organizational psychologists have argued that the way an individual feels about work is a crucial element of the employment experience (Judge and Bono, 2001). Although job satisfaction is oftentimes examined as a dependent variable, other researchers have noted its importance as a mediator between the work environment and individual outcomes (e.g., Dormann and Zapf, 2001). The relationship between job satisfaction and individual performance has been the subject of much debate and the subject of several meta-analyses (e.g., Bowling, 2007; Judge et al., 2001). Here, we expect, as found in prior research (e.g., Morris and Venkatesh, 2010) that the implementation of an enterprise system will have a corresponding impact on how people feel about their jobs and how they perform their jobs.

Work Process Interdependence

Task interdependence is the degree to which employee work activities depend on others and others depend on the focal employee's work activities (Morgeson and Humphrey, 2006). Our conceptualization of Work Process Interdependence builds on the task interdependence literature and extends it by explicitly considering the number of work process collaborators in addition to the degree of task interdependence in the sourcing process. This conceptualization considers both the *degree* of dependence between sourcing professionals and others in the strategic sourcing business process as well as the *number* of interdependent relationships.

Figure 2: Research Model



HYPOTHESES DEVELOPMENT

Work Process Interdependence as a Moderator of the Impact of Use for Selection on Job Satisfaction

Sourcing enterprise systems are touted to have certain job-related benefits for sourcing professionals. Although these benefits support decision making and facilitate the work process through integrated data and information and standardization, their rigidity nonetheless creates tension for the sourcing professional as standardization comes up against the complexity and uncertainty of interdependent work processes.

One set of benefits related to enterprise systems implementations is integration, or more precisely, the linking together of data and information from multiple systems so that it is available in a single location for decision-makers (Gattiker and Goodhue, 2004). In a pre-implementation environment, data and information necessary for decision-making in the business process may reside, unstandardized, on multiple systems or may even be inaccessible in the spreadsheet and word-processing file locations of process participants. For example, a sourcing professional in the services category may be working on a project to source security services on a national basis. In each location, information about who is providing these services, at what price and in consideration of what local contingencies is kept by

whoever is locally responsible for the agreement (e.g., sourcing professionals, plant manager, facilities manager). For sourcing professionals, in the selection stage of the business process, the advantage of integration is that it provides consistent access to data and information stored across systems in different business units or global locations. So taking up again the previous example, the sourcing professional using the system would have access to supplier information, requirements, evaluation criteria and quote for each location. This benefit enables the sourcing professional to better understand the relationship among sourcing requirements, pricing of offerings across suppliers, total landed costs of supplies (includes costs above and beyond purchase price that may be stored at various places in the organization) and spend volume by category of products and services. Another potential benefit of an enterprise system implementation for decision-makers is standardization of both data and work processes (Bendoly and Schoenherr, 2005; Davenport, 1998; Gattiker and Goodhue, 2002; Ross and Vitale, 2002).

Standardization in the selection stage of the sourcing process has several advantages. One advantage of standardized data in the selection stage is that by eliminating redundancies and multiple supplier and material identifiers, the sourcing professional is able to identify and make decisions about the capabilities of existing suppliers. An advantage of work process standardization in this phase of the business process is that by following a structured and automated workflow, the sourcing professional's productivity increases as cycle time is reduced.

Two psychological mechanisms provide the theoretical rationale for why these enterprise-system enabled benefits lead to job satisfaction for sourcing professionals when they use the system for supplier selection. One is that the decision-making constraints (Simon, 1957, 1972, 1991), placed on the sourcing professional in the pre-implementation environment because of redundant and fragmented data and information, are alleviated by access to integrated, accurate data and information. As such, bounded rationality constraints are alleviated for sourcing professionals. The second mechanism addresses the benefit of standardization in the selection stage of the business process. Here, by following a process that is consistent and based on the analysis of comparable information, the sourcing professional perceives

that they are engaged in procedural fairness in selecting supplier proposals, which increases their job satisfaction (cf. Brockner et al., 2009)

However, given the complexity and uncertainty surrounding the selection and evaluation of suppliers, scripts for interactions and data collection may break down as both internal constituents (i.e., requestors, category managers) and suppliers may appeal to context specific, more qualitative considerations. In evaluating supply options, internal collaborators may appeal to feelings of trust or flexibility, or perceived supplier innovativeness or quality based on relationship-specific experiences that may not be part of the scoring template that is configured in the enterprise system. Suppliers, on the other hand, may also object to the rigidity of the selection process following the implementation of the sourcing enterprise system. For example, prior to the implementation of a sourcing enterprise system, sourcing professionals might allow suppliers to provide their own spreadsheets breaking down their pricing or budgets for a good or service. The sourcing professionals would then manually extract this information for comparison and, if necessary, follow-up with telephone calls or emails to further refine the price quotes. Post-implementation, suppliers might be presented with a standardized budget or price-quote template as part of their response. This template might create delays and frustration in the work process as each supplier tries to negotiate changes to the standard template. If the sourcing professional requires suppliers to use the system, this might lead to misleading quotes as suppliers try to apply their pricing to the standard template; if they revert to spreadsheets then this information is not visible to interested parties such as category managers or the requesting department.

Sourcing enterprise systems benefit sourcing professionals during the selection stage of the sourcing process through automating and standardizing work process activities. However, as elaborated above, the technology features that enable these benefits also can be the source of tensions as rigidity forces work process participants to negotiate work-arounds in the performance of complex and uncertain work process activities.

Hypothesis 1: At lower/higher levels of Work Process Interdependence, Use for Selection will have a positive/negative relationship with Job Satisfaction.

Work Process Interdependence as a Moderator of the Impact of Use for Governance on Job Satisfaction

One of the prospective benefits of a sourcing enterprise system is that these systems will reduce the variability with which the sourcing process is executed and ideally the outcomes that are realized by sourcing professionals. These systems provide sourcing professionals with tools for executing a standardized process by providing a centralized location for accessing work process documents and providing standard workflows and automated status updates. Despite these benefits, in the context of highly interdependent work processes, these process standards may introduce rigidity into the work process.

For example, sourcing professionals may feel constrained by standardization in the contracting and agreements work process, particularly in the context of supplier negotiations, where issues of market power, collaboration and supplier development increase the number of stakeholders in negotiations and the complexity of the issues. Pre-implementation, sourcing professionals might rely on phone calls and email attachments to negotiate the commercial and legal terms of sourcing contracts and agreements. Because sourcing contracts and agreements are highly complex and uncertain documents, the sourcing professional might serve as a point person connecting legal representatives from both sides who would early in the work process verbally discuss and negotiate the legal terms, relying on the direct email exchange of “red-lined” documents. Post-implementation, this work flow might be standardized and automated by the sourcing enterprise system. Although there are advantages to this approach (e.g., status alerts may keep the work flow moving), there are disadvantages in practice. For example, the standardized work flow in the system might have legal representatives exchanging red-lined documents via the system, where they receive status alerts via email when their counterpart has uploaded a changed document. This requires interested parties to log into the system to retrieve the documents. For participants in the business process who do not feel that these steps benefit their work processes (and who are not under the same use mandates and performance evaluations), this relatively minor step may cause delays in execution and push-back on using the system in the business process. Although this approach,

standardized by the system, provides for better document control and audit trail over the manual process, it nonetheless may lead to delays and frustration in this stage of the sourcing process and the sourcing professional may need to intervene and redirect the workflow.

This example illustrates the challenges sourcing professionals may face when they use a sourcing enterprise system for certain work process activities during the governance stage of the sourcing process. Although sourcing enterprise systems may offer advantages in standardizing work processes for sourcing professionals, there may also be circumstances in practice where using the system to perform interdependent work activities during the governance stage may lead to delays and frustration which negatively impact sourcing professional job satisfaction. Prior research in other enterprise system contexts has suggested that these implementations place additional burdens on employees who then need to realign and renegotiate their interdependent work processes with collaborators (Robey et al., 2002; Sharma and Yetton, 2003). In contexts of high interdependence, this may mean that employees are required to engage in considerable planning and coordination outside of what is supported by the enterprise system (Van Der Vegt et al., 2000).

Although the work process standardization tools provided by sourcing enterprise systems may have certain job performance benefits, under conditions of high work process interdependence in a sourcing context, use may have a negative impact on a key job outcome—how sourcing professionals feel about their jobs.

Hypothesis 2: At lower/higher levels of Work Process Interdependence, Use for Governance will have a positive/negative relationship with Job Satisfaction.

Role of Job Satisfaction as Mediator to Job Performance

An employee's job satisfaction is reflective of their attitude toward the methods they use to perform their work activities (cf., Janssen, 2001). High positive appraisal of their job activities makes employees more willing to carry out tasks that contribute to effectiveness (Eagly and Chaiken, 1993; Judge et al., 2001). This is consistent with the IS literature that has suggested that satisfaction with the technology in the work process leads to downstream impacts on the performance of those activities

(Morris and Venkatesh, 2010; Seddon, 1997; Shang and Seddon, 2002; Straub et al., 1995). We expect that sourcing professionals' interactions with the sourcing enterprise system to perform their work process activities will likewise have an impact on their job satisfaction which will mediate this effect on their job performance.

Hypothesis 3: The interaction effect of Use for Selection and Work Process Interdependence on Job Performance is mediated by Job Satisfaction.

Hypothesis 4: The interaction effect of Use for Governance and Work Process Interdependence on Job Performance is mediated by Job Satisfaction.

METHODOLOGY

To test our research model empirically, we conducted a field study to examine how sourcing enterprise system use is related to job outcomes in the sourcing process. To support our understanding of the research context we collected qualitative data over a period of 18 months through interviewing category directors (supervisors for sourcing professionals), sourcing professionals (in multiple categories), IT managers and support staff; and, by observing steering committee meetings (directed by the CPO) and training sessions for the sourcing enterprise system. The data for the key constructs in our research model was collected after 12 months of use experience with the sourcing enterprise system. In section 4.1, we provide background information by describing the firm where our study took place and providing information about the sourcing professionals and the particular sourcing enterprise system that was implemented.

The Organizational Context

The Firm and the Sourcing Function

The empirical context for our study is a large manufacturer of paper, pulp, packaging and related chemicals that operates over 100 global manufacturing sites. The central strategic sourcing department is located at the corporate headquarters under the direction of a chief purchasing officer. At the time of our study the department was responsible for sourcing both goods (direct and indirect materials) and services,

where each sourcing professional was assigned to one primary category but also could spend some of their time on the other categories. For example, a sourcing professional could spend 80% of their time on sourcing direct materials, 10% on sourcing indirect materials, and 10% on sourcing services. In addition to the centralized sourcing group located at headquarters, the firm has other sourcing professionals located at its manufacturing sites throughout the U.S. Depending on the size of the manufacturing facility and the sourcing volume, although sourcing was their primary job responsibility, these professionals may be assigned responsibilities outside of sourcing. For example, a sourcing manager at a plant may spend 75% of their time on sourcing activities and the remaining 25% on administrative duties at the plant. As such, sourcing professionals vary not only in their job experience (experience as a sourcing professional), job tenure, experience as a sourcing professional in this organization, but also on the primary sourcing category and on the sourcing location within the organization, i.e., central sourcing department at headquarters or manufacturing plant.

Implementation of the Sourcing Enterprise System

Before the implementation of the enterprise sourcing system, sourcing professionals, both at the central sourcing department and the plants, used personal productivity applications at their discretion. Although several sourcing professionals had been recruited to evaluate potential enterprise sourcing systems and were very supportive of the project, a few others resisted top down change on principle and a number of others were ambivalent and took a wait-and-see approach. One sourcing professional who currently relied on spreadsheets to analyze suppliers and manage projects stated that while he was not entirely satisfied with the technology tools available to him, he was skeptical that a mandated sourcing enterprise system would make him better off. One reason why management wanted to implement an enterprise tool was that they wanted sourcing professionals to be able to aggregate spend with a supplier across projects and categories. Under the current set of tools it was difficult to share this information across categories and organizational units (e.g., between headquarters and field locations) and across sourcing professionals at headquarters. Even when the files that contained this information could be

shared, suppliers were oftentimes doing business under different names in different categories, and there was no way to consolidate this information across personal files.

The implementation process itself was supported by a power-user group who were recognized as being experts in the sourcing process and early and enthusiastic users of the tool. Based on input from this group, initial refinements were made to the system configuration. The system was introduced to the sourcing professionals following a day-long program of hands-on training during which time the sourcing professionals had the opportunity to begin entering information about their projects into the system. Ongoing and refresher training was offered over the next several weeks as sourcing professionals became more experienced with interacting with the system as part of their work processes. During these sessions users requested system enhancements which were referred for evaluation to a steering committee. On an ongoing basis users would be supported by staff expert in the sourcing enterprise system and knowledgeable about the business process.

To push the adoption of the system, senior managers implemented a policy in which sourcing professionals would not receive credit for their work on a project if they did not enter basic information about the project into the system. This is considered to be the baseline functionality of sourcing enterprise system use as we discussed earlier in theorizing enterprise system use. Although the use of additional features for supplier selection and for supplier governance was strongly encouraged, sourcing professionals were viewed to be experts in the business process and to have some discretion in which functionalities with respect to selection and governance to incorporate into work processes. Six months after the implementation of the system, the enhancements were completed and the system was being used by all sourcing analysts to enter basic information on their projects that were visible to supervisors and others in the work process. At this stage, we interviewed the Global Director of the business process, the category Directors and seven sourcing professionals, and while the system was being very broadly used by all sourcing professionals to enter basic sourcing project information, there was reported variability in what key functionalities for supplier selection and for supplier governance individual sourcing professionals had adopted as part of their work processes. This provided us with preliminary validation

for our theoretical distinction between use for selection and use for governance of the sourcing enterprise system that was likely to occur even when basic information on sourcing projects was being documented in the enterprise system by managerial mandate.

Measurement Items

We measured all constructs on multi-item, Likert-type scales anchored at (1) = strongly disagree, (4) = neutral, and (7) = strongly agree. The measurement items for each construct are presented in Table 1.

Sourcing Enterprise Systems Use: We drew on Burton-Jones and Straub's (2006) approach for conceptualizing and measuring the two enterprise system use constructs in the sourcing context. Here, we describe our process for measuring Use for Supplier Selection and Evaluation and Use for Supplier Governance. Following this approach, the researcher is encouraged to select measurement items that relate to the identified concept and to the other constructs in the nomological network. Working with a panel of domain experts (i.e., category directors, enterprise system vendor and consultants, and sourcing managers), we identified items that reflected the underlying structure of activities for supplier selection and supplier governance (e.g., consolidating supplier responses, making fair comparisons, verifying adherence to agreements).

Job Performance: After we reviewed relevant theory and research on job performance (Chopra and Meindl, 2001; Mentzer, 2004; Simchi-Levi et al., 2003), we followed a similar process in order to identify relevant measurement items for Job Performance. In consultation with the category directors, we identified measures of cost savings and avoidance, cycle-time reduction and inventory reduction as being the key items for evaluating sourcing professional job performance in this context.³

Job Satisfaction: Job satisfaction was assessed by 4 items based on Janssen's (2001) scale of affective responses to the substance and results of work activities.

³ Self-reported job performance measures were cross-validated with category manager aggregate assessments of the job performance of direct reports ($r=0.8$). For confidentiality reasons, the organization would not reveal the performance reviews of individual sourcing managers.

Work Process Interdependence: Work process interdependence was measured as an index of four items of task interdependence (Morgeson and Humphrey, 2006), weighted by the number of collaborators that the sourcing professional worked with in a typical sourcing process.

Control variables: To account for the possibility that job outcomes may vary across sourcing categories, we included sourcing category as a control variable in our study. Each sourcing professional worked in a primary category and may have responsibility in secondary categories. We captured the percentage of time spent sourcing in the other categories to account for heterogeneity in the categories they were involved in. We coded the sourcing categories as Services, Direct and Indirect Materials, and we measured each category as the percentage of time the sourcing professional spent working in that category.

We controlled for *job experience* (measured in years) to account for the impact of sourcing process knowledge. We controlled for *job tenure* (measured in years) to account for the influence of socialization into the organizational culture. We controlled for job location (whether the sourcing professional is based in the central sourcing department or in a manufacturing plant) to account for any possible differences in performance based on the definition of the sourcing roles at these locations.

Data Collection Procedure

We received a schedule for the system implementation, training sessions and a list of participating employees from the project manager. During the initial training session, the employees were made aware of the aims of this study survey and were requested to participate. We pre-tested our survey with category directors, IT managers and academics to assess validity and completeness in this context and to eliminate any ambiguity in wording. We modified the survey as necessary to reflect this feedback. Following 12 months of experience with the sourcing system, we had requested the business unit manager to send a customized email to each sourcing professional, containing a unique survey link. When an employee clicked on the link, the survey software was able to detect the employee and create a unique ID for the employee. Each survey link was introduced with a cover letter reiterating the purpose of the study

and details regarding anonymity and confidentiality. A reminder was sent to each participant within the following seven days. Based on the list provided by management, we invited 141 sourcing professionals to participate; we received a total of 125 (89%) usable responses.

ANALYSIS & RESULTS

We analyzed the survey data using SmartPLS 2.0 (Ringle et al., 2005) because it does not require multivariate normality of data and is especially well suitable for the theory-building orientation of our research (Chin, 1998; Gefen et al., 2011).

Measurement Model Assessment

First, we calculated item loadings and cross-loadings using partial least squares (PLS) for confirmatory factor analysis. Using the recommended procedure for PLS (Gefen and Straub, 2005), item-construct loadings were evaluated (Appendix B). Although the loadings derived from this method will be higher than from those usually derived from exploratory factor analysis (Gefen and Straub, 2005), each item loaded higher on its principal construct than on the other constructs by at least the suggested level of 0.10 (Gefen and Straub, 2005), thus supporting a claim for convergent and discriminant validity in the measurement model. We retained the relatively higher cross-loading items for use for selection and use for governance for reasons of content validity (Gefen and Straub, 2005). We further assessed convergent validity, which reflects the degree to which items for a given construct are in reality related, by examining Cronbach's alpha and internal consistency reliability, which uses item loadings within the nomological network (Fornell and Larcker, 1981; Nunnally; Straub et al., 2004). Further, we assessed discriminant validity among the constructs in our research model by examining the square root of the average variance extracted in relation to its zero-order correlation with other constructs. These results are reported in Table 2. We modeled our use constructs as reflective (for both use for selection and use for governance) because we theorized that the features employed for each stage of the business process would be used as a set in performing the activities for that particular stage of the business process and thus would covary (see

Petter et al, 2007). We cross-validated the results of our self-reported measures of job performance for the sourcing professionals with their respective category manager who was their direct report.

Table 2: Correlations, Convergent and Discriminant Validity

	Mean	s.d.	CR	α	USEL	USG	JP	JSAT	WPI
USEL	4.67	1.02	0.94	0.90	0.79				
USG	4.42	0.99	0.81	0.76	0.53**	0.60			
JP	4.32	0.96	0.88	0.80	0.11	0.27*	0.72		
JSAT	5.78	0.87	0.95	0.93	0.22	0.24*	0.45**	0.83	
WPI	--	--	--	--	0.05	0.04	-0.13*	-0.02	--
DM	23.86	32.56	--	--	0.26*	0.05	-0.06	-0.13*	0.00
JEXP	8.30	8.00	--	--	0.20*	0.24*	-0.04	0.09	0.17*
JTEN	12.83	10.58	--	--	0.05	0.13*	-0.16*	0.07	0.18*
IM	42.44	38.63	--	--	-0.16*	-0.06	-0.19	0.09	-0.10
SRVS	25.15	30.08	--	--	-0.10	0.01	0.03	-0.05	0.02
PJOB	88	25.85	--	--	0.19*	-0.02	0.04	0.25	0.16*
LOC	--	--	--	--	-0.44*	-0.17*	-0.20*	0.01	-0.18*

Notes: s.d. = standard deviation; CR = Composite Reliability; α =Cronbach's alpha; USEL=Use for Selection; USG = Use for Governance; JP= Job Performance; JSAT=Job Satisfaction; WPI=Work Process Interdependence; DM = Direct Materials; IM = Indirect Materials; LOC = Location; SRVS = Services; PJOB = Percent Job; JEXP = Job Experience (yrs.); JTEN = Job Tenure (yrs); Square root of AVE on diagonal, bold text; *=p < 0.05 (two-tailed).

Common Method Bias Assessment

We evaluated common method bias based on the procedure suggested by (Podsakoff et al., 2003).

We found the items to exhibit very low loadings on the method factor relative to the substantive factors.

We also conducted marker variable analyses to evaluate common method bias (Lindell and Whitney, 2001; Malhotra et al., 2006). Here again, the results suggest that common methods bias should not be of concern.

Structural Model Assessment

Our research model was tested using partial least squares analysis using data collected through survey questionnaires. We used 500 bootstrapping samples to estimate the standard errors and to test the statistical significance of the structural paths (Rai et al., 2009). We report the path coefficients, significance tests and r^2 results for Job Satisfaction, and Job Performance in Table 3. We mean-centered the variables involved in the interaction terms in order to guard against multicollinearity (Aiken and West, 1991; Cohen et al., 2003). The R^2 values for Job satisfaction ($r^2 = 0.20$) and (Job Performance ($r^2 = 0.33$))

indicates that our research model explains a substantial amount of variance in the job outcome variables. Our overall model posits the interaction effects of use for selection and work process interdependence and of use for governance and work process interdependence on job satisfaction positively relate to job performance. We generally find support for the research model; the results of a hierarchical PLS analysis are presented in Table 3, and the results of our mediation analysis are presented in Tables 4 and 5.

The first set of hypotheses posited the interaction effects of use for selection and use for governance, each in turn with work process interdependence on job satisfaction. We find support for our hypothesis (H1) that at lower/higher levels of work process interdependence, use for selection will have a more positive/negative relationship with job satisfaction ($\beta=-0.69$; $t=2.01$). Similarly, we find support for our supposition (H2) that at lower/higher levels of work process interdependence, use for governance will have a more positive/negative relationship with job satisfaction ($\beta=-0.49$; $t=1.78$). To further aid in our interpretation of these effects, we conducted a simple slope analysis⁴ (Aiken and West, 1991), and found the slopes of the interaction between use for selection and work process interdependence to be significant at $Z = 1$ ($t = 2.80$) and $Z = -1$ ($t = -1.65$). We found the moderation slope of use for governance and interdependence significant at $Z = -1$ ($t = 2.00$) but not at $Z=1$ ($t = 1.48$).

⁴ The formula we used to calculate significance for the simple slope of each interaction is

$$t = \frac{b_1 + b_3Z}{\sqrt{\text{var}(b_1) + 2Z\text{COV}(b_1b_3) + Z^2\text{Var}(b_3)}}$$

, where b_1 represents the coefficient of the independent variable and b_3 represents the coefficient of the interaction term.

Table 3: Hierarchical PLS Analysis

DIRECT MODELS					MODERATED MODELS			
Controls	Job Performance		Job Satisfaction		Job Satisfaction (1)		Job Satisfaction (2)	
	β	t-value	β	t-value	β	t-value	β	t-value
Job Experience	0.04	0.31	-0.12	1.34	-0.13	1.45	-0.13	1.43
Job Tenure	-0.08	0.97	0.12	1.34	0.14	1.57	0.13	1.41
Percent Job	-0.23	2.67	0.34	3.20	0.33	3.33	0.33	3.26
Location	0.12	1.40	0.26	2.41	0.23	2.03	0.24	2.16
Indirect	0.17	1.86	0.04	0.57	0.03	0.43	0.02	0.27
Services	0.02	0.28	0.04	0.65	0.03	0.66	0.03	0.60
Direct	-0.15	1.89	-0.12	1.43	-0.13	1.57	-0.15	1.73
Main Effects								
Job Satisfaction	0.57**	7.62						
Use for Selection			0.16	1.55	0.18	1.59	0.14	1.25
Use for Governance			0.17*	1.98	0.20*	2.09	0.22**	2.36
Work Process Interdependence			-0.04	0.85	0.60*	1.90	0.41	1.53
Interactions								
SEL*INTER					-0.69*	2.01		
GOV*INTER							-0.49*	1.78
R²	0.33		0.17		0.20		0.20	
ΔR^2					0.03		0.03	
F R²					4.50		4.50	

Notes: Indirect = 1. Indirect Materials; Direct = Direct Materials; SEL*INTER = Use for Selection * Work Process Interdependence; GOV*INTER = Use for Governance * Work Process Interdependence 2. *= $p < .05$; **= $p < .01$

Our final set of hypotheses (H3 and H4) posited that the interaction effects of each enterprise system use construct, in turn, and work process interdependence is mediated by job satisfaction in their respective impact on job performance and. Thus, we tested whether our hypothesized moderations were being mediated in their effect on job performance through job satisfaction (Edwards and Lambert, 2007). We followed a complementary two-step approach for assessing the hypothesized mediation (Subramani, 2004). First, we compared our research model which implies full mediation by job satisfaction with a partially mediated model which includes a direct path from each interaction term to each job performance variable. The direct effect of each interaction term on job performance was assessed independently. Because the models are nested, we used PLS to make statistical conclusions about model fit (Baron and Kenny, 1986;

Hoyle and Kenny, 1999). The results of these tests (Table 4) indicate that adding the additional direct path for each relationship significantly increased the variance explained in both job performance variables, suggesting that a model positing the direct effect of each interaction term on job performance outperforms a full mediation model.

Table 4: Nested Model Comparison

Direct Path	R² in Full Mediation	R² in Partial Mediation	f² Value	Pseudo F² F (1, 120)
Use for Sel * WP Inter → Job Perf	0.32	0.37	0.08	9.52
Use for Gov * WP Inter → Job Perf	0.31	0.35	0.06	7.38

Notes: 1. f^2 is calculated using the following formula: $(R^2 \text{ partial mediation} - R^2 \text{ full mediation}) / (1 - R^2 \text{ partial mediation})$. 2. Pseudo $F = f^2 * (n - k - 1)$, with 1, (n-k) degrees of freedom, where n is the sample size and k is number of constructs in model.

Next, we assessed the significance of the mediation effects in our model by examining the magnitude and variance of the paths among the independent (IV) (i.e., use for selection *work process interdependence; use for governance*work process interdependence), mediator (MV) (i.e., job satisfaction) and dependent variable (DV) (i.e., job performance; (Hoyle and Kenny, 1999). We calculated the magnitude of the mediation effect as the cross-product of the paths between each IV and the MV and between the MV and each DV; the standard error of each particular mediation path was computed using the magnitude and variance of the respective paths among the IV, MV and DV (Hoyle and Kenny, 1999). The statistical significance of each mediated path was assessed using the bootstrapping procedure (MacKinnon et al., 2002) and the results derived from PLS. These results are included in Table 5. This analysis provides support for our arguments that the impact of each joint effect on job performance is partially mediated by job satisfaction, supporting H3 and H4.

Table 5: Significance of Mediated Paths

Mediated Path	Path Magnitude	z-statistic
Use for Sel * WP Inter → Job Sat → Job Perf	-0.29	-6.26
Use for Gov * WP Inter → Job Sat → Job Perf	-0.26	-2.23

Note: 1. $z = P_1P_2 / \sqrt{P_1^2\sigma_2^2 + P_2^2\sigma_1^2 + \sigma_1^2\sigma_2^2}$

DISCUSSION

The motivation for this research was to enhance understanding of how sourcing professionals use sourcing enterprise systems in the context of their work processes and the job outcomes that result. This research responds to the Call for Papers of the Special Issue on integrating perspectives in IS and operations management to better understand how supply-chain and service processes can be enabled by IT. It also responds to recent calls in the OM literature for greater understanding of individual behavior in practical, operational contexts (Bendoly et al., 2006b). More specifically, we contribute to the literature examining behavioral responses to enterprise system implementations in operational processes (Bendoly et al., 2006a; Bendoly and Cotteleer, 2008) and to the literature examining the impact of enterprise systems in business process contexts (Seddon et al., 2010; Sykes, 2009) and on performance outcomes (Morris and Venkatesh, 2010; Morris et al., 2005; Sykes et al., 2009; Venkatesh et al., 2000; Venkatesh et al., 2003). In examining individual enterprise system use behaviors in the sourcing process, we also build on research in the IS literature that has examined micro-level system use behaviors (e.g., Burton-Jones and Straub, 2006) and their impact on individual performance and extend this understanding by considering contingencies in the individual work process context. By examining the impact of sourcing enterprise system use on sourcing professional job satisfaction and job performance we address calls in the literature for research examining the impact of technology adoption on job outcomes (Venkatesh, 2006). We recognized the importance of the technology and process context in conceptualizing the system use construct and in identifying

salient contextual factors that contravene the direct impact of system use on job outcomes. Our results support the contention that an understanding of the functionalities of the enterprise system and the characteristics of the work process context is crucial for understanding how sourcing professionals use these systems and the job outcomes that result.

This research makes important contributions to our understanding of how sourcing professionals use enterprise systems technology and how that use interacts with the work process context to impact job outcomes. First, we developed a context aware conceptualization of system use reflective of the work process and enterprise system. Our concept of strategic sourcing system rich use is modeled on the two core stages of the sourcing process above and beyond the baseline functionality of simply documenting a sourcing project. Since not all enterprise systems are comprised of the same set of applications and not every implementation environment will involve the same functionality, researchers can apply and extend this foundation to selecting and developing use dimensions as appropriate to the empirical context examined. Second, we identified work process interdependence as a contextual factor that interacts with system use in impacting job satisfaction. Our interaction analysis suggests that at low levels of enterprise system use, sourcing professionals engaged in highly interdependent work processes report higher job satisfaction than those engaged in low levels of work process interdependence. This interaction effect inverts, however, at high levels of system use, where sourcing professionals engaged in highly interdependent work processes report lower job satisfaction than those engaged in low levels of interdependence. Further, the results of our mediation analysis highlight the importance of job satisfaction for realizing individual job performance benefits in the strategic sourcing context. Our results indicate support for the theoretical argument that the interactive impact of sourcing enterprise system use and work process interdependence on job

performance is partially mediated by job satisfaction. These results suggest that the relationship between enterprise system use and job satisfaction extends beyond the technology itself to the work process context as elaborated below.

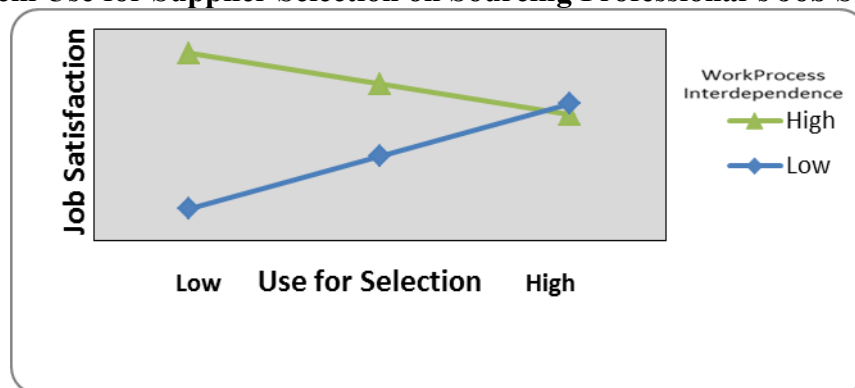
Work Process Interdependence as a Moderator of the Impact of Use for Selection on Job Satisfaction

The results of our moderation analysis suggest that the impact of enterprise system use on job satisfaction is more complicated than a direct effects model would suggest. (See Figure 3.) We find that high work process interdependence negatively moderates the impact of enterprise system use for selection on job satisfaction, resulting in lower levels of job satisfaction under high use than under low use. On the other hand, at low levels of work process interdependence, high use of the system to perform activities during the selection stage of the sourcing process leads to higher levels of job satisfaction than does low use of the system to perform these activities under low levels of work process interdependence.

The results of our study suggest the importance of examining the interaction effects of enterprise system use behaviors and the work process context, providing support for Johns' (2006) view that context can change the effects of key organizational behaviors. While the benefits of enterprise systems that accrue from consolidating and achieving consistency of enterprise-wide data (e.g., prices, spend by category, etc.) and the implementation of business process standards for interactions among collaborators are documented (Seddon et al., 2010; Sykes, 2009), it is important to consider the limits that constraints to interactions can impose in highly interdependent work process scenarios where sourcing professionals have to interact dynamically with internal clients, other sourcing professionals, and suppliers. When the nature of the sourcing process is such that there is the need for extensive interactions by sourcing professionals to access, interpret and clarify complex information (e.g., trust in suppliers, past

experiences with suppliers, innovativeness of suppliers, quality of complex products and services), the use of enterprise systems is unlikely to be effective, leading to the accumulation of frustrating and counterproductive experiences, thereby reducing job satisfaction.

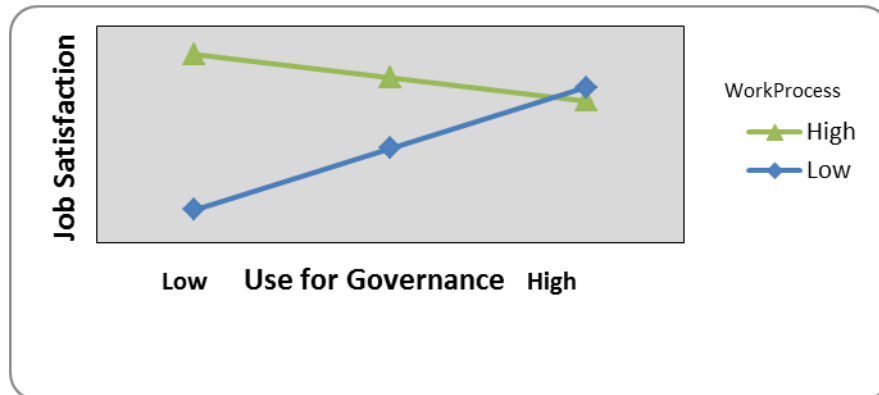
Figure 3: Moderation Effect of Work Process Interdependence on the Impact of Sourcing Enterprise System Use for Supplier Selection on Sourcing Professional's Job Satisfaction



Work Process Interdependence as a Moderator of the Relationship of Use for Governance on Job Satisfaction

Our results indicate that driving high levels of sourcing enterprise system use for supplier governance under conditions of high work process interdependence have a detrimental impact on job satisfaction. (See Figure 4.) On the other hand, high usage patterns under conditions of low work process interdependence for supplier governance are linked to higher levels of job satisfaction.

Figure 4: Moderation Effect of Work Process Interdependence on the Impact of Sourcing Enterprise System Use for Supplier Governance on Sourcing Professional’s Job Satisfaction



Here again, our findings suggest the importance of examining the interaction effects of system use behaviors and the work process context. The results of our moderation analysis suggest that the impact of sourcing enterprise system use for governance on job satisfaction is more complicated than a direct effects model would suggest. We find that driving high levels of enterprise sourcing system use for governance under conditions of high work process interdependence has a detrimental impact on job satisfaction. On the other hand, high usage patterns under conditions of low work process interdependence in the sourcing process are linked to higher levels of job satisfaction. We theorized that although the enterprise sourcing system is expected to improve consistency of enterprise-wide data and establish standards for collaboration in performing work processes, that these systems are also disruptive to existing interdependent work routines (e.g., Boudreau and Robey, 2005; Sharma and Yetton, 2003) and place additional burdens on employees who must renegotiate the performance of their work activities with collaborators. In the case of the use of sourcing enterprise systems for governance, in particular, the scripts for interactions implemented in enterprise systems are unlikely to cover the range of complex interactions among collaborators within the organization (e.g., sourcing professionals and internal clients) and across organizational boundaries (e.g., with suppliers) due to the

unstructured nature of information and complex decision criteria involved in auditing, renegotiating, and renewing contracts with suppliers. As a result, high use of sourcing enterprise systems under conditions of high interdependence may be especially limiting and stressful. At an extreme, sourcing professionals may have to invest the time and effort to also execute “shadow processes” outside of the available scripts implemented in the enterprise system to audit, discuss, renegotiate and renew contracts with suppliers. While using the scripts that are implemented in a sourcing enterprise system for auditing, discussing, renegotiating and renewing contracts may work well for the sourcing of certain products and services that require limited work process interdependence for supplier governance, the use of such scripts is likely to impose counterproductive restrictions, reducing job satisfaction.

Role of Job Satisfaction as Mediator to Job Performance

We find evidence from our mediation analysis to suggest that the interaction effects of both use for selection and use for governance, each with work process interdependence, on job performance are partially mediated by job satisfaction. Job satisfaction is frequently treated as a dependent variable; we identify its role in impacting job performance and thus suggest a more complete understanding of the relationships among job outcome constructs. As such, our findings suggest that IS success especially in contexts that entail knowledge-work require a careful elaboration of the mechanisms through which employee job satisfaction is enhanced because job satisfaction is a key mediator to realizing economic benefits from IT-enabled process interventions. The mediation pathway also reveals that psychological outcomes (satisfaction) and various economic outcomes (cost avoidance, inventory turns) should be considered in a more holistic manner to understand how complex IT solutions (e.g., enterprise systems) create business value in core interfirm operational processes that involve professionals engaging in knowledge work characterized by the imminent bounded rationality constraints,

incomplete information, and complex coordination with multiple stakeholders both internal to the firm (e.g., clients, sourcing category directors) and external to the firm (e.g., supplier sales representatives and account managers).

Implications for Practice

The results of our study respond to the Call for Papers of the Special Issue by providing several insights for managers who are responsible for sourcing system implementations or the sourcing business process. Our findings clearly demonstrate that enterprise systems can create positive effects in the sourcing context but that if work process characteristics are not considered, these complex, resource-intensive initiatives can end up yielding more downside than upside effects in terms of psychological and economic outcomes of key stakeholders. First, managers should be aware of the importance of assessing the work process context in driving sourcing enterprise system use. While prior research has found that job satisfaction declines initially following an enterprise system implementation, our results provide a more granular insight into how the work process context relates to job outcomes even after well after system implementation. Our results highlight work process interdependence as one characteristic of the sourcing professional's work process context on which managers could intervene to meaningfully define how the enterprise system should be used, along with other IT-enabled and non-IT enabled processes, to drive job satisfaction. In particular, our analysis and discussions with sourcing professionals suggests the importance of carefully evaluating how the use of the system can be scaled to contexts where the work process interdependence is high. If the interdependence entails exchange of complex information and extensive negotiation, the role of complementary IT-enabled and non-IT processes (e.g., face-to-face discussions) that are suitable for the transfer of complex information should be evaluated. The challenge, of course, is for managers to determine the complementary or substitutive nature of the relationship of specific

functionalities of the enterprise systems and other modalities of information exchange and collaboration as the context of sourcing changes from low work interdependence to high work interdependence. Second, managers should also recognize the importance of job satisfaction for conveying the impact of usage behavior on job performance. Our results indicate that job satisfaction is crucial to garnering the full job performance benefits of using sourcing enterprise systems and evaluating job satisfaction, and not just performance, is important even in the post-implementation phases of the enterprise system. Indeed, in the post-implementation phases, the sourcing professionals are likely to have developed beliefs of the system's strengths and limitations based on their accumulated experiences. Diagnosing the reasons for low/high job satisfaction through discussions with sourcing professionals using detailed descriptions of usage experiences using even anonymous methods can provide a powerful means to improve the configurations of enterprise systems and to complement them with accompanying process solutions. Finally, managers should also recognize that assessing system use behavior is more complex than recording the number of pages accessed or duration of access and that the conceptualization and measurement of use behavior also has implications for assessing job outcomes.

Limitations and Future Research

The results of this study should be interpreted considering its strengths and limitations. This research represents the experience of a single organization in the paper manufacturing industry implementing a sourcing enterprise system. Caution should be applied in generalizing these results to other enterprise system implementations, business processes and industry contexts. Future work may provide additional insights by examining the use of other sourcing enterprise systems that are implemented in other industry and organizational contexts. Also, while we considered enterprise system use for two key sourcing functions, supplier selection and

supplier governance, it will be useful to understand how solutions (e.g., social networking capabilities to interact with suppliers) can be used to promote the selection and governance process. Future research may also identify and validate other characteristics of the work process context that may be impacting job outcomes. Finally, future research on sourcing systems may also further elaborate the rich conceptualization of use to more granular dimensions (e.g., contract-based governance vs. relational governance).

CONCLUSION

The implementation of a sourcing enterprise system demands a great deal of organizational resources both in terms of human and financial capital. In order to manage and justify these costs managers need a better understanding of the complex relationship among usage behaviors, work process characteristics and job outcomes. We conceptualized and measured enterprise system use appropriate to a use context comprised of sourcing professionals using a sourcing enterprise system to perform sourcing work activities. We demonstrated the utility of a rich conceptualization of sourcing enterprise system use that contrasts use for supplier selection and use for supplier governance in that this rich conceptualization provides a basis not only to describe the usage behaviors of sourcing professionals in a more nuanced manner than possible with lean measures of use (e.g., duration) but also in that it provides a basis to uncover countervailing interactions between each of these types of use and salient characteristics of the sourcing context. Importantly, we uncovered that both types of use generate positive psychological outcomes (job satisfaction) and economic outcomes (job performance) when work process interdependence is low but that they create negative psychological and economic outcomes when work process interdependence is high. Collectively, our study demonstrates the

critical need to closely coordinate initiatives to implement complex enterprise systems and innovate operational processes by considering the interactions between the two.

APPENDIX A – Measurement Items

Construct	Items	References
Use for Selection	When I am Using the e-sourcing tool, I use feature that help me to... 1. ...keep the playing field level for all potential suppliers. 2....engage as many potential suppliers as possible. 3....consolidate the responses of suppliers. 4....make even comparisons across suppliers.	Burton-Jones & Straub (2006)
Use for Governance	When I am using the e-sourcing tool, I use features that help me to... 1....develop contracts to manage suppliers. 2. ...verify that a supplier is adhering to contract terms. 3....collaborate with suppliers.	Burton-Jones & Straub (2006)
Job Satisfaction	How satisfied or dissatisfied are you with... 1....your work performance? 2....the quality of your work performance? 3....the way you perform your work? 4....the way you carry out your work activities?	Janssen (2001); Janssen & Van Yperen (2004)
Job Performance	Please assess your sourcing performance for your primary category on the following dimensions: Cost Savings – One Time. Cost Savings – Run Rate. Cost Avoidance. Cycle Time Reduction. Inventory Reductions.	Developed for this study based on performance considerations of sourcing professionals
Work Process Interdependence	Cross-product of number of collaborators in typical sourcing project and index of following items: 1. My job cannot be performed independently of others. 2. My job cannot be planned without coordinating with others. 3. It is usually required to obtain information from others to complete my job. 4. My job requires frequent coordination with the effort of others.	Thompson (1967); Morgeson & Humphrey (2006); Sharma & Yetton (2003; 2007)

APPENDIX B – Item to Construct Loadings

	USEL	UG	JP	JSAT
USEL 1	0.97	0.78	0.12	0.22
USEL 2	0.66	0.48	0.16	0.13
USEL 3	0.96	0.64	0.07	0.25
USEL 4	0.92	0.68	0.08	0.15
UG 1	0.71	0.89	0.22	0.22
UG 2	0.36	0.66	0.24	0.01
UG 3	0.45	0.75	0.23	0.16
JP 1	0.01	0.20	0.88	0.37
JP 2	0.16	0.20	0.83	0.41
JP 3	0.11	0.28	0.67	0.36
JP 4	0.14	0.21	0.69	0.12
JP 5	0.08	0.20	0.79	0.21
JSAT 1	0.20	0.20	0.34	0.81
JSAT 2	0.13	0.15	0.42	0.94
JSAT 3	0.26	0.28	0.46	0.94
JSAT 4	0.19	0.23	0.42	0.94

Note: USEL 1-4=Use for Selection ;
 UG 1-4 =Use for Governance; JP= 1-5 Job Performance;
 JSAT 1-4=Job Satisfaction

APPENDIX C: Marker Variable Analysis to Evaluate Common Method Bias

To test for method bias we applied the marker variable method suggested by Lindell and Whitney (2001) and applied by Malhotra et al. (2006). We identified a low correlation marker variable collected during survey administration (R_{M1}). (See Table C-2.)

In Table X-1, we present the correlations after correcting for R_{M1} :

- Adjusting for R_{M1} , *all* correlations among the substantive variables differed by only .04.
- In addition, we computed the average correlation of the marker variable with the study variables (R_{M1avg}). Here, we observed a similar increase in correlations.

Factors	Uncorrected	M1	t	$M1_{avg}$	t
r(USEL,UG)	0.53	0.49*	6.21	0.57*	7.66
r(USEL,JP)	0.11	0.07	0.78	0.15*	1.68
r(USEL,JSAT)	0.22	0.18*	2.02	0.26*	2.97
r(USEL,WPI)	0.05	0.01	0.11	0.09	1.00
r(UG,JP)	0.27	0.23*	2.61	0.31*	3.60
r(UG,JSAT)	0.24	0.20*	2.25	0.28*	3.22
r(UG,WPI)	0.04	0.00	0.00	0.08	0.89
r(JP,JSAT)	-0.13	-0.17*	-1.91	-0.09	-1.00
r(JSAT,WPI)	-0.02	-0.06	-0.66	0.02	0.22

Notes: USEL=Use for Selection; UG=Use for Governance; JP=Job Performance; JSAT=Job Satisfaction; WPI=Work Process Interdependence; M1=Marker Variable: I have shared understanding with my collaborators on a project. *=p<.05 (two-tailed).

	USEL	UG	JP	JSAT	WPI	M1
USEL	1.00					
UG	0.53*	1.00				
JP	0.11	0.27*	1.00			
JSAT	0.22	0.24*	0.45**	1.00		
WPI	0.05	0.04	-0.13	-0.02	1.00	
M1	-0.06	0.02	-0.15	-0.13	0.22	1.00

Notes: USEL=Use for Selection; UG=Use for Governance; JP=Job Performance; JSAT=Job Satisfaction; WPI=Work Process Interdependence; M1=Marker Variable: I have shared understanding with my collaborators on a project. *=P<.05 (two-tailed).

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The Joint Impact of Enterprise Sourcing System Use and the Employee Work Context on Information Benefits

Abstract

This study examines the impact of enterprise sourcing system use on the information needs of sourcing professionals performing the sourcing business process. We conceptualize two distinct use behaviors aligned with key stages of the business process: use for supplier selection and use for supplier governance; we identify repetitive sourcing projects as being an important contextual variable in affecting the impact of employees' two use behaviors on the post-implementation change in employees' information accessibility and information credibility. To test our model, we pursued a longitudinal research design and collected data (at 3 points in time) on sourcing professional information needs pre-implementation and following 12 months of use and on use of the enterprise system six months post-implementation. The results of the interaction graphs suggest that sourcing professionals will realize higher information benefits from using the enterprise sourcing system if primarily sourcing repetitive projects and lower information benefits if primarily sourcing unique projects.

Keywords

Rich Enterprise Sourcing System Use, Information Benefits, Work Context, Sourcing Process

Chapter 4: Introduction

Many firms have implemented enterprise sourcing systems (ESS) to innovate the work processes of sourcing professionals. Some have realized significant benefits at the business process level from implementing these enterprise systems, while others have found lackluster results (e.g., Hsieh and Wang, 2007; Liang et al., 2007). While it is often assumed that important characteristics of enterprise systems like data integration and standardization will increase the information benefits in the business process (Davenport and Brooks, 2004), our understanding of how employees' system use and their work process interact to impact information benefits in the sourcing business process is limited. To investigate how this transformation occurs favorably, we draw on the system use (e.g., Burton-Jones and Straub, 2006; Devaraj and Kohli, 2003) and system success literatures (e.g., DeLone and McLean, 1992, 2003; Rai et al., 2002) to understand how sourcing professionals use these systems in the context of their work processes and the information benefits they realize. This work complements research that has investigated the use of IT innovations in the procurement process at the firm level (e.g., Mishra and Agarwal, 2010; Mishra et al., 2007). In the remainder of the introductory section, we describe what the pre-implementation information context is like, review the capabilities of enterprise sourcing systems that have the potential to improve the information benefits in the business process and identify our research objectives based on our review of knowledge gaps in the existing research literature.

Before the implementation of an enterprise system, sourcing professionals work in a fragmented and irregular information environment with the resident problems that arise from such environment (Goodhue, 1998; Goodhue et al., 1992a; Goodhue et al., 1992b).. To elaborate, in the pre-implementation context, sourcing professionals collect, analyze, store and communicate information using personal productivity software and communications technology

such as spreadsheets, faxes and email. As such, they have their own information bases that are not integrated across sourcing professionals and other business professionals (e.g., those in contracting) involved in various aspects of the sourcing process. This lack of integration of information has at least two impacts on the value of information in the sourcing business process as perceived by the sourcing professional. Because the information used by each sourcing professional is “siloes,” the location, or even existence of, information needed by others in the business process may not be visible or even discoverable using the existing information technologies and patterns of communication among participants in the business process. Second, even when needed data and information is discoverable, there are still at least two issues related to its credibility. One is that there may be a lack of trust in the source of the information and given that this information is not viewed by others it may not have been validated by others in the business process (Goodhue, 1998). For example, supplier performance ratings may be perceived as being more credible as information is contributed from and confirmed by multiple perspectives using established standards (Goodhue et al., 1992b). Second, there may be idiosyncratic data capture as different participants in the business process capture data and information differently. For example, one sourcing process participant might capture the parent company information while another participant captures and assigns information about the particular business unit. This may lead to confusion about whether or not all available information is complete and meaningfully integrated at the same level. Further, when purchasing novel or complex products the source of demand in the buyer organization and sourcing professional may both lack an understanding of product characteristics and the purchasing process, leading to uncertainty about the consistency and completeness of information in the sourcing process (Trautmann et al., 2009).

In order to address these particular issues in the pre-implementation environment, ESS incorporate capabilities for information accessibility and credibility. Some of the ESS features that support information accessibility are standardized reports and data extractors that ensure that operational data are collected and made accessible through the system, searchable repositories for project documents, support for multiple levels of granularity (e.g., line-item analysis of sourcing documents), and integration with external data sources for supply market data and information (Bharadwaj, 2006). Some of the system features that support credibility capabilities include standardized templates for entering information, unified master data for suppliers and items (across systems, business units and geographies) and data mapping tools to identify misclassified materials and duplicate suppliers (Gebauer and Shaw, 2004). Sourcing professionals may take advantage of capabilities for information accessibility and credibility through their use of the ESS which may lead to information benefits in the sourcing business process (Puschmann and Alt, 2005).

However, prior studies have not consistently found a positive relationship between system use and the ability to realize individual-level benefits (Petter et al., 2008). An investigation of context may provide insight into why these inconsistencies occur (Johns, 2006) and extend understanding from *whether or not* ESS use is effective to an understanding of the *specific contexts where* ESS use is effective or ineffective. Our research builds on the system use literature (e.g., Burton-Jones and Straub, 2006; Devaraj and Kohli, 2003) as well the IS success literature, particularly that which has examined the impact of information system use on individual outcomes (e.g., DeLone and McLean, 1992, 2003; Rai et al., 2002). In order to extend this foundation and specifically the understanding of how ESS use leads to information benefits for employees in the post-implementation phase, this study pursues the following objectives: (1)

develop a rich conceptualization of ESS use behavior consistent with the features of the IT, the activities of the work process, and the stages of the sourcing business process; (2) understand how the sourcing work context interacts with ESS use behavior; and (3) assess the impact of ESS use on individual-level information benefits in the business process.

THEORY

Rich Enterprise Sourcing System Use⁵

In order to realize the benefits from investments in enterprise systems, employees need to interact with the system (DeLone and McLean, 1992; Devaraj and Kohli, 2003). Much previous research has taken an atheoretical approach to conceptualizing the use construct and has applied omnibus measures that try to capture the entire content of the activity (Burton-Jones and Straub, 2006). Common examples of this approach are frequency of use, which may be measured by the number of system log-ins, duration of use, which may be measured by the amount of time a user is logged-in to the system and intensity of use, reasonably measured by the number of times a particular feature is used. A problem with this approach, as noted by Burton-Jones and Straub (2006), is that it considers usage behavior at a level that obscures what is actually happening in the complex behavior.

As an alternative, Burton-Jones and Straub (2006) suggest a two stage approach to conceptualizing and measuring use behavior. In step one, the definition stage, the researcher defines the distinguishing characteristics of use and the assumptions of use. In step two, the selection stage, the researcher selects the best measures for the part of the use activity that is of interest. We follow this approach in the present essay.

⁵ Description of Rich Enterprise Sourcing System Use is adapted from Essay 2 of the dissertation.

We apply a conceptualization of use behavior that is closely linked to the stages of the sourcing process, individual work activities and the sourcing enterprise system. We define rich use of the enterprise sourcing system as the use of one or more features of the system to perform a work activity in the sourcing process. In order to operationalize this construct, we select the elements of use most pertinent to our context. Because our context involves a complex technology in a complex work process, we combine features of the enterprise system and elements of the work process. This approach considers the context, which is important to understanding use across processes and contexts (Devaraj and Kohli, 2003; Subramani, 2004).

Burton-Jones and Straub (2006) note that, given the complexity of the usage construct, the researcher can validate what parts of the usage construct they are measuring based on the context of the study. In our research context, we identify two distinct usage constructs—use for selection and use for governance—that correspond to two stages of the sourcing process; Table 1 describes example use behaviors for each construct.

In section 4.1 below, we describe the particular measures selected to reflect use for selection and use for governance.

Table 1: Examples of Sourcing Enterprise System Use by Sourcing Professionals

Use for Supplier Selection	Use for Supplier Governance
Automating the creation of requests for information, proposals, and quotations.	Automating rebidding, auditing, renewing and renegotiating activities.
Creating a repository where supplier profiles, updated files and discussion records are kept.	Defining metrics and creating supplier performance scorecards.
Analyzing bids using collaborative scoring, weighted scoring, cost calculations, side-by-side comparisons or pricing and savings reports.	Creating unique portals where suppliers can participate in collaborative discussions, view scorecard performance and view active contracts.

Context of Use: Repetitive Sourcing Projects

Routine sourcing activities usually involve the processing and communication of large amounts of standardized information; thus the performance of these activities have benefited from the application of information technology (Teo et al., 2009). Typically, because the attributes of routinely sourced items are well-known to the organization, they are fully described in the standard representations of products provided by the enterprise system (Bichler, 2000; Bichler and Kalagnanam, 2005). However, it is not so easy to completely represent the attributes of products that are not well known to the organization and the sourcing professional, and related research in the adoption of e-procurement systems has noted the challenges of applying technology to the purchase of items having complex or multiple attributes (e.g. (Trkman and McCormack, 2010; Wu et al., 2007)). Given the importance of the distinction between routine vs. unique projects in the application of information technology in other contexts, we expect it will be salient in the application of an ESS to sourcing activities.

Table 2: Comparison of Characteristics of Repetitive and Unique Sourcing Projects

Sourcing Project Characteristic	Repetitive Sourcing Project	Unique Sourcing Project
Knowledge of features or characteristics of good or service	Well understood by the sourcing professional	Requires complex discussions with source of demand and suppliers
Knowledge of supply market	Potential suppliers identified; offerings understood	Number of potential suppliers, offerings may be unknown or not previously evaluated
Knowledge of supplier	Supplier capabilities and performance known from long-term relationship	Supplier capabilities, performance may be unknown or not previously evaluated
Project Cycle Time	Relatively short-term	Relatively long-term
Project Frequency	Regularly sourced	One-time or infrequently sourced project

Information Benefits: Accessibility & Credibility

In order to make decisions about the selection and governance of suppliers, sourcing professionals need to repeatedly pursue information. Goodhue (1998) describes the information acquisition process as beginning with the decision to pursue certain information, then its acquisition, and finally the interpretation of that information. Here we focus on understanding how rich ESS use impacts the sourcing professional's assessment of their ability to access credible information needed to perform two distinct stages of the sourcing process. Previous work has demonstrated that information quality has an important impact on information system use (e.g., DeLone and McLean, 1992; DeLone and McLean, 2003; Halawi and Aronson, 2007; Rai et al., 2002) and has investigated the various dimensions of information quality (e.g., McKinney and Yoon, 2002; Nelson et al., 2005; Wang and Strong, 1996; Wixom and Todd, 2005).

Although IS quality has been proposed as a composite concept, many empirical research studies have treated it as a reflective construct (e.g., Kettinger and Lee, 1994; Rai et al., 2002). In doing so, the indicators of this construct are treated as equivalent, and the interest has been in exploring covariation. Here, we focus on two dimensions of information quality, accessibility and credibility, which previous research in IS success has recognized (Goodhue, 1998) and which we theorize as important to understanding patterns of ESS use and the information outcomes from that use. However, because we conceptualize access and interpretation (specifically, the degree to which information is credible) as two distinct stages of the information acquisition process (Goodhue, 1998) we emphasize that it is reasonable to expect that these items may not covary since, for example, the information that is accessible in the business process might not be interpreted as credible and the information that would be interpreted as credible may not be accessible. Therefore, we conceptualize these two dimensions

as two distinct constructs. This will allow us to examine (dis)similar effects on these two dimensions and to avoid the interpretational problems that occur when constructs are aggregated or treated as multidimensional (Williams et al., 2009).

Information Accessibility

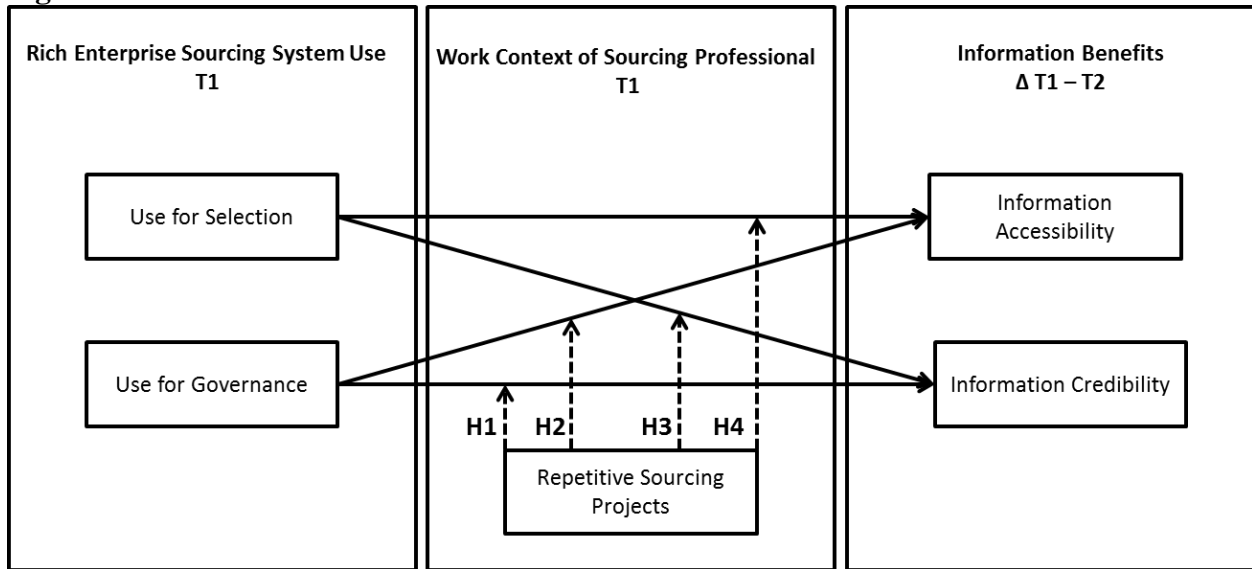
We describe information accessibility as referring to information being available to a decision maker in the appropriate format at the right time (Nelson et al., 2005; Wixom and Todd, 2005). Contingencies in different stages of the business process can impact this information characteristic. Although access to information is important to making decisions in both the supplier selection and supplier governance stages of the sourcing process, the information required to make the decisions unique to each stage is distinct. The process of selecting and evaluating suppliers requires identifying vendors, gathering and evaluating information about their competencies and aligning qualifications with identified needs. In order to enable decisions about supplier selection the sourcing professional needs access to information about the suppliers' adherence to required standards, support for relevant business processes, the quality of their goods or services and their logistical capabilities for on-time delivery. This information might come from the vendors themselves, from third-party information services or from the insight and experiences of other sourcing professionals in the organization. The performance of activities in the supplier governance stage requires access to information about the existence of a contract or agreement with a supplier, the current status and use of the document, supplier performance against the contract and marketplace changes. This information can be qualitative (e.g., preferences or abilities for being flexible) or quantitative (e.g., quality performance) but will mostly come from sources inside the organization such as the experiences of the source of

demand, automatically collected performance indicators stored in an information system or the experiences of other sourcing professionals.

Information Credibility

For the information used in the sourcing process to be effective, it should also be judged by the sourcing professional to be credible. We describe information credibility as referring to information that the user trusts because it is accurate and complete (Nelson et al., 2005; Wixom and Todd, 2005). One of the important steps in developing a strategy for a sourcing project and for ultimately selecting a supplier is understanding who is supplying the organization what good or service for what price. For information used in decision making during the supplier selection stage of the business process to be effective, it needs to be integrated across applications and systems so the sourcing professional has visibility into spend volume and demand aggregation opportunities. A sourcing professional will most likely not be confident in information about suppliers, items or prices that is redundant, inaccurate or incomplete. The supplier governance stage of the sourcing process requires evaluations of suppliers and decisions about such approaches as contract structure or whether or not to strengthen a relationship. The sourcing professional may be interested in price and item information from other sourcing projects or contracts and with information related to supplier compliance with the terms of an agreement and other key performance indicators (e.g., delivery, reliability, quality). If this information is unavailable or unreliable because of fragmented systems then the sourcing professional most likely will not have confidence in the information.

Figure 1: Research Model



HYPOTHESES

The Joint Effect of Use for Supplier Selection and Repetitive Sourcing Projects on Sourcing Professionals' Information Accessibility

Although the activities followed in the supplier selection stage of the sourcing process have not been standardized across firms, identifying potential suppliers, generating selection criteria and evaluating responses to those criteria are among the most prominent activities (De Boer et al., 2001). The supplier selection stage is one of the most challenging in the sourcing process because of the need to locate and evaluate both quantitative and qualitative data and information (Masella and Rangone, 2000; Nydick and Hill, 1992). In order to make decisions during this stage of the business process the sourcing professional may need to rely on historical data and experiences from prior projects (Weele, 2002). For example, the sourcing professional might need access to data on how a particular supplier performed on delivery times or on how the technical requirements for a similar RFP were written.

Sourcing enterprise systems are designed to support the work processes of sourcing professionals performing the selection stage of the sourcing process. Sourcing enterprise systems include features for storing and searching on all business documents (e.g., sourcing projects, RFXs) entered into the system as well as some master data fields (e.g., suppliers)(e.g., sap.com). This feature can enable the capabilities of sourcing professionals to access information from prior projects across a range of project characteristics. Another feature of sourcing enterprise systems are templates. These templates might be predefined with product or service attributes and a list of predefined values. A sourcing professional can use these standard templates to reduce the time needed to create an RFP.

An ESS provides an integrated repository of information for use in the selection stage of the business process and standardized templates to structure work activities. Repetitive sourcing projects source products that have clearly known characteristics from suppliers well known to the firm. The attributes of the sourced product and the supplier master data is represented in the integrated data schema and in the structured work practices.

Using the system for supplier selection work processes for non-routinely sourced items may have a negative impact on information accessibility. Typically, item or price information will be missing from master data and item attributes will not be supported by existing templates and scoring models. In order to source unique products the sourcing professional needs to understand the characteristics of the product, the nature of the marketplace and the behaviors and capabilities of suppliers whom the firm has little or no experience. The source of this information may be rich interactions with suppliers and with other firms sharing similar experiences in the marketplace.

H1: At higher/lower levels of repetitive sourcing, use for supplier selection will have a positive/negative relationship with information accessibility.

The Joint Effect of Use for Supplier Selection and Repetitive Sourcing Projects on Information Credibility

The impact of using the system for supplier selection activities on perceptions of information credibility may also be affected by repetitive sourcing projects. Features embedded in an enterprise sourcing system are designed to enhance the reliability and validity of the data and information in the system. For example, data mapping eliminates inconsistency among sources of the same data and data cleansing may remove incorrect data caused by user-entry error or incomplete or invalid values. In addition, repetitive sourcing projects should positively impact information credibility because consistent procedures should lead to more credible information in the business process because these “standard” procedures should reduce the variance in information entered into the system (Wang and Strong, 1996). Furthermore, these standard procedures should reduce perceptions that the information entered into the system is biased by subjective appraisals since these “rules” should create a common understanding for how particular values were arrived at (Strong et al., 1997b; Wang, 1998).

However, other ES features, such as templates may have a negative impact on whether a sourcing professional perceives the data in the system to be credible when working on unique sourcing projects. For example, when evaluating supplier responses to proposals the sourcing professional needs to be able to make like comparisons among supplier responses. If the RFQ templates do not support the creation of multiple RFQ types, the supplier responses may not accurately express the configuration of item characteristics, quantity and price. Unique sourcing projects may require non-standardized procedures for assessing and entering information about the business process. The constraints imposed by the system may restrict or eliminate subjective assessments or insights, which may lead to assessments that the information in the system doesn't match actual experience (Strong et al., 1997a, b).

H2: At higher/lower levels of repetitive sourcing, use for supplier selection will have a positive/negative relationship with information credibility.

The Joint Effect of Use for Supplier Governance and Repetitive Sourcing Projects on Information Accessibility

One of the principle activities performed during the supplier governance stage of the sourcing process is to prepare and negotiate a contract or agreement with the supplier (Weele, 2002). An ESS has features that support a centralized repository of contracts, work flow approvals for drafting, historical data collection and alerts for contract renewals (e.g., sap.com). During the supplier governance stage of the sourcing process, sourcing professionals also need to monitor supplier performance and adherence to the terms of the agreement. ESS offer features to monitor contract performance, internal use of the contract as a framework for purchasing and contract expiration dates.

Using the ESS for governance of the sourcing process may lead to greater information accessibility for repetitive projects. For example, during contract negotiation, there is a high likelihood that the system will provide visibility to an existing contract, the terms of which can be modified or copied. In addition, the sourcing professional can populate existing contract templates using item and supplier data contained in master data files. Because much of the information needed to perform governance activities for repetitive projects exists in the organization, the ESS provides an integrated platform that improves information accessibility.

In contrast, using the system to perform governance activities for unique projects may have a negative impact on information accessibility. One reason for this is that in unique projects there is little opportunity for reuse of the knowledge or content of a sourcing contract as new agreements need to be negotiated for new business situations. Copying existing attributes or information or developing agreements from existing templates may be impractical. The

automation features that supported the accessibility of historical information for repetitive projects may not be the source of the unique project information required by non-repetitive projects. In these contexts, where there are limitations in the ability of the ESS to support decision making about the governance framework for transactions, it is difficult to fully specify all contingencies in a contract. Contracts where contingencies cannot be fully specified are referred to as incomplete contracts (Williamson, 1989), and alternative governance mechanisms may be required to reduce transaction costs (Grover and Malhotra, 2003). However, relational governance mechanisms such as trust, develop over time through repeated social interactions and experiences (Poppo and Zenger, 2002). Using standard templates for governance activities may be perceived as limiting rather than facilitating access to information. Without ESS capabilities to support the collection and retrieval of these exchanges over time, sourcing professionals may not perceive that they can access this information even if it is technically available through the experiences of others in the firm.

H3: At higher/lower levels of repetitive sourcing, use for supplier governance will have a positive/negative relationship with information accessibility.

The Joint Effect of Use for Supplier Governance and Repetitive Sourcing Projects on Information Credibility

In order to streamline the contracting process for sourcing projects, sourcing professionals frequently rely on reusing contracts from previous projects (Sollish and Semanik, 2011). In the case of repetitive projects, information can be copied from existing contracts or built from a predefined template. Such a strategy is good practice because it helps ensure compliance with external regulations and internal practices (Sollish and Semanik, 2011). Furthermore, decision-making is supported by predefined reports that can include spend analysis for products and suppliers as well as information on key performance indicators for suppliers. Because this

information originates from inside the firm and is supported by the features of the ESS (e.g., data mapping, data validation), sourcing professionals may be confident in this information.

For non-repetitive projects, however, the source of this information may be outside the organization. Although a supplier might exist in a master data file, information surrounding their performance on a particular product may be absent or incomplete, or the contractual terms for an unfamiliar service may not be completely specified by a pre-existing template. What information is available to the sourcing professional for supplier governance may be incomplete or entirely absent. In these contexts, it may not be possible to specify complete contracts (Williamson, 1989), and alternative governance mechanisms that require frequent information exchange and trust building may be preferred to reduce transaction costs (Grover and Malhotra, 2003). In these cases, the use of standardized governance templates may limit access to information rather than promote it.

H4: At higher/lower levels of repetitive sourcing, use for supplier governance will have a positive/negative relationship with information credibility.

METHODOLOGY

To address our research objectives, we conducted a longitudinal field study at a large multinational paper products and related chemicals manufacturing firm. The employees whose usage behaviors we examine in this study are sourcing professionals. Sourcing professionals are knowledge workers who collect information about demand requirements, analyze the supply market, qualify and select suppliers, negotiate agreements and manage supplier relationships among other job responsibilities. The focal technology for our study is an enterprise sourcing system. An enterprise sourcing system is an integrated application composed of several modules that support the work processes of sourcing professionals tasked with executing the sourcing business process. The sourcing business process has not been standardized across firms; it typically requires an assessment of demand, the qualification and selection of suppliers,

and the creation of a framework for the governance of transactions and relationships. In order to inform our data collection, we interviewed senior business managers, IT managers and sourcing managers; we also observed training sessions for the system and attended steering committee and staff meetings. The focus of the present study is on the analysis of quantitative data collected through multiple phases of questionnaire administration corresponding to phases of the implementation process. The longitudinal data collection spanned about 12 months including measurements at three points in time. Figure 2 below describes when we measured what constructs.

Measurement Items

All of the constructs in our research model were measured using multi-item, Likert-type scales that were anchored at (1) = strongly disagree, (4) = neutral, and (7) = strongly agree, except for repetitive sourcing projects. We have included the specific measurement items used in our study in Table 3.

We describe the approach we followed in determining our construct measures next. In order to conceptualize and measure our Use for Supplier Selection and Use for Supplier Governance constructs, we followed the approach recommended by Burton-Jones and Straub (2006). We identified measurement items that relate to these concepts by working with a panel of domain experts (i.e., sourcing managers). We selected items that reflected the underlying structure of activities for supplier selection and supplier governance (e.g., consolidating supplier responses, making fair comparisons, verifying adherence to agreements). From this analysis, we developed measures for the Use for Supplier Selection and Use for Supplier Governance concepts. After we reviewed the data and information quality literature (e.g., McKinney and Yoon, 2002; Nelson et al., 2005; Wixom and Todd, 2005) we identified information accessibility and information credibility as two important characteristics of information valuable to knowledge workers in making sourcing decisions and governing the supplier relationship in the sourcing process. After reviewing the literature, we selected measurement items that reflected the content of these constructs; we worked with a panel of domain experts to review these items for face validity and understandability. The measurement items selected to reflect these constructs are presented in Table 3.

Following a review of the sourcing literature, we identified repetitiveness as an important characteristic of sourcing projects and selected a single-item measure. Single item measures are appropriate when the meaning of the item is clear, and a clear objective measure can be mapped to the construct of interest. Rossiter (2002) provides a theoretical rationale for using single-item measures. Rossiter argues that single-item measures suffice when (1) the *object* of the construct is easily and uniformly imagined (e.g., sourcing project), and (2) the *attribute* of the construct (e.g., repetitiveness, routineness) is also easily and uniformly imagined (Bergkvist and Rossiter, 2007; Rossiter, 2002). The “easily and uniformly imagined” criterion is based on Wittgenstein’s picture theory of language (Wittgenstein, 1961). In our case, we used the percentage of routine projects that a sourcing professional works on as a measure of sourcing project repetitiveness that characterizes the employees sourcing context. The sourcing category of the respondent, experience working in a sourcing role and length of time the individual had been employed with the organization were included as controls. These controls were chosen to account for outcome variance because of differences in the types of goods or services sourced and for differences in job knowledge and organizational commitment.

Table 3: Measurement Items

Construct	Items	References
Use for Selection	When I am Using the e-sourcing tool, I use feature that help me to... 1. ...keep the playing field level for all potential suppliers. 2....engage as many potential suppliers as possible. 3....consolidate the responses of suppliers. 4....make even comparisons across suppliers.	Burton-Jones & Straub (2006)
Use for Governance	When I am using the e-sourcing tool, I use features that help me to... 1....develop contracts to manage suppliers. 2. ...verify that a supplier is adhering to contract terms. 3....collaborate with suppliers.	Burton-Jones & Straub (2006)
Information Accessibility	1. I am able to access the specialized knowledge of others	Wixom and Todd (2005); Nelson et al. (2005)

	<p>required for a sourcing project.</p> <p>2. I am able to access the learning of others from previous projects (e.g., how savings were generated).</p> <p>3. I am able to access the experience of others with specific suppliers.</p>	
Information Credibility	<p>1. I am confident in the product-related information accessed through the system.</p> <p>2. I am confident in the project-related information accessed through the system.</p> <p>3. I am confident in the price-related information accessed through the system.</p> <p>4. I am confident in the vendor-related information accessed through the system.</p>	Wixom and Todd (2005); Nelson et al. (2005)
Repetitive Sourcing Projects	What percentage of your projects are for items that are repetitively sourced?	Bichler (2005); Bichler and Kalagnanam (2005)

Data Collection Procedure

From the implementation project manager, we received a schedule for the system implementation, training sessions and a list of participating employees. During the initial training session, the employees were made aware of the aims of this study survey and were requested to participate. Before the sourcing professionals were formally trained on the system, we collected data on information accessibility and information credibility in their pre-implementation work process. Following six months of experience with the ESS, we collected system usage data. After an additional 12 months of ESS use, we collected another wave of data measuring information accessibility and credibility at this point in the implementation. For each wave of data collection, we had requested the business unit manager to send a customized email to each sourcing professional, containing a unique survey link. When an employee clicked on the link, the survey software was able to detect the employee and create a unique ID for the employee. Each survey link was introduced with a cover letter reiterating the purpose of the study and

details regarding anonymity and confidentiality. A reminder was sent to each participant within the following seven days.

Figure 2: Data Collection Process

Pre-Implementation (T ₀) (Immediately before Training) T ₀	Post-Implementation (T ₁) (Six Months after T ₀) T ₁	Post-Implementation (T ₂) (12 Months after T ₀) T ₂
Measures: --Information Accessibility --Information Credibility	Measures: --Rich Use for Selection --Rich Use for Governance --Repetitive Sourcing Projects	Measures: --Information Accessibility --Information Credibility



ANALYSIS & RESULTS

We analyzed both our measurement and structural models using SmartPLS 2.0 (Ringle et al., 2005) because it does not require multivariate normality of data and is suitable for the theory-building orientation of our research (Chin, 1998).

Measurement Model Assessment

First, we examined our measurement model by calculating the item loadings and cross-loadings using partial least squares (PLS) for confirmatory factor analysis (see Table 4). Although the loadings derived from this method will be higher than from those usually derived from exploratory factor analysis (Gefen and Straub, 2005), each item loaded higher on its principal construct than on the other constructs by at least the suggested level of 0.10 (Gefen and Straub, 2005), thus supporting a claim for convergent and discriminant validity in the measurement model. We retained the relatively higher cross-loading items for use for selection and use for governance for reasons of content validity (Gefen and Straub, 2005). In order to assess the degree to which items for a given construct are in reality related, we examined Cronbach's alpha and composite reliability, which uses item loadings within the nomological network (Fornell and Larcker, 1981; Nunnally, 1978; Straub et al., 2004). We found strong consistency among the items used

to measure each construct as all values were above .9. We further assessed discriminant validity among the constructs in our research model by calculating the square root of the average variance extracted in relation to its zero order correlation with other constructs. We report these results in Table 5. We modeled our use constructs as reflective (for both use for selection and use for governance) because we theorized that the features employed for each stage of the business process would be used as a set in performing the activities for that particular stage of the business process and thus would covary (see Petter et al, 2007). Overall, the results indicate that the measures were reliable and valid for purposes of evaluation of the structural model and the hypothesized interaction effects. suggested by Lindell and Whitney (2001) and applied by Malhotra et al. (2006).

Table 4: Item to Construct Loadings

	USEL	UG	ACC	CRED	REPSRC
USEL 1	0.73	0.60	0.06	0.00	0.05
USEL 2	0.97	0.73	0.13	0.07	-0.01
USEL 3	0.97	0.69	0.15	0.03	0.02
USEL 4	0.98	0.54	0.14	0.05	0.04
UG 1	0.71	0.95	0.11	0.06	-0.02
UG 2	0.59	0.98	0.13	0.07	-0.03
UG 3	0.48	0.96	0.14	0.07	-0.04
ACC	0.14	0.13	1.00	0.74	-0.08
CRED	0.04	0.07	0.74	1.00	-0.13
REPSRC	0.02	-0.03	-0.08	-0.13	1.00

Notes: USEL = Use for Selection; UG = Use for Governance; ACC = Information Accessibility; CRED = Information Credibility; REPSRC = Repetitively Sourced Projects

Table 5: Correlations, Convergent and Discriminant Validity

	Mean	s.d.	CR	α	ACC	CRED	UG	REPSRC	USEL
ACC	-.22	1.89	--	--	--				
CRED	-.38	1.90	--	--	0.74*	--			
UG	4.33	1.09	0.97	0.96	0.13	0.07	0.96		
REPSRC	48.73	32.14	--	--	-0.08	-0.13	-0.03	--	
USEL	5.03	1.12	0.95	0.93	0.14	0.04	0.53*	0.02	0.92

Notes: ACC = Information Accessibility; CRED = Information Credibility; UG = Use for Governance; REPSRC = Repetitively Sourced Projects; USEL = Use for Selection; *= $p < .05$ (two-tailed).

Structural Model Assessment

We used 500 bootstrapping samples to estimate the standard errors and to test the statistical significance of the structural paths (Rai et al., 2009). The results of our analysis are presented in Table 6. We report the path coefficients, results of the tests for statistical significance and r^2 values for information accessibility and information credibility in Table 6. We orthogonalized each moderation term and entered all four hypothesized effects concurrently. We mean-centered the variables involved in the interaction terms (Aiken et al., 1991; Cohen, 2003). The R^2 value for information accessibility ($R^2 = 0.10$) and for information credibility ($R^2 = 0.10$) indicates that our main effects research model explains a moderate amount of variance in these outcome variables. Our overall model posits the interaction effects of use for selection and level of repetitive sourcing projects and of use for governance and level of repetitive sourcing projects positively relate to information accessibility and information credibility. We find support for the research model. Our first and second hypotheses posited the interaction effects of use for selection and level of sourcing project repetitiveness on information accessibility and information credibility, respectively. We find support for our hypothesis (H1) that at lower/higher levels of sourcing project repetitiveness, use for selection will have a more positive/negative relationship with information accessibility ($\beta=-0.24$; $t=2.69$); similarly, we find support for our supposition (H2) that at lower/higher levels of sourcing project repetitiveness, use for selection will have a more positive/negative relationship with information credibility ($\beta=-0.19$; $t=2.15$). Our third and fourth hypotheses posited that the interaction effects of use for governance and level of sourcing project repetitiveness on information accessibility and information credibility, respectively. We find support for our hypothesis (H3) that at lower/higher levels of sourcing project repetitiveness, use for governance will have a more positive/negative relationship with information accessibility ($\beta=-0.22$; $t=2.38$); similarly, we find support for our supposition (H4) that at lower/higher levels of sourcing project repetitiveness, use for governance will have a more positive/negative relationship with information credibility ($\beta=-0.18$; $t=1.76$).

Table 6: PLS Results												
	Controls Only				Main Effects				Moderated Models			
	Information Accessibility		Information Credibility		Information Accessibility		Information Credibility		Information Accessibility		Information Credibility	
Controls												
Chemicals	.25	1.21	.47*	1.73	.35	1.58	.47	1.76	.45*	1.78	.54*	1.82
DM	.32*	1.64	-.14	.68	.25	1.21	-.16	.75	.36	1.65	-.10	.52
MRO	-.21*	1.81	-.23*	1.97	-.37**	2.86	-.33**	2.43	-.32**	2.69	-.33**	2.35
OUT	-.03	.25	.18	.84	.23	1.39	.41	1.56	.07	.52	.32	1.33
Services	-.12	1.02	-.10	1.07	-.16	1.33	-.13	1.03	-.21*	1.80	-.15	1.18
% Job	-.11*	1.62	-.18*	2.16	.07	.14	-.09	1.31	.05	.91	-.04	.73
Job Exp	-.02	.53	.07	1.15	-.06	1.00	.07	.96	-.11	1.49	.03	.38
Job Ten	-.12*	1.67	-.10	1.45	-.13*	1.71	-.10	1.45	-.11	1.47	-.11	1.52
Main Effects												
Use for Selection					.20*	1.87	.10	1.01	.02	.26	.02	.24
Use for Governance					-.38**	2.29	-.32**	2.28	.46**	2.60	-.41	2.63
RSP					-.05	.61	.01	.61	-.03	.42	.03	.32
Interactions												
USEL*RSP									.53**	2.66	.36*	2.02
UGOV*RSP									.30*	1.72	.33*	1.77
R ²	.14		.12		.23		.19		.31		.24	
Δ R ²	--		--		.09		.07		.08		.05	
<i>p-value</i> Δ R ²	--		--		--		--		.05		.08	

Notes: *= $p < .05$; **= $p < .01$;

DM=Direct Materials; MRO=Maintenance, Repair and Operations; OUT=outsourcing; % Job=Percent of time spent on sourcing projects; Job Exp=Job Experience (in Sourcing role); Job Tenure=Time employed by firm (includes all job roles); RSP=Repetitive Sourcing Projects; USEL=Use for Selection; UGOV=Use for Governance

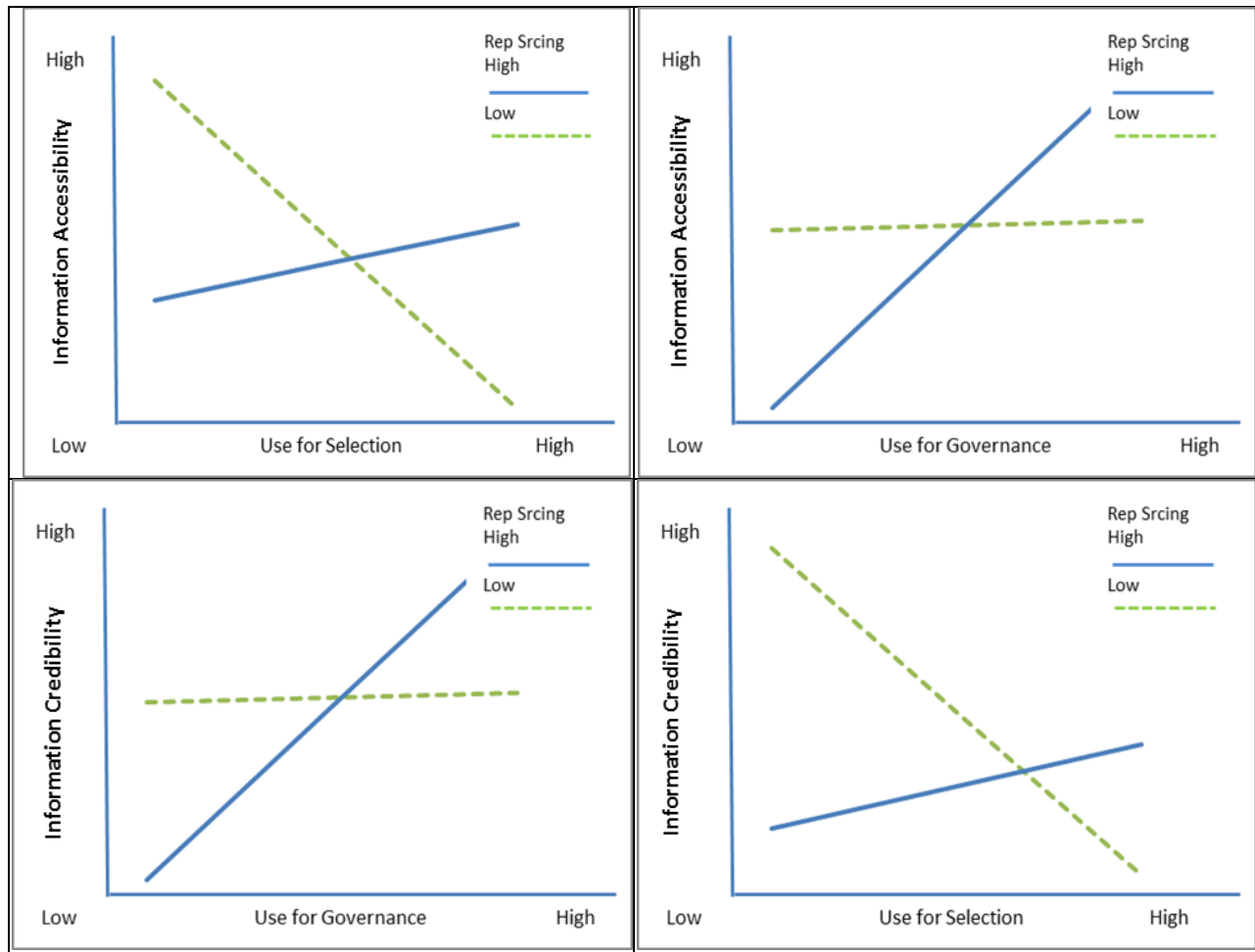
We graphed the interactions and analyzed the significance of the simple slopes⁶ as suggested by Aiken and West (1991). We did find significant slopes for use for selection and repetitive projects interactions at high ($Z=1$; $t = 3.85$) and low ($Z=-1$; $t = -2.27$) levels of the moderator in each interaction. We also found a significant interaction slope for use for governance and repetitive projects at low levels of the moderator ($Z=-1$; $t = -2.17$). The plots of our interaction effects are present in Figure 3. An interesting pattern emerged from our analysis as described by the interaction plots. As use for selection and use for governance increases for routine sourcing projects, there is a corresponding increase in information accessibility and credibility. However, as use for supplier selection and use for governance increase in non-routine project contexts, there is a corresponding decrease in information accessibility and information credibility.

⁶ The formula we used to calculate the t=value for each interaction slope is

$$t = \frac{b_1 + b_3Z}{\sqrt{\text{var}(b_1) + 2Z\text{COV}(b_1b_3) + Z^2\text{Var}(b_3)}}$$

, where b_1 represents the coefficient for the independent variable and b_3 represents the coefficient for the interaction term. .

Figure 3: Interaction Plots



DISCUSSION

We contribute to understanding how sourcing professionals' rich use of an ESS impacts the accessibility and credibility of information in the sourcing business process when a salient characteristic of their work process is considered. We extend knowledge in the information systems literature by identifying how different patterns of rich ESS use considered within the context of the work process lead to information benefits as perceived by employees using these systems.

Findings and Contributions

Our findings make important contributions to both research and practice. We extended the system use literature (e.g., Burton-Jones and Straub, 2006; Devaraj and Kohli, 2003) by theorizing and validating two system use constructs specific to the activities of sourcing professionals, the stages of the sourcing business process and the features of enterprise sourcing systems. In doing so, we were able to examine patterns of ESS use behavior specific to two different stages of the sourcing business process. We also extended research on the individual-level benefits from information system use (e.g., Delone and McLean, 2003; Rai et al., 2002) by theorizing and validating the impact of rich ESS use on information accessibility and credibility. Past research has not always found a positive relationship between system use and individual benefits (Petter et al., 2008); here, through our approach to theorizing use behavior and incorporating characteristics of the work process in analyzing its impact, we extend understanding of why rich conceptualizations of use behavior and the work process must be examined to understand the individual level benefits from use.

Our interaction plots describe an interesting effect whereby sourcing professionals who perform a high percentage of repetitive sourcing projects realize higher information benefits from high use, whereas those who perform a high percentage of unique sourcing projects realize higher information benefits from low levels of ESS use. More specifically, we find that sourcing professionals who enjoyed higher use of the ESS for supplier selection activities realized greater information accessibility and credibility when their work involved repetitive projects than when their work involved unique sourcing projects. However, at low levels of ESS use, we find that sourcing professionals who worked on unique projects realized greater information accessibility and credibility benefits than those who worked on repetitive projects. We find a similar pattern when examining use of the ESS for supplier governance activities, in that high sourcing professional use of the ESS garnered higher levels of information benefits for repetitive sourcing projects and lower information benefits for unique sourcing projects. We also found that at low

levels of use for supplier governance activities, sourcing professionals realized higher information benefits for unique rather than repetitive sourcing projects.

Taken together, our findings reveal how the information benefits garnered from rich ESS use are moderated by the repetitive nature of the sourcing project and contribute to our understanding of how the work context impacts the benefits realized from enterprise system use. Our findings extend the work of Morris and Venkatesh (2010) who evaluated the effects of ES implementation on job performance by showing that (a) ES use needs to be richly conceptualized in the use context (e.g. sourcing) and (b) the impact of ES use is moderated by the employees' work context in which the use is situated (e.g., repetitive projects where reuse, standardization, and completeness of contractual specification make ES use more effective in enhancing the access and credibility of information vs. unique sourcing projects where these characteristics function as constraints and reduce information outcomes. Our results show that championing high levels of ESS use requires understanding the work process context and the particular factors that can either amplify or reduce the information benefits realized. Our study has implications for future research on other enterprise system and business process contexts such that the usage behavior is explored in concert with key characteristics of the work process in understanding the impact on individual level benefits.

Our study also makes several contributions to management practice. First, since most enterprise systems are implemented in mandatory use environments, managers should carefully examine more-is-better assumptions. Based on our findings, managers should consider the type of project a sourcing professional works on and whether they are for repetitively or uniquely sourced goods or services. Second, in order to understand how sourcing professionals are using an ESS, some consideration should be given to examining how the sourcing professional is using certain system modules that align to different stages of the business process. For example, low use or rejection of the module for supplier governance activities may indicate issues in the supplier relationship or in the contract management process rather than the ESS itself. Finally, our study

suggests that one-size-fits-all approaches to understanding the use of enterprise systems in business processes is not tenable. More specifically, managers need to consider the unique characteristics of the business process and of the work process context in order to be able to understand how a particular enterprise system is being used and impacting individual-level benefits.

Limitations and Future Research

Future research can build on our work conceptualizing the rich ESS usage and in incorporating key characteristics of the work process in examining the impact of that use behavior on information benefits and more beyond several of the limitations of this study. For one, we only examined two stages of the sourcing business process; future research can extend beyond this limitation to examine other stages of the sourcing business process (e.g., demand determination) to investigate complementary benefits from the implementation and use of different ESS modules. While we found repetitive sourcing projects to be an important factor, other characteristics of the sourcing work context may give additional insight into and extend understanding of the use-to-information-benefits relationship. This work might also be extended to examine other information benefits such as reliability and being current.

CONCLUSION

Our study integrates the literatures pertaining to system use and information systems success with insights about the sourcing business process and enterprise sourcing systems, and it complements research on the firm-level use of IT innovations in the procurement process (Mishra et al., 2007). We establish that a sourcing professional's rich use of an ESS for supplier selection and supplier governance activities interacts with the repetitiveness of their sourcing projects to influence the information benefits they realize. We offer empirical evidence that the effect of employees' ESS use behavior on information benefits (i.e., credible and accessible information)

is more nuanced than a main effects model suggests, and that the benefits from system use is intensified or diminished by the characteristics of the sourcing project. More specifically, we found that high use leads to higher information benefits when sourcing repetitive projects, but that high use leads to lower information benefits when sourcing unique projects. For management practice, our study provides a framework for understanding ESS use behavior in various stages of the sourcing business process and the impact of characteristics of the sourcing project on the individual-level benefits from ES use.

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Chapter 5: Conclusion

The three essays that comprise my dissertation were drawn from a longitudinal field study of the work process innovation of sourcing professionals at a large multinational paper products and related chemicals manufacturing firm. In this study, we focused on examining how characteristics of the work process innovation context impact enterprise system (ES) acceptance, rich ES use behavior and the resulting individual-level job outcomes realized by knowledge workers in a strategic business process. The ES, an enterprise sourcing application, was introduced to innovate the work processes of employees who perform the sourcing business process. This study makes several important contributions to our understanding of how the work process context impacts knowledge worker behavioral responses and job outcomes during IT-enabled work process innovation.

Contributions to Research

Impact of Work Process Context and Implementation Characteristics on Knowledge Worker's Mental Acceptance of an Enterprise System Innovation

We found evidence of the importance of the work process context in impacting both the knowledge worker's acceptance decision as well as moderating the job outcomes and information benefits they realized. In examining the acceptance decision, we theorized that standards, identity and interdependence would be influential and found that work process identity had a direct, positive effect on performance expectations. We also found that interdependence and identity, in turn, interact with social support; and that standards and identity, individually, interact with technical support to have a complementary effect on performance expectations. We also validated cognitive adoption of an ES by knowledge workers as a gauge of mental acceptance in mandatory use contexts.

These findings have several implications for research. One consequence is the need to shift focus from an emphasis on behavioral intention to an examination of cognitive adoption. We provided theoretical support and empirical validation for the use of cognitive adoption in work

contexts characterized by the mandatory use of complex enterprise systems to execute complex work processes. We also emphasize that beliefs about the employee's work process are important to influencing mental acceptance of the technology in combination with beliefs about the technology and implementation characteristics. In particular, we described how perceptions of the benefits of the technology are endogenous to the employee's work context and their beliefs of the implementation process. Much previous technology acceptance research has viewed these beliefs as being predictors of behavioral intention, but we show that performance expectancy is endogenous to perceptions of the work process and can be influenced by these beliefs.

Conceptualizing and Measuring Rich Enterprise Sourcing System Use

We extended the system use literature (e.g., Burton-Jones and Straub, 2006; Devaraj and Kohli, 2003) by theorizing and validating two rich enterprise system use constructs specific to the activities of sourcing professionals: use for supplier selection and use for supplier governance. We developed these constructs considering the context of system use reflective of the work process and enterprise system. Our concept of strategic sourcing system rich use is modeled on two of the core stages of the sourcing process. Since not all enterprise systems are comprised of the same set of applications and not every implementation environment will involve the same functionality, researchers can apply and extend this foundation to selecting and developing use dimensions as appropriate to the empirical context examined.

Job Outcomes and Information Benefits from Enterprise Sourcing System Use

We identified job satisfaction and job performance as two important outcomes from enterprise sourcing system use. Although job satisfaction is frequently treated as dependent variable, we found evidence of its role in impacting job performance and thus suggest a more complete understanding of the relationship among job outcome constructs. In particular, our findings suggest that an understanding of the economic benefits of IT-process innovation requires an elaboration of the mechanisms leading to job satisfaction, given its mediating role in realizing job performance outcomes. We also identified information accessibility and credibility as information

benefits related to the use of an enterprise system and found evidence that high system use and high levels of repetitive work activities lead to higher levels of benefits versus high levels of use when performing high levels of unstructured work processes.