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An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage

Noel Wint Jr.
Nova Southeastern University, Nwintjr@cfl.rr.com

An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage

by

Noel Wint Jr.

A dissertation submitted in partial fulfillment of the requirements
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We hereby certify that this dissertation, submitted by Noel Wint, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

Timothy J. Ellis, Ph.D. — Date
Chairperson of Dissertation Committee

Ling Wang, Ph.D. — Date
Dissertation Committee Member

Lynette Ralph, Ph.D. — Date
Dissertation Committee Member

Approved:

Ronald J. Chenail, Ph.D. — Date
Interim Dean, College of Engineering and Computing

College of Engineering and Computing
Nova Southeastern University

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An Abstract of a Dissertation Submitted to Nova Southeastern University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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Abstract

Existing literature indicates that although both academics and practitioners recognize knowledge management (KM) as a source of competitive advantage, users are not always willing to use a knowledge management system (KMS). Because of the social nature of knowledge transfer, a KMS can be considered a socio-technical system. Many explanations have been presented for this failure to utilize the KMS. These explanations include a number of the socio-technical factors relating to people, processes, and technologies. While these factors may have significant explanatory power when examined independently, existing studies have not sufficiently addressed the interactions among all three socio-technical factors or their impacts on KMS usage.

The goal of this study was to develop a comprehensive understanding of socio-technical factors that impact KMS usage within decision support systems (DSS). A comprehensive framework was presented that will be helpful in developing and improving KMS initiatives and thus improving KM across the organization. This study identified factors of people (self-efficacy, social ties, and ease of use), processes (leadership, culture/climate, and governance), and technologies (system & information quality, and technology fit) and their influence on KMS system usage. Analysis for this problem required a causal, non-contrived field study employing structural equation modeling.

Founded on socio-technical systems theory, nine hypotheses were proposed. Data was collected using a 36 item survey distributed to KMS users from a variety of industries in the United States. Confirmatory factor analysis and an eight-stage structural equation modeling procedure were used to analyze 97 usable responses. The results confirmed that technology-oriented factors predicted knowledge seeking and contributing in DSS. Furthermore, significant positive relationships were confirmed between certain sociotechnical factors including: (1) people and process, (2) people and technology, (3) processes and technology, (4) processes and people, (5) technology and people, and (6) technology and processes. These findings extend the relevance and statistical power of existing studies on KMS usage.

This study indicated that the most important concerns for increasing KMS usage were system quality, information quality, and technology fit. Results also confirmed that in the context of this study, people-oriented factors (self-efficacy, social ties, and ease of

use/usefulness) and organizational process factors (leadership, organizational culture/climate, and governance) were not critical factors directly responsible for increasing KMS usage. However, the relationships among socio-technical factors all had positive significant relationships. Therefore, investments in people and process-oriented factors will create a more favorable perspective on technology-oriented factors, which in turn can increase KMS usage.

On a practical front, this study provided indicators to managers regarding a number of desirable and undesirable conditions that should be taken into consideration when developing or implementing knowledge management initiatives and the systems to support them. This study offered an original contribution to the existing bodies of knowledge on socio-technical factors and KMS usage behavior. The constructs presented in this study highlighted the significance of social and technical relationships in understanding knowledge seeking and contribution in a decision-driven organization.

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Chapter 1

Introduction

A knowledge management system (KMS) captures internal knowledge like corporate history, expert knowledge, and innovation, to make it available for reuse throughout the organization (Lin & Huang, 2008). Information technology (IT), in this case the KMS, is an important enabler of corporate initiatives like knowledge management (KM) (Alavi & Leidner, 2001). The IT team must be aware that the usage of a knowledge management system (KMS) is one of the critical success factors of the organization's KMS initiative (DeLone & Mclean, 2003).

While not all KM initiatives involve an implementation of IT, many firms will rely on IT as an important enabler of KMS (Alavi & Leidner, 2001). These IT implementations can be costly to the firm, especially if they are not implemented correctly (Lin & Huang, 2008). Deployment of KMS through use of technology can increase the firm's success in gaining a competitive advantage, however, the organization will not recognize the full benefits of the KMS unless users are willing to use the system (Kulkarni & Freeze, 2006). Because the investment in KMS can be significant, the project will be considered a failure if benefits are not realized. Improper understanding and alignment of system components can impede system usage, result in poor performance, or end in system failure (Hester, 2012).

KMS success depends largely on knowledge sharing (Wang & Noe, 2010). The extent to which users are willing to share using the system has been identified as one of the key factors in determining system effectiveness (Oyefolahan, 2012). Although KMS capabilities have significant relevance, just having the system will not necessarily guarantee success in the organization's KM projects (Joshi, Chi, Datta, & Han, 2010). Prior research studies have proven that users can have a significant impact on the usage of a KMS (Taylor, 2004). Therefore, if the organization does not consider these users when developing KMS initiatives, they may be more likely to fail.

Problem Statement

Although KM is accepted by both academics and practitioners as a source of competitive advantage, employees are not always willing to use a KMS. According to He, Qiao, and Wei (2009), the KMS requires a significant amount of social interaction to facilitate effective knowledge sharing. Therefore, getting employees to effectively use the KMS to improve organizational performance is a challenge (He et al., 2009; Tsai et al., 2010; Oyefolahan et al., 2012). Although IT and KMS have matured in the last several decades, the process of user acceptance remains difficult and complex (Hester, 2012). Systems supporting KM capabilities can add significant value, but merely having a KMS will not necessarily guarantee success in the organization's KM projects (Joshi, Chi, & Han, 2010). Capturing worthwhile organizational knowledge in the KMS continues to be a problem, therefore new solutions that increase meaningful usage of the KMS must be explored (Hester, 2010).

The intention of this study was to develop a comprehensive understanding of socio-technical factors that impact KMS usage. Successful KMS usage is dependent upon both contributors of knowledge to the system, and seekers of knowledge retrieving reusable information (Lin & Huang, 2008). Because of the social nature of knowledge transfer, a KMS can be considered a socio-technical system. Socio-technical systems (STS) consider people, process, and technology factors (Kwahk & Ahn, 2010).

Therefore, when properly configured they are usually more likely to be adopted by end users and provide value to the organization (Baxter & Sommerville, 2011). Much of the KMS usage literature relies on technical theories for explaining utilization, but there are few studies that have also considered a comprehensive set of social factors. As a result, previous studies have limitations that may not sufficiently explain factors contributing to KMS usage (Lin & Huang, 2008).

Prior research has proven that differences in people's cognitive abilities can have a significant impact on KMS usage (Lin & Huang, 2008). Taylor defined cognitive abilities as the consistent individual differences in the way people process information to make decisions (Taylor, 2004). These differences include how individuals think, solve problems, relate to others, and learn new skills (Taylor, 2004). Factors that relate to people are self-efficacy, social ties, and perceived ease of use/usefulness. If the organization does not carefully consider these cognitive differences when developing KMS initiatives, they may be more likely to fail due to lack of use (Chen, Chuang, & Chen, 2012). However, differences in cognition alone cannot sufficiently explain KMS usage.

The literature also supports process and organizational factors as a determinant of KMS usage. Furthermore, these factors are essential for knowledge sharing in general (Cao & Xiang, 2012). Throughout the KMS usage body of knowledge, organizational factors such as leadership, culture/climate, and governance were all found to be relevant factors. Prior studies suggest that leadership can influence system usage (Kuo, Lai, & Lee, 2011; Xue & Liang 2010). In addition to leadership, organizational climate also has a significant influence on both knowledge-sharing behavior and attitudes toward knowledge sharing (Xue & Liang, 2010). Another important process that influences knowledge sharing is knowledge governance, which consists of both formal and informal controls that define how the organization manages knowledge initiatives (Cao and Xiang, 2012). Although process variables can partially explain KMS usage, they lack explanatory power when considered without other socio-technical factors (Kwahk & Ahn, 2010).

Existing studies have established a positive relationship between perceived usefulness and system usage (Goodhue & Thompson, 1995). System quality has also been found to be influential on usage (Ramayah, Ahmad, & Lo, 2010). Regardless of system quality, data and information quality are equally important when considering utilization (Oyefolahan, 2012). Although literature supports the importance of technology factors when considering Information Systems (IS) and KMS usage, these factors alone are not enough to ensure system usage. This would suggest that further study in the area of KMS usage is needed.

Recent studies have determined that meaningful KMS usage can be impacted positively when socio-technical factors are considered during the implementation of KMS projects (Doherty, 2012). However, current studies on KMS usage do not sufficiently explain the relationship between KMS usage and socio-technical factors. Lee and Cheng (2012) concluded that knowledge reuse was found to be one of three key themes for KM research. Their study found that meaningful KM usage studies are under-explored and lack maturity. There is a need to address a gap in the KM usage body of knowledge by investigating the combined impact of socio-technical factors on KMS usage. The resulting model would be relevant for both researchers and practitioners in developing and implementing KMS initiatives.

Dissertation Goal

Much of the research and practice in KMS implementation and usage concentrates on component factors of socio-technical systems but few studies consider the combined impact of all three socio-technical factors. Although the individual components of socio-technical systems can influence KMS usage independently, the integration of all socio-technical factors simultaneously appear to provide a better explanation than any of the components applied alone (Baxter & Sommerville, 2011). This study addressed a gap in the literature by performing analysis that examined the relationship between people, processes, technology and KMS usage. A quantitative analysis of the impacts of socio-technical factors on KMS usage revealed major cognitive insights that could be useful in increasing the organization's competitive advantage.

Knowledge can be successfully transferred via KMS, but that transfer works best when the KMS was designed with socio-technical factors in mind. Socio-technical systems (STS) theories were helpful in developing a comprehensive understanding of the people, processes, and technology aspects of KMS usage. Based on the review of the literature, it is apparent that prior research has provided significant but only partial insights into how socio-technical factors impact KMS usage. The impact of personal cognitive differences and socio-technical factors in the KMS usage literature have largely been overlooked (Olschewski, Renken, Bullinger, & Moslein, 2013). Xue, Bradley, and Liang (2011) also suggested that process and organizational factors, as they pertain to

KMS usage, have not been sufficiently studied. Lin (2012) determined a need to further explore technology factors and their impact on system usage.

Research Questions and Hypotheses

The following research questions provided the basis for this study:

1) What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage?
2) What are the relationships among these factors and how do they influence KMS usage?

To understand how people, process and technology factors are related, STS theory provided a useful theoretical foundation for understanding determinants that can enhance KMS usage. The theory is robust enough to address personal cognitive dimensions but is also flexible enough to accommodate the process and technology aspects of system usage (Lin, 2012). The central theme of this study was: How do the various elements included in the STS theory interact in predicting KMS usage? To answer this question, the following hypotheses were proposed:

H1: More favorable people-oriented factors in an organization will promote greater KMS usage.

H2: More favorable organizational process factors in an organization will promote greater KMS usage.

H3: More favorable technology-oriented factors in an organization will promote greater KMS usage.

H4: More favorable people-oriented factors in an organization will promote a more favorable perspective of the process-oriented factors in that organization.

H5: More favorable people-oriented factors in an organization will promote a more favorable perspective of the technology factors in that organization.

H6: More favorable process-oriented factors in an organization will promote a more favorable perspective of the technology factors in that organization.

H7: More favorable process-oriented factors in an organization will promote a more favorable perspective of the people-oriented factors in that organization.

H8: More favorable technology factors in an organization will promote a more favorable perspective of the people-oriented factors in that organization.

H9: More favorable technology factors in an organization will promote a more favorable perspective of the process factors in that organization.

These hypotheses provided a robust foundation to analyze the relationships among the relevant socio-technical factors and their influence on KMS usage.

Relevance and Significance

Organizations are not likely to recognize the full benefits of the KMS unless users are willing to use the system. Because the investment in KMS can be significant, the project will be considered a failure if the system is not used and visible benefits are not realized (Doherty, 2012). Improper understanding and alignment of socio-technical system components can result in poor performance, lack of usage, or ultimately system failure (Hester, 2012). It has also been recognized that successful KMS deployments depend largely on knowledge sharing (Wang & Noe, 2010). The extent to which users are willing to use the system is a key factor in determining system effectiveness (Oyefolahan et al., 2012). Therefore, KMS usage must be recognized as a key determinant of KMS success.

The interaction of social and technical factors can facilitate conditions for successful, or unsuccessful, organizational performance. Socio-technical systems is a relevant theory that can explain the interrelatedness of the social and technical aspects of a KMS. Hester (2012) recommended considering socio-technical systems theory to examine the social and technical aspects of a work system. Jelavic also noted that the socio-technical system perspective on KM outlines a holistic approach that delineates social and technical factors in human work and systems (2011).

Understanding the determinants of KMS usage provides a continued source of relevant topics for researchers seeking to advance the knowledge management (KM) body of knowledge. According to Kankanhalli et al. (2005), strategically managing knowledge is essential to the organization's competitive advantage. Therefore, KMS usage has significant business relevance. Studies that focus on KMS usage deliver a unique dimension to support a better understanding of KMS (Lin & Huang, 2008).

Much of the emphasis in existing KMS literature has been placed largely on information technology and not on personal cognition (Taylor, 2004; Lin & Huang, 2008; Wang & Noe, 2010). There is also a benefit in understanding personal motivation perspectives as they relate to KMS usage (Lin & Huang, 2008). Understanding determinants of KMS usage and how they interact should ultimately be helpful in increasing utilization of the systems. The study of KMS usage can contribute to broader understanding of both KM and KMS. Proper understanding of these relationships will prove useful for both researchers and practitioners.

Barriers and Issues

One problem that may have presented a barrier to developing this study was the ability to obtain a large enough sample size to yield significant statistical results. Several studies reviewed in the literature performed structural equation modeling (SEM) with relatively small sample sizes. This study employed Partial Least Squares (PLS) to perform the data analysis, which is a form of structural equation modeling. Although Henseler et al (2009) reported that PLS can be more effective than other techniques when addressing small sample sizes, a goal of this study was to utilize a relevant sample size to increase generalizability. Henseler et al (2009) recommended that PLS sample sizes greater than 200 provide significant statistical power, but exploratory studies may utilize less. The inherent bias that is introduced with volunteer responses also presented a challenge to the study. The researcher developed a methodology to mitigate this bias, and to yield results with a high level of validity. Research was not supplemented with actual usage data, so access to an appropriate system was not critical.

Finally, the proposed research also necessitated multi-disciplinary research and theoretical analysis between the concepts of socio-technical systems theory and knowledge management system usage. While, each of these fields has existing work relevant to this proposed study, they utilize differing terminology, research methods, and reporting styles. There are also few antecedents that attempt to use robust amalgamations of these disciplines that define the study’s theoretical framework. This presented a challenge to the researcher in properly integrating and synthesizing the relationships between these constructs.

Assumptions, Limitations, and Delimitations

Assumptions

1. It was assumed that study participants were an adequate representation of knowledge workers that contribute to or retrieve information from a KMS.
2. When completing the survey, it was also assumed that participants would provide complete and truthful responses in a timely manner.
3. Study participants had a valid postal address, e-mail address, or access to a computer and the Internet. Furthermore, participants would be familiar with the use of web-based surveys.
4. Despite rigorous validation processes, socio-technical factors and KMS usage could be accurately measured using the survey instrument designed for the study.

Limitations

1. The sample of voluntary survey respondents may not have been representative of a given population. Self-reported questionnaire responses may not have fully represent sample outcomes as they were reliant on the truthfulness of those being surveyed.
2. Although the researcher attempted to control bias in survey responses, total bias can never completely be removed when relying on self-reported data (Leedy & Ormrod, 2010).

3. Investigation of the research problem was based on a point in time, therefore, results may differ if a longitudinal approach to the study is conducted over a longer period of time.
4. To assure manageability of the collected data, the survey instrument contained only multiple-choice items and limited open-ended response items.

Delimitations

1. Due to the unique sample available for the study, results may not be generalizable beyond the specific population from which the sample was drawn (Sekaran & Bougie, 2009).
2. Due to the large number of potential participants in the study population, the current study was focused only on KMS users within the United States.
3. Only KMS were measured in the study. Generalizations to other types of information systems may be limited, or even inappropriate.
4. The study was limited to several specific socio-technical factors related to people, processes, and technologies. It was not possible to address all possible socio-technical factors in the scope of this research.

Definition of Terms

Ease of use/Usefulness. The user's belief that knowledge sharing can improve their job performance, productivity, effectiveness, or ease of task completion (Kulkarni, et al., 2006).

Electronic Knowledge Repository (EKR). A key technology used to facilitate codification and storage of knowledge for reuse (Grover & Davenport, 2001).

Explicit Knowledge. A formal and systematic type of knowledge that can be easily communicated and shared. This knowledge can be transferred through information systems (Nonaka, 1991).

Governance. A vital component of the KM framework. Without governance, there is no assurance that the KMS will ever be used. Governance provides clear corporate expectations, performance management, and KM support (Lin et al., 2013).

Information quality. The ability of information to represent its content. Quality is characterized by relevance, timeliness, and comprehensibility (Kulkarni, et al., 2006).

Knowledge Management (KM). Includes the acquisition, creation, storage, sharing, and usage of knowledge to increase organizational effectiveness and competitive advantage (Alavi & Leidner, 2001).

Knowledge Management System (KMS). A technology used to support and enhance organizational knowledge management for the purpose of gaining a competitive advantage. The system supports application of explicit and tacit knowledge (Alavi & Leidner, 2001). Alavi and Leidner note that many KMS can be categorized as one of the following:

1. Expert Systems – domain expert knowledge
2. Groupware - collaboration tools
3. Document management systems – versioning and document sharing
4. Decision support systems – informed decision-making
5. Database management systems – storage and retrieval of data collections
6. Simulation systems – modeling real world scenarios

KMS usage. The implementation, analysis, and development of knowledge in such a way that the organization can learn and create knowledge to promote better decisions (Kulkarni et al., 2006).

Knowledge. Gained by deriving cognitive insights from facts that have been placed in context, analyzed, and synthesized using frames of reference, mental comparison, and consideration of consequences (Davenport & Prusak, 1998).

Leadership. The analysis and synthesis of various market conditions and organizational variables to provide vision and direction for the organization (Scovetta & Ellis, 2014).

Organizational Culture/Climate. Social influences arising from other people that influences an individual's social and knowledge sharing behavior (Xue et al., 2011).

Self-efficacy. The extent or strength of one's belief in their ability to complete tasks and reach goals using an information system (Lin & Huang, 2008).

Social ties. Established trust and communication that enhances the social interaction among individuals and promotes knowledge sharing (Chai & Kim, 2012).

Socio-technical System (STS). An approach to complex organizational work and system design that recognizes the interaction between people, processes, and technologies (Baxter & Sommerville, 2011).

System Quality. Measures of the system's ability to support KM effectiveness which can be characterized by accessibility, knowledge quality, usability, and relevance (Kulkarni, et al., 2006).

Tacit Knowledge. The informal or uncodified knowledge gained from experience. This knowledge is not easily transferred because it is difficult to codify (Davenport & Prusak, 1998).

Technology Fit. The extent to which technology features match the requirements of the task (Lin & Huang, 2008).

Summary

Chapter 1 identified the problem that although KM is accepted by both academics and practitioners as a source of competitive advantage, employees are not always willing to use a KMS. The goal of this study was to determine if socio-technical factors of the KMS are predictive of KMS use. Because KM is an important factor to organizational success, there was a need to address a gap in the KM usage body of knowledge by investigating the collective impact of socio-technical factors on KMS usage.

Chapter 2 reviewed the literature relating to constructs of KMS using, socio-technical systems. Socio-technical factors (People, Processes, and Technology) were also explored in an effort to understand how these factors may influence KMS usage and subsequently KM success and failure.

Chapter 3 presented the design of the study. The methodology used was an experimental research design. Included in this chapter is a discussion of the population sample, the sample design, data collection methods, the survey instrument, and data analysis. In Chapter 4 the results of the study are presented, and in Chapter 5 the conclusions, implications and recommendations are offered.

Chapter 2

Review of the Literature

The review of literature in this research provides an overview of available research dealing with KMS usage as it relates to socio-technical systems. Pertinent literature regarding each socio-technical factor was presented to provide a comprehensive understanding of the problem. As previously mentioned, much of the literature in the area of KMS usage has incorporated at least one of the socio-technical factors. However, most of these studies insufficiently integrate and explain a comprehensive set of linkages of socio-technical factors and their relationship to KMS usage. Emphasis has been placed largely on the KMS as a technology and not on social attributes. It is apparent that prior research has provided significant but only partial insights into how socio-technical factors impact KMS usage. This literature review is divided into the sections described in Figure 1 below.

Background Literature

KMS Usage	**Socio-technical Systems**	**Socio-technical System (STS) Factors**		
		People	**Processes**	**Technologies**
Venkatesh et al., 2003	Kwahk & ahn, 2010	*Self-Efficacy*	*Leadership*	*System Quality*
Khankanhalli et al., 2005	Baxter & Sommerville, 2011	Compeau & Higgins, 1995	Kuo et al., 2011	Lin, 2012
Kulkarni et al., 2006	Hester, 2012	Strong et al., 2006	Humayan & Gang, 2013	Wang & Lai, 2014
He et al., 2009		Lin & Huang, 2008	Scovetta & Ellis, 2014	
Hester, 2010				*Information Quality*
Chung & Galleta, 2012		*Social Ties*	*Culture/Climate*	Kuo & Lee, 2009
		Lin & Lu, 2011	Xue et al., 2011	Oyefolohan, 2012
		Chai & Kim, 2012	Chen et al., 2012	
		Wang et al., 2013		
			Governance	*Technology Fit*
		Ease of Use/Usefulness	Cao & Xiang, 2012	Ramayah et al., 2010
		Davis, 1989	Lin et al., 2013	Hester, 2014
		Olschewski et al., 2013		

Figure 1. Background Literature

Knowledge Management System (KMS) Usage

Venkatesh, Michael, Gordon, and Fred (2003) proposed that for information systems to improve productivity, they must be both accepted and used by employees. However, it is not always possible to maximize use. According to Venkatesh et al., IS acceptance literature has generated many competing models with differing determinants which need to be reviewed, synthesized, and unified under a single view of user acceptance. During the last twenty years, a significant amount of company's capital investment has been in IT and related needs (Venkatesh et al., 2003). To realize benefits of this investment, system use is necessary.

Venkatesh et al. reviewed and synthesized eight models in their study: 1) Theory of reasoned action, 2) Technology acceptance model (TAM), 3) Motivational model, 4) Theory of planned behavior, 5) A model combining the technology acceptance model and the theory of planned behavior, 6) Model of PC utilization, 7) Innovation diffusion theory, and 8) Social cognitive theory. The study proposed a unified model, called the Unified Theory of Acceptance and Use of Technology (UTAUT).

Venkatesh et al. conducted longitudinal field studies at four organizations where individuals were being introduced to a new technology in the workplace. A previously validated questionnaire was created with items from prior research that were adapted to the technologies and organizations studied. PLS was used to analyze data on the eight previous models and the UTAUT model. According to Ventatesh et al., UTAUT was able to account for 70% of the variance in usage intention. This is a more powerful predictor of usage than any of the original eight models and their extensions.

While all of the usage models presented in Venkatesh et al. can predict technology usage behavior successfully, the UTAUT model was the only one that considered numerous moderators. This illustrates a more comprehensive view of individual perceptions about technology. More work is required to fully develop and validate appropriate scales for UTAUT. More support may also be needed to identify and test additional boundary conditions of the model, attempting to provide a more robust understanding of technology adoption and usage behavior.

Venkatesh et al. suggested that one direction for future research is to examine the effects of information technology implementation on performance-oriented constructs related to organizational culture and climate. Venkatesh et al. outlined strengths and weaknesses of eight models commonly used to measure determinants of system usage. Findings indicate that many existing models perform better when they are enhanced with other models than they do when applied alone.

Kankanhalli, Tan, and Wei (2005) noted that employees will not always share information in KMS, so a large number of KM initiatives fail. Although technology is important, having complex KMS does not guarantee success in KM initiatives (Kankanhalli, et al., 2005). Kankanhalli et al. focused on electronic knowledge repositories (EKR) as a basic element of organizational knowledge capture and sharing. Factors that impact the usage of EKR usage are not well understood (Kankanhalli et al., 2005). Social issues appear to be significant in ensuring successful knowledge sharing. According to Kankanhalli et al., both social and technical barriers to usage of KM systems must be addressed in order to realize benefits of KM initiatives.

The model presented in Kankanhalli et al. identified cost benefit factors that impact the usage of EKRs from a social exchange theory perspective. Social capital theory was also used. A field study was conducted to support an experimental study based on hypothesis testing. Kankanhalli et al. distributed 400 surveys across 17 companies. Of these surveys, 150 responses were obtained, a response rate of 37.5 %. The constructs were first assessed for reliability and validity. Hypotheses were then tested using moderated multiple regression analysis at a 0.05 level of significance.

Kankanhalli et al. indicated that helping others had the strongest impact on EKR usage by knowledge contributors, followed by knowledge self-efficacy and organizational rewards. Kankanhalli et al. concluded that knowledge self-efficacy can be raised by indicating to contributors that their contribution have significant impact on the organization. Enjoyment that knowledge contributors experience can be increased as they help others (Kankanhalli et al., 2005). Organizational rewards are effective for encouraging EKR usage by knowledge contributors.

Kankanhalli et al. used a sample of 150 respondents to obtain several significant results. However, a larger sample could increase statistical power. The results of Kankanhalli et al. suggest that future research should examine how power and image (social factors) are perceived by knowledge contributors. Kankanhalli et al. went beyond previous studies by building on the cognitive aspect of antecedents to system usage. Their research validates linkages between KMS self-efficacy and KMS usage.

Clearly, knowledge management systems are not always successful. Kulkarni, Ravindran, and Freeze (2006) examined a KM success model that measured how well knowledge sharing and reuse activities are internalized within an organization. Previous research focused mainly on knowledge-sharing incentives or quality of shared knowledge. Kulkarni et al. validated an integrated model that included knowledge sharing and knowledge quality and their relationship to knowledge reuse. According to Kulkarni et al., there was a lack of adequate empirical validation of KM success factors. Unsuccessful attempts to leverage knowledge can be costly to the firm (Kulkarni et al., 2006).

Kulkarni et al. is an extension of the Seddon (1997) re-specification of DeLone & McClean's IS Success Model. The IS Success model is based on communications theory (Shannon & Weaver, 1949) and the information "influence" theory of Mason (1978). Kulkarni et al. is an experimental field study that analyzes data collected via survey and uses factor analysis to test correlations. A survey was administered to 150 midlevel managers enrolled a large university part-time professional MBA program, yielding 111 usable responses. Preliminary factor analysis on the first 70 usable responses was used to test validity of the model. A full factor analysis was then performed on the data set.

Results of Kulkarni et al. can be summarized in the following three areas: 1) perceived usefulness of knowledge sharing and user satisfaction (0.57), 2) supervisor, coworker, leadership, and incentives (0.62), and 3) knowledge content quality, KM system quality, and knowledge use (0.73). The model achieved good overall fit with all factor loadings for the constructs significant (>0.50) at the 0.01 level. Perceived usefulness of knowledge sharing reinforces user satisfaction, which results in knowledge use.

Kulkarni et al. developed and tested a KM success model based on the IS success model introduced by DeLone & McLean (1992) and Seddon (1997). The model was later enhanced by KM research by Alavi and Leidner (2001), Davenport and Prusak (1998), and Davenport et al. (2002). One limitation of this study is that it considered only explicit knowledge. To study differences across industries or business types, it may be necessary to distinguish between explicit and tacit knowledge (Kulkarni et al., 2006). Future research can include additional ease of use and usefulness variables to understand the antecedents of KM success. Kulkarni et al. provided an understanding of some antecedents of KM success, including ease of use and usefulness.

Many organizations make significant investments in KMS and never realize a return on their investment since many KM projects end in failure (Chua & Lam, 2005). Although the KMS may be present in the organization, employees will not always use it (Lin & Huang, 2008). To understand why the KMS is not used, He, Qiao, and Wei (2009) examined social relationship as a possible cause. Prior KMS research has proposed the importance of interpersonal relationship on knowledge sharing (Bhattacherjee & Premkumar, 2004). This relationship considers social factors like relational capital, reciprocal relationships, and social ties. According to He et al., current literature has not sufficiently explained these factors and understanding how these social interactions affect contribution to and usage of KMS.

Although KMS is considered to be of strategic value, the organization can only recognize this value if the system is utilized (Chung & Galletta, 2012). Much of the current KMS literature has been primarily focused on design, development, and management of KMS. He et al. utilized a case study, which the authors note can be valuable when research issues are in the early stages. This case used a positivist approach to achieve a qualitative understanding of why and how social relationships affect KMS usage in the organization.

Empirical data was collected to enhance the data gained through in-person interviews. KMS users, including those not interviewed, completed an internal survey. Data collection for this research study occurred in three stages. First various company documents, system statistics, and secondary evidence from the public media were collected. Second, semi-structured interviews with 11 members of the organization were conducted (1 team leader of the KMS project—the CIO, 2 team members, and 8 end users of the KMS in different functional units). Finally, in the third part of the study a web-based survey was used to collect data for statistical analysis. The survey examined employees' perceptions about system usefulness, social relationship with co-workers, attitudes on KMS usage, and actual behavior. Of the 200 users that were randomly selected from the KMS, 53 (26.5%) completed responses were collected. He et al. utilized social capital theory in their case study to examine the social relationship construct considering tie strength, shared norms, and trust. Social capital theory assumes that networking ties provide access to resources. It also assumes that interpersonal connections can influence both access to people for knowledge sharing and their perceived value in that sharing (He et al., 2009).

He et al. confirmed a significant influence of social relationship on KMS usage. Besides perceived usefulness, a consistent trend of social influence on KMS usage was observed. KMS users queried in this study noted the relationships with co-workers by feelings of trust, friendship closeness, and shared norms. External organizational motivators were also found to affect KMS usage behavior. Results revealed that the difference in users' attitude between people with high social relationship and those with low social relationship was significant (R^2= 0.466). The study determined that social relationship is the key factor affecting knowledge sharing behaviors and ultimately KMS usage. The He et al. study confirmed that the social relationship could establish positive attitudes toward knowledge sharing and positively impact KMS usage.

Like many studies on KMS usage, the relatively small sample size of He et al. has inherent limitations that affect the generalizability of the results. Given that this research is focused on a single organization, it would be difficult to justify the findings elsewhere. However, the social interactions, attitudes, and behaviors in use of KMS are typical of those in many organizations that use KMSs. He et al. found that social relationship could positively influence knowledge sharing attitudes and subsequently KMS use.

Hester (2010) agreed that in spite of ongoing development of KMS, adoption still presents a challenge. Some KMS studies show the organization's relevant knowledge cannot be found in the system after implementation (Venkatesh, Morris, Davis, G., & Davis, F., 2003). Hester's study extended Innovation Diffusion Theory (IDT) to include another independent socially focused variable, expectation. Implementation of information systems, such as the KMS, is often met with resistance from users. Therefore social factors are as important as technological factors (Hester, 2012). The study population involved individuals engaging in usage of knowledge management systems in an organizational setting. As an exploratory study, a wide range of respondents were desired representing various types and sizes of organizations as well as various types of knowledge management systems. Systems often go unused and organizational knowledge is not captured and cannot be shared. Hester (2010) studied a population involving individuals engaged in usage of KMSs in an organizational setting. The usable sample size was 129, consisting of 86 females and 43 males. The PLS method was used to examine the hypotheses, as it is recommended for complex models focusing on prediction, and allows for minimal demands on measurement scales, sample size, and residual distribution. A two-stage analysis was performed using confirmatory factor analysis to assess the measurement model followed by examination of the structural relationships.

Results of the Hester (2010) study indicated that some factors are important in determining adoption, while others in determining usage. Voluntariness, visibility, reciprocity expectation, and result demonstrability had a positive effect on adoption. Visibility, trialability, and relative advantage had a positive effect on usage level. These findings conclude that 3 out of 4 social factors were significant compared to 1 of 4 technological factors for system adoption. Regarding usage, 1 of 4 social factors compared to 2 of 4 technological factors were significant.

It is important to recognize that Hester (2010) indicated that social factors are more important in the early stages of adoption, whereas technological factors are more important for continued usage. This finding lends credibility to using the holistic approach provided by Socio-technical Systems (STS) theory for considering both social and technological factors when examining KMS usage. Hester’s model should be tested further to lend additional credibility and more generalizable results. Since technology projects are subject to potential problems of user resistance, social factors are as important as technological factors where usage is concerned (Hester, 2009; Lam, Cho, & Qu, 2007).

Chung and Galletta (2012) proposed that knowledge use, defined as the extent to which the KMS is used for tasks, has been a dependent variable in numerous KM studies. However, there is little research that systematically examines the theoretical aspects of this important construct (Kulkarni, Ravindran, & Freeze, 2006). Chung and Galletta also noted previous studies extended IS usage constructs then applied them to the evaluation of KMS content. A more comprehensive evaluation of KMS usage is needed. Chung and Galletta synthesized literature on KMS usage and developed a theoretical model that provided further explanatory power. It hypothesized knowledge quality is also an important predictor of KMS usage. Chung and Galletta defined three key categories of use. These categories are innovative use, conceptual use, and affective use.

Chung and Galletta performed an experimental study that employed hypothesis testing. Data for their study were collected from users of a KMS maintained by Xerox since 1994. A total of 212 users, 106 usable responses, participated in the study. Chung and Galletta explored two hypotheses regarding the interaction of knowledge quality, procedural justice, and knowledge use. The structural model was tested using SmartPLS. Results of the study established a positive relationship between procedural justice and knowledge use ($R^2 = 0.315$) and knowledge quality and knowledge use ($R^2 = 0.223$). However, Chung and Galletta cautioned that additional research is required to validate the three-dimensional model of knowledge use in broader contexts. These findings are consistent with previous studies and this study adds to the body of knowledge by testing a multi-faceted KM usage model.

A key limitation of Chung and Galletta's study is the approach. The sample used data from participants of a larger study that was conducted on another topic. The study could be replicated with a new set of respondents to make its results easier to generalize. This research highlights the need for further study considering different aspects of knowledge use as the dependent variables in KM research. Relevant to broader research on KMS usage, Chung and Galletta provided a valuable model for usage. Information quality will impact KMS usage.

Socio-Technical Systems (STS)

Kwahk and Ahn (2010) investigated reasons for ERP failure from the user's perspective. Socio-technical factors that affect ERP system use were studied. The purpose of the study was to test a theoretical model that classifies ERP systems as a driver of change and a complex IS. These factors were then used to discuss ERP usage. Much like the KMS, ERP system failure is not always attributable to technical issues. Ngai, Law, and Wat (2008) outlined socio-technical factors or interactions between people, processes, and technologies have also been identified as causes of ERP failure. Successful technical development of the ERP system cannot guarantee project success if usage is low due to a lack of willingness to change (Ngai et al., 2008). Hence the system cannot provide benefits to the company if there is a lack of usage.

Kwahk and Ahn reviewed prior studies on ERP adoption from an STS theory perspective. Kwahk and Ahn focused on attitude toward change and computer self-efficacy as key socio-technical factors. They also examined the effect of cultural misfit, and its effect on ERP system adoption. The study's theoretical framework was tested using data collected from a field survey, with hopes of yielding generalizable results. Data were collected from two organizations that have ERP systems. The use of two systems provided a robust setting to develop hypotheses focused on localization differences. The study tested impacts of attitude toward change on perceived usefulness, computer self-efficacy on perceived usefulness, and perceived usefulness on intention to use an ERP system.

PLS was used to conduct data analysis. Results indicated R^2 values of attitude toward change on perceived usefulness (0.423), computer self-efficacy on perceived usefulness (0.223), and perceived usefulness on intention to use an ERP system (0.703). Based on these values, all hypotheses were supported. The model proposed in this study identified socio-technical factors required for ERP success. It also confirmed that adopting and using a specific system is not only dependent on the technology, but also on other aspects, like the organizational or social context. Attitude toward change can be thought of in terms of the organization, while computer self-efficacy is related to the technology. Although Kwahk and Ahn focused on ERP, key learning may be applied to other types of IS. This study confirmed a positive linkage between socio-technical factors, attitude toward change and computer self-efficacy, and system adoption and usage.

The term socio-technical system was originally coined by Emery and Trist in 1960 to describe systems that involve a complex interaction between users, technology, and the environmental aspects of the work system (Baxter & Sommerville, 2011). Development efforts that consider socio-technical factors lead to greater acceptance by end users and deliver better value to stakeholders (Eason, 2001). In their 2011 study, Baxter and Sommerville noted socio-technical development approaches are not often employed. Many technology focused approaches to systems design do not properly consider the complex relationships between the organization, people, business processes, and systems supporting these processes (Eason, 2001). Baxter and Sommerville outlined a pragmatic approach to the engineering of socio-technical systems. This should be accomplished through a gradual introduction of socio-technical factors into existing software procurement and development processes. Failure to employ socio-technical approaches to systems design can increase risks that systems will not be used and thus will be unsuccessful. Systems can meet their technical requirements but still be considered a failure because they do not deliver the expected support for the users' processes and tasks (Chua & Lam, 2005).

Baxter and Sommerville outlined a framework and proposed a research agenda for socio-technical systems engineering (STSE) where implementation problems were identified. Their study focused on summarizing previous research on organizational tasks, information systems, computer supported cooperative work (CSCW), and cognitive systems engineering. Based on the framework, research problems on applying affordable approaches in a cost-effective way were derived. Facilitating the integration of STSE with existing systems and software engineering approaches were also formulated. The problems identified in this study must be addressed for socio-technical approaches to be successful. Among the problems identified were terminology, abstraction, value systems, success criteria, and analysis without synthesis.

Baxter and Sommerville proposed a solid framework for future study by examining STS theories. The study also suggested the importance of effective user-focused design is now generally recognized. System problems are not always technical issues, so cultural changes in how developers engage in systems development are needed. Baxter and Sommerville supported the importance of understanding socio-technical issues and their impacts on system usage. Although empirical support is not provided, this paper summarized key research in the discipline, and provided a roadmap of people-centric components. The study confidently outlines problems with existing approaches to socio-technical system design. Examination of socio-technical problems can suggest the need for the use of STSE.

According to Hester (2012), information systems, like KMS, are becoming more and more dependent on social interaction. Hester (2010) confirmed system use can be impacted by complex relationships across task, technology, and social concerns. In a follow up study, Hester (2012) warned that failure to address these areas with a holistic approach will negatively impact system usage. Bostrom and Heinen (1977) originally proposed this position in their seminal work in socio-technical systems theory, describing the organizational work system as being composed of a social sub-system and a technical sub-system. Hester (2012) employed hypothesis testing to define the relationship between socio-technical and technical frameworks as they relate to system use. An experiment was conducted as a pilot study performed in a lab setting, using students as test subjects.

Hester (2012) utilized an organizational simulation to collect data to determine whether socio-technical alignment will have a positive influence on system use. Nineteen undergraduate students enrolled in a senior-level project management course in an MIS program were the subjects. Questionnaire data were collected and items were measured using a five-point Likert scale. PLS, which is frequently used for analysis of complex predictive models with small samples, was used to examine the hypotheses. A two-stage analysis was then performed. Confirmatory factor analysis was used to assess the measurement model, and structural relationships were tested using path analysis. Composite reliability and the average variance extracted (AVE) were used to test reliability. Reliability scores exceeded the recommended threshold of 0.70. The second stage of the analysis involved structural equation modeling (SEM), which included testing path coefficients and the R^2 values. Results indicated alignment among actor and technology had a positive influence on system use. Tasks, technology, and structure, may not have a positive influence on system use. The model tested in this study provided measures that indicated increased IS use.

The research presented by Hester (2012) was a pilot study with a very small sample size of 19 students. For this reason, it may be difficult to generalize results. Although the results may indicate a positive relationship between socio-technical factors and system usage, caution must be observed in generalizing these findings. Hester (2012) provided components for developing a model that explores alignment of relationships among socio-technical system components that are essential to understanding system usage, and ultimately system success. Given the study’s focus on Wiki technology, further relevant study is required regarding other types of IS and KMS to lend support to the social-technical implications for system usage.

People-Oriented Factors of STS

Self-Efficacy

Compeau and Higgins (1995) noted that although IS can increase organizational effectiveness, IS are not always utilized. Compeau and Higgins performed a study aimed at understanding the impact of self-efficacy on individual reactions to computing technology. The study involved the development of a measure for computer self-efficacy and a test of its reliability and validity. Understanding self-efficacy can be important to the successful implementation of systems in organizations (Compeau & Higgins, 1995). Compeau and Higgins relied on Social Cognitive Theory (SCT) to provide explanatory power for their research.

The Compeau and Higgins study used experimental research and employed hypothesis testing. Data collection was accomplished by mailing 2,000 surveys mailed, 1,020 were completed and returned, and 91 were returned as undeliverable. Thus, the response rate was 53.4%. Assessment of the research model was conducted using Partial Least Squares (PLS). PLS is a regression-based technique that can analyze structural models with multiple-item constructs and direct and indirect paths. The findings of this study provide support for the research model, which relates SCT and computing behavior. Self-efficacy was found to play an important role in shaping individuals' feelings and behaviors as it relates to IS. Based on the results of this study, individuals with high self-efficacy used computers more, derived more enjoyment from their use, and experienced less computer anxiety. Furthermore, outcome expectations, in particular those relating to job performance, were found to have a significant impact on affect and computer use.

Compeau and Higgins concluded that computer self-efficacy was found to exert a significant influence on individuals' expectations of the outcomes of using computers, and their actual computer use. An individual's self-efficacy and outcome expectations were found to be positively influenced by the encouragement of others within their teams, as well as others' use of computers. Therefore, self-efficacy represents an important individual trait, which moderates organizational influences on an individual's decision to use computers and systems. The study was limited with respect to the self-efficacy measure due to the use of a hypothetical scenario for responses. It is questionable whether hypothetical scenarios can fairly represent actual situations. The second concern relates to self-efficacy with respect to learning versus using computers. According to the authors, focusing on an unfamiliar software package, the notion of self-efficacy with respect to learning to use computers is introduced as an additional dimension of the construct. First, longitudinal evidence is required. This research relied on cross-sectional data, making interpretation of causality problematic. Second, additional dependent variables need to be studied. This study focused on self-reports of computer use. Self-efficacy, however, is also argued to influence the development of ability. Thus, future research might focus on how computer self-efficacy influences the development of computing skill.

Strong, Dishaw, & Bandy (2006) recognized that there is a need to understand why system users choose to use a system. Understanding the system fit and the perceived needs of the user is an essential part of intention to use these technologies. This study continues research that is focused on understanding system utilization of users by extending and testing Task-technology Fit (TTF) models in a variety of domains using various methods and model extensions. Most information system users will utilize technologies that enable them to complete their tasks with the greatest net benefit. However, systems that do not offer clear and significant advantages will not be utilized.

Strong et al. extended a TTF model by including the Computer Self-Efficacy (CSE) construct. This is an experimental study that utilizes field study for data collection, and PLS to study relationships among variables. Data were collected by questionnaire from 220 business students, which uses Compeau and Higgins' (1995) CSE items. For the Task and Technology constructs, this paper utilized a published TTF questionnaire operationalized for software maintenance tasks and tools in the previously reviewed study (Dishaw & Strong, 1998). PLS was used to perform the analysis since the authors noted it is better than Structural Equation Modeling for small sample sizes, and for studies in which theory is still being developed.

While the theoretical literature suggests that individual characteristics interact as part of fit, results obtained from Strong et al. provided support for this proposition. When applying CSE, the influence of fit on utilization increases slightly to 0.70. Furthermore, the direct effect of CSE (0.30) is significant, but does not have as large an effect as fit (0.70) in explaining utilization. The interaction effect from CSE-technology fit is not significant. Overall, 34.9% of the utilization variation is attributed to the fit of the technology functionality to the students' tasks, as well as to CSE, a student's belief in their ability to use IT to accomplish tasks.

Strong, Dishaw, & Bandy's extended TTF Model, the basic TTF model extended with CSE adds a dimension to address the individual characteristic. It posited that IT utilization in a TTF model is also affected by users' judgment of their ability to employ computing technology as moderated by the characteristics of the technology being considered. Strong et al. extended a Task-Technology Fit (TTF) model by including the Computer Self-Efficacy (CSE) construct. This was first suggested by Berthon et al. (2002). This model was first described by the theoretical model presented by Goodhue and Thompson (1995). However, that study did not test the individual characteristics outlined in the model. Goodhue and Thompson did empirically test it using computer literacy as the individual characteristic and found significant, but weak direct effects and no significant interaction effects. Strong et al. approached the extension of TTF by adding a single individual characteristic. However studying relationships among multiple constructs may yield different results.

Strong et al. tested the TTF model in the context of students using modeling tools. Although students provide valid results within the context of this study, the CSE extension proposed in this research could also be tested with professionals and other practitioners. Strong et al. utilized an extended TTF Model, and validates that the basic TTF model extended with Computer Self-Efficacy (CSE) adds a dimension to address the individual characteristic. This is of particular significance to researchers, since SCT has been argued as the prominent model for explanations of self-efficacy. It can then be concluded that in the context of KMS usage, TTF extended with SCT can provide significant explanatory power. This reinforces the need to understand the interaction among socio-technical factors when studying KMS usage.

According to Lin and Huang (2008), KMS can increase organizational learning by capturing internal knowledge and making it available for reuse, however, KMS are not always successful. Task-Technology (TTF) interprets system usage by considering the needed technology and task when determining usage. Unfortunately, TTF largely ignores personal cognition, which previous studies have found to impact system usage (Lin & Huang, 2008). By extending TTF with SCT, Lin and Huang integrated key factors affecting KMS usage in IT, the organizational task, and personal cognition.

A KMS can be used to maintain organizational history, experience and expertise of long-term employees. Employee knowledge can be incorporated into the systems that help them and their successors run the business. According to TTF, system usage may vary based on configuration and task. Generally speaking, TTF models address four key dimensions: 1) task characteristics, 2) technology characteristics, 3) fit, and 4) performance or utilization (Lin & Huang, 2008). SCT proposes that self-efficacy has direct impact on performance or utilization expectations. Positive expectations are negated if the user doubts their ability to execute the behavior (Lin & Huang, 2008). So in the context of KM, those who believe they are able to use KMSs effectively will be more likely to expect positive outcomes.

Lin & Huang utilized an experimental field study with correlation analysis, using PLS to test hypotheses. Lin and Huang used a survey to collect data to test their research model. The samples were collected from 500 former students who work in Taiwanese companies. There were 192 usable responses collected from KMS users. Scale validity was achieved using previously tested questions that were modified and used to measure the constructs.

Among the key factors, KMS self-efficacy was found to be especially important as it was substantially and positively correlated to perceived task technology fit, personal and performance-related outcome expectations, and KMS usage (Lin & Huang, 2008). Reliability was assessed by Cronbach's alpha; the lowest value was 0.70 for task tacitness; all the others were well above 0.70 (Lin & Huang, 2008). The percentage of the variance explained (R^2) of perceived TTF was 0.403. The integrated model explains about 50% of the variance in KM system usage, proving that TTF enhanced by SCT is relevant when studying KMS usage (Lin & Huang, 2008).

Foundation for the theory of TTF was adapted from Goodhue and Thompson (2005), who suggested that technology use was governed by the fitness of technology features and the task requirements. Dishaw and Strong also presented construct of perceived CSE, which examines users' beliefs regarding their ability to address specific tasks using the system. Lin and Huang noted that self-efficacy plays a dominant role in context of knowledge sharing.

KMS usage measurement was derived from individual's self-administered questions which can limit validity. Lin and Huang caution that research relying on volunteers is contingent upon whether they are willing and able to participate. Therefore, bias may be a concern. Another key limitation is that different KMS support different tasks, and therefore may invoke different user perceptions. Finally, the study was based on a sample of 192 respondents, so the limited sample size might make it difficult to generalize results. Although Lin and Huang yielded several significant results, a larger sample would provide the model with more statistical power. In addition, sampling different cultures and contexts in future research may enhance the ability to generalize results.

Understanding KMS usage determinants provides a continued source of relevant research seeking to advance the KM body of knowledge. Lin and Huang set the stage for future research that will add to the literature on the determinants of KMS usage. Furthermore, Lin and Huang established a clear relationship between the personal cognitive dimension, TTF, and KMS usage. These concepts suggest a need for a socio-technical approach to understanding KMS usage. Future studies can add to the KMS usage body of knowledge by building upon research concluded by Lin and Huang.

Social Ties

According to Lin and Lu (2011), system users that report perceived ease of use and usefulness to other users create a condition to increase system usage. However, lack of support for ease of use or usefulness can dampen system usage. Existing literature has not sufficiently studied how user feedback relates to the formation of other user's perceptions on social networking sites (Lin & Lu, 2011). Positive user perceptions of ease of use and usefulness of social networking sites can increase the site's economic benefits. Lin and Lu indicate that ease of use and usefulness are important factors affecting system users. Their study employed network externalities and motivation theory to explain why users join social networking sites. Motivation theory is widely used in previous research to explain individual's behavior of accepting information technology (Lin & Lu, 2011).

Lin and Lu distributed an online questionnaire for experimental research. For the study, they collected and analyzed data of 402 samples using SEM. The population consisted of randomly selected users of Taiwan Facebook Online who provided data between January 15 and March 15, 2010. Of the responses, samples from males and females were roughly equal in number from predominantly 25–34 year olds, accounting for 40.5%. The survey was adapted from previous literature. Confirmatory factor analyses was used to test the measurement model. Reliability analysis used Cronbach's alpha and composite reliability to assess the model's internal consistency (Lin & Lu, 2011).

Based on R^2 of continued intention to use (0.69), usefulness (0.58), and enjoyment (0.60), the research model appears to have sufficient explanatory power.

Usefulness ($\beta = 0.16$, $p < 0.05$) had positive direct effects on continued intention to use. These findings indicate that usefulness is an influential factor in user's continued use of social networking sites. Lin and Lu's findings were from a single study with samples collected in Taiwan. Therefore, generalizing the findings may not be possible. The study also employed self-reported results, which are prone to bias. Future studies may apply cross-cultural contexts to compare the differences in antecedents to continued intention to use.

Chai and Kim (2012) recognized that knowledge contribution behavior can be impacted by certain factors when users contribute knowledge into social networking sites (SNS). User participation in knowledge contribution behavior in SNS is influenced by both social and technological factors. The experimental study investigated the role of ethical culture and SNS usage while examining the impact of social ties among SNS users on their usage behavior. Of particular relevance, this study hypothesized that social ties among SNS users are positively associated with their knowledge contribution behavior and social ties are positively associated with sense of belonging to SNS.

Chai and Kim utilized a survey that was created from compiling questions from previous studies. The unit analysis was an individual who has been a member of social networking websites. The survey was pre-evaluated through semi-structured interviews with social networking website members for validity. During the interviews, users provided suggestions to improve the clarity of the survey. The questions were then refined based on feedback from those interviewed, and a total of 211 surveys were distributed. Chai and Kim then performed structural equation modeling using partial least squares to investigate both measurement and structural models.

Research results confirmed there is a significant link between social ties and knowledge contribution behavior (β=0.369, t= 3.207, $p < 0.01$). The strong social ties among SNS users make a positive impact on their knowledge contribution behavior. Social ties are also positively associated with sense of belonging to SNS (β=0.600, t=7.948, < 0.01). The social ties among SNS users strengthen a sense of belonging to SNS positively.

Chai and Kim confirmed that social factors are as significant as technological factors in users contributing their knowledge in the SNS. In fact, in the social networking arena, social factors appear to have much greater importance than technological factors. The sample demographics of this study were made up of college students who actively use SNS. Unfortunately, student subjects may not be generalizable for application in the workplace. Chai and Kim provided empirical support that social factors affect user's knowledge sharing in the context of SNS. Ethical culture, social ties and a sense of belonging are important social and human factors that should also be considered in developing, maintaining, and driving usage of KMS.

Value of a KMS is dependent on use for contributing and obtaining knowledge. However, KMS are not always used. According to Wang, Meister and Gray (2013), socio-technical processes can determine KMS use by creating a bandwagon effect. Mainly because KMS are often used in ways that are very visible to others (Kankanhalli et al. 2005). Previous studies on KMS usage have focused little on social influence, with limited empirical support (Wang et al., 2013). Leadership efforts to employ KMS are often not successful because of a lack of understanding social influence (Wang et al., 2013).

Utilizing Kelman's (1958) social influence theory, Wang et al. investigated two key processes underlying social influence to provide new insights. These processes influence individuals' use of KMS they follow the needs of the group, and when they follow the opinions of others. Wang et al. performed an experimental study in which they tested six hypotheses that related individual use in a social context.

Wang et al. tested their hypotheses using longitudinal KMS usage data collected from more than 80,000 employees of a management consulting firm. Data reflected 499,296 records of 83,216 individuals working in 21 different work groups during a seven month period. Wang et al. constructed a holistic analysis of social influence mechanisms which is not abundant in the technology diffusion literature.

Wang et al. confirmed that social influence factors impact KMS use at different levels within the organizational hierarchy. Results concluded that social influence processes play a complex role in affecting individuals' KMS use. Wang et al. found that peers' prior use significantly influenced subjects' system use. They also found that subordinates' prior use influenced subjects' system use for all employees who had subordinates. This indicates a pattern of bottom-up technology diffusion which supports social ties as a contributor to KMS usage. Wang et al. found substantial support for bottom-up social influence, limited support for peer-level influence, and basically no support for top-down influence.

Based on prior research, Wang et al. investigated four primary groups that may exert social influence. The results of the Wang et al. study may not be generalizable as it is based on results from a single firm. Certain demographic variables such as age and gender may also moderate the effect of social influence. Future research to test additional moderators may increase the explanatory power of the study executed by Wang et al. However, their study lends support for the need to consider social ties when investigating system usage.

Ease of Use/Usefulness

Although IT can improve organizational performance, these improvements will not be realized unless users accept and subsequently use available systems (Davis, 1989). In the system usage literature, models predicting user acceptance are lacking. According to Davis, many existing studies utilized subjective measures which were not validated, and relationships to system usage is still relatively unknown. Future study is needed to validate perceived usefulness and perceived ease of use as determinants of system usage.

Improved measures for predicting and explaining system use could be valuable to managers that would like to assess user demand for new system designs and those who would like to improve organizational performance (Davis, 1989). Davis relied on theories associated with perceived usefulness, expectancy theory, self-efficacy, and the cost-benefit paradigm. Davis performed an experimental study, using correlation analysis, which had both field and lab study components. A field study was conducted to assess the reliability, and validity of the 10-item scale from a pretest. Then a lab study was performed to evaluate the six-item usefulness and ease of use scales resulting from scale refinement in the first study.

Davis research was based on 152 users and four application programs. The lab study had a sample of 120 users that provided data via questionnaires. The field study was designed to apply the lab test using 40 volunteers. According to Davis, both perceived usefulness and ease of use had significant correlation with indicators of system use. Perceived use and usefulness was correlated (0.63) with current use in the lab study and (0.85) with predicted use in the field study. Perceived ease of use was correlated (0.45) with use in the lab study and (0.69) in the field study. These correlations are comparable with other correlations between subjective measures and usage in existing MIS literature (Davis, 1989).

One of the most significant findings of Davis' study was the strength of the relationship between usefulness and usage when compared to the relationship between ease of use and usage relationship. In both studies, usefulness had a more significant correlation to usage than ease of use. Davis measured the impact of perceived usefulness on system use, and was supported by Schultz and Slevin (1975) and Robey (1979) which has similar findings. The importance of perceived ease of use is also supported by Bandura's (1982) research on self-efficacy.

A key limitation of Davis is that the usage measures were self-reported as opposed to objectively measured. According to Davis, not enough is known about how accurately self-reported data will reflect actual behavior. Also, since usage, usefulness, and ease of use were all on the same survey, the possibility of a halo effect existed (Davis, 1989). Future research is needed to address how other variables relate to usefulness, ease of use, and acceptance. Davis supported the notion that factors other than technology fit, such as self-efficacy, are highly influential determinants of system usage. Davis provided relevant support to confirm that perceived task-technology fit has an influence on KMS usage, but that other social factors may exist.

Olschewski, Renken, Bullinger, and Moslein (2013) surmised that social influence is important to collaboration technologies since they are designed to be used by group members and not by individuals. The study proposed a model to address gaps in the adoption of online collaboration technology. Its theoretical framework extended the Tecnology Acceptance Model (TAM) for assessing the effect of social influence and technology readiness on the adoption and use of collaboration technology. Several relevant theories were explored in this study. Olschewski et al. criticized TAM as an overused IT adoption model that has reached its limits, partly due to its failure to assess the degree of users appropriating and repurposing well-known technologies in a new usage environment (Olschewski et al., 2013; Dishaw & Strong, 1999).

Olschewski et al. (2013) performed a cross-sectional analysis utilizing IS undergraduate students at a major university in Germany. In all, 11 propositions related to actual system use and actual alternative system usage were outlined in this study. Noteworthy propositions implied that perceived ease of use has a positive effect on perceived usefulness and social influence has a positive effect on actual collaboration technology use. Of the 43 surveys distributed, 36 were used in the analysis, or 84%. The study used scales from previous research, with adaptations to fit the context of collaboration technology. The eleven propositions for the study's proposed TAM-CT research model were then tested using PLS techniques. The study revealed the importance of social influence in assessing collaboration technology acceptance. The analysis of collaboration technology use has been extended by including alternative technology usage and observing how alternative technologies are used.

Given the small sample of 36 cases, only limited statistical conclusions can be made. Since the participants of the survey were IS students, it may not reflect the real working environment. The results of Olschewski et al. may have been biased, since students of an IS class might yield different results than the typical student, researcher or employee. Future attempts to validate constructs within this study should involve non-student samples to validate the research model. Recent studies have explored and shown a significant effect of social influence on technology adoption (Klopping & McKinney, 2004).

The key relevance of Olschewski et al. is that their study revealed some of TAM's limitations, and at the same time promoted the need to investigate socio-technical aspects of system usage. Countless studies have relied on TAM as a fundamental underpinning of the theoretical model to explain ease of use/usefulness. However, based on the socio-technical nature of knowledge sharing, TAM cannot sufficiently explain KMS usage.

Process and Organizational Factors of STS

Leadership

According to Kuo, Lai, and Lee (2011), prior research has concluded that leadership impacts KMS acceptance and use, but there has only been limited study of the specific managerial behaviors associated with adoption success. Kuo et al. focused on understanding the influence of empowering leadership on KMS adoption through its effects on task-technology fit and compatibility. Their experimental field study employed hypothesis testing to examine whether empowering leadership is positively related to TTF and compatibility. It also questioned whether TTF and compatibility are positively related to KMS usage.

Survey data were collected from 500 information technology managers of large companies in Taiwan. Of these, there were a total of 151 usable, or 30.2%. All item measures were based on a five-point Likert scale. Using SEM, hypotheses were then tested. Empowering leadership has a positive relationship with TTF (H1) ($\beta = 0:50$, $p < 0.01$) and compatibility ($\beta = 0:31$, $p < 0.05$). The results also determined that TTF ($\beta = 0:65$, $p < 0.01$) and compatibility ($\beta = 0:31$, $p < 0.01$) positively impact KMS usage.

Results of Kuo et al. suggested that organizations should be as concerned about management and leadership style as about the technology itself. Empowering users can create an environment where they are willing to participate in KM activities more spontaneously. Poor leadership can mitigate the impacts of an effective KMS. Therefore, the KMS will not provide appropriate benefit and is likely to fail. The sample for Kuo et al. was taken only from organizations in Taiwan. Therefore, it would be premature to generalize results across other cultural contexts. However, the study confirmed empowering leadership has an indirect effect on KMS usage. Empowering leadership was positively related to both task-technology fit and compatibility, which in turn were both positively related to usage of KMS. In terms of socio-technical systems, leadership is an important cultural aspect of the organization that must be considered if the KMS is to receive significant use by employees.

According to Hamayan and Gang (2013), the intention of KM is to improve performance, but managing knowledge is a challenge and many organizations never realize performance improvements. This is largely due to fact that employees do not use the system. Numerous studies address contributing and sharing knowledge; however, few studies have focused on knowledge seeking and knowledge contribution as many are concerned with use (Hamayan & Gang, 2013). Hamayan and Gang stated that leadership exists when a leader influences other team members to accomplish shared goals. There are few existing studies that sufficiently address leadership in knowledge seeking using KMS (Hamayan & Gang, 2013).

Without KMS use, benefits of the system will not be realized. Thus, understanding knowledge sharing using KMS is a worthy problem for leaders when attempting to advance KM initiatives. Hamayan and Gang reviewed theories of IT adoption and the importance of leadership support in promoting KM initiatives in the organization. They noted that technology perceptions are related to KMS usage.

To test their hypotheses, Hamayan and Gang utilized an online survey for data collection. The survey methodology was used since the study was focused on understanding personal and social factors. The population consisted of software developers using KMS in their workplace. Previously validated questions from prior research were used to increase the study's validity. Some additions and revisions to the questions were also applied. Partial Least Squares was used to test the model. Hamayan and Gang stated that PLS is useful when examining research in earlier stages.

Leadership support was positively related to continuous seeking intention, showing strong significance ($\beta = 0.47$, $t = 4.73$, $p<0.05$). This indicated that leadership support had a significant influence on employee's intention to seek knowledge from the KMS. Also of relevance, user beliefs that seeking knowledge from KMS positively impacted performance were also strongly significant ($\beta = 0.53$, $t = 4.12$, $p<0.001$). Hamayan and Gang examined leadership impacts on knowledge seeking using KMS. Findings supported the relationship between leadership and KMS use for knowledge seeking. Support from leadership is also a determinant of KMS use. Hamayan and Gang concluded that leadership should be prioritized to promote KMS use and influence knowledge sharing.

One limitation of Hamayan and Gang's study was the population, with data that was collected only using Chinese programmers as subjects. Testing other geographical contexts could make findings more generalizable. Leadership support was also the primary focus of this study. Additional factors that interact with leadership and promote KMS use may need to be considered. Hamayan and Gang cautioned additional social and organizational factors apart from leadership should also be considered to increase KMS usage.

According to Scovetta and Ellis (2014), knowledge quality, perceived usefulness of knowledge sharing, system quality, user satisfaction, incentives, and leadership have all been identified as valid antecedents of KM success. These constructs have been empirically linked to KM success (Scovetta & Ellis, 2014). Each of these constructs require deeper exploration in terms of observation, measurement, and constitution. Without robust understanding of these leadership constructs, a lack of leadership effectiveness may not support the organization's KMS initiatives (Scovetta & Ellis, 2014). Scovetta and Ellis explored Leadership Social Power (LSP) as a critical success factor of KM. Leadership studies have substantiated the importance of the leader's influence over followers. Scovetta and Ellis relied on Power Theory to support their study.

Scovetta and Ellis conducted an experimental study to support their research. Two surveys were needed to provide measures for the study. The first was concerned with factors of KM success (leadership commitment, knowledge quality, and knowledge use). For these factors, an instrument previously used by Kulkarni, Ravindran and Freeze was used. A second instrument was also used to measure leadership power. The surveys were distributed to 900 KM workers in the manufacturing industry via postal mail and electronic mail. Of the surveys distributed, 145 responses were obtained, or a 16% response rate. Cronbach's alpha was used to test internal consistency of the items, the correlation analysis was used to test the data. Multiple Regression Analysis (MRA) was used to examine the causality.

Results found by Scovetta and Ellis confirmed the causal relationship between LSP and Leadership Commitment to KM. The study determined that power had impacts on Knowledge Use. The study Researchers provided additional empirical evidence that leadership is an influence on KM success (Scovetta & Ellis, 2014). Scovetta and Ellis expanded the understanding of the factors of leadership that influence that success. However, the study had limitations. First, it focused on a limited set of KM success factors (Leadership Commitment, Knowledge Content Quality, and Knowledge Use). Furthermore, the study was limited to the manufacturing industry in the United States. Therefore, study results may not apply to other industries. Future research could focus on other geographic regions and potentially other industries.

Culture/Climate

In addition to empowering leadership, Xue, Bradley, and Liang (2011) investigated the impact of team climate on individual knowledge sharing behavior. They believed these organizational factors have not been sufficiently studied in the existing literature. Team climate and empowering leadership help to shape individuals' attitudes, which in turn lead to the desired knowledge sharing behavior (Bock, Zmud, Kim, & Lee, 2005). In addition, team climate and empowering leadership both have a direct impact on the knowledge sharing behavior.

Xue et al. conducted an experimental field study that employed hypothesis testing. They suggested that team climate has a positive influence on knowledge sharing attitude and knowledge sharing behavior. They also assumed empowering leadership has a positive influence on knowledge sharing attitude and knowledge sharing behavior. Finally, their study confirmed knowledge sharing attitude was found to have a positive influence on behavior.

The research model for Xue et al.'s study was developed based on prior knowledge management studies. Survey data were collected via an online survey from 434 students at a major university located in the US who were enrolled in courses that required team projects. PLS was used to test the research model, and results indicated team climate has a significant effect on knowledge sharing attitude ($\beta = 0.34$, $p < 0.01$). Empowering leadership also had a significant effect on knowledge sharing attitude ($\beta = 0.21$, $p < 0.01$). These two factors accounted for 23% of variance in knowledge sharing attitude. Team climate was found to have a significant effect on knowledge sharing behavior ($\beta = 0.14$; $p < 0.05$). Empowering leadership also had a significant effect on knowledge sharing behavior ($\beta = 0.18$, $p < 0.01$). Knowledge sharing attitude has significant positive influence on behavior ($\beta = 0.28$, $p < 0.01$). Overall, approximately 24% of variance in knowledge sharing behavior can be explained by the three determinants.

Xue et al. demonstrated that cohesive, innovative teams with a high level of trust and an empowered leader will have a higher level of knowledge sharing. This knowledge sharing is critical for increasing KMS usage. The study's sample consisted only of students in the U.S. which could make it difficult to generalize the findings of this study across other geographic areas or in a practitioner-based setting. Results determined from student data may not always provide an accurate reflection of behavior in the workplace since organizational conditions may be difficult to simulate in the classroom. Furthermore, cultural difference may apply when trying to apply results across different cultural contexts. Xue et al. confirmed a positive relationship between team climate and empowering leadership on individuals' knowledge sharing attitude and behavior.

Chen, Chuang, and Chen (2012) proposed that organizational climate is a people-oriented factor that can prevent organizations from obtaining competitive advantages if not appropriately considered. Organizational culture and climate can improve cross-functional coordination, thereby increasing quality and performance. However, teams do not always share knowledge. Existing literature has not sufficiently examined knowledge sharing from an organizational culture and climate perspective. When factors relating to culture and climate are not considered, firms might not obtain competitive advantages from KMS usage (Chen et al., 2012).

To maximize knowledge sharing, organizations must understand the factors that impact knowledge sharing behaviors (Bock, Zmud, Kim, & Lee, 2005). Chen et al. performed an experimental field study which utilized hypothesis testing. Six hypotheses were tested in their study. The hypotheses examined the impacts of KMS quality, self-efficacy and organizational climate on attitude and intention to share knowledge. Attitude toward knowledge sharing was assumed to be positively associated with intention to engage in knowledge sharing.

Measures used in Chen et al. study were all adapted from previous studies on KMS quality, self-efficacy, organizational climate, and knowledge sharing. Data were collected using a seven-point Likert scale from 770 Taiwanese electrical manufacturing firms. A total of 134 complete and effective responses for data analysis were collected, representing a 17.4% response rate. Data was then analyzed using PLS techniques. Most importantly, the relationship between efficacy and attitude ($\beta = 0.474$, $p > 0.001$), efficacy and intention ($\beta = 0.487$, $p > 0.001$) and attitude and intention (H2-1: $\beta = 0.211$, $p > 0.001$) were all confirmed. Chen et al. concluded that KMS quality have an insignificant but positive influence on attitude toward knowledge sharing. Most relevant to the proposed study, KMS self-efficacy has a significant influence on attitude and intention to engage in knowledge sharing, and organizational climate is positively related to attitude and intention to engage in knowledge sharing.

Chen et al. findings regarding KMS self-efficacy and attitude toward knowledge sharing are consistent with previous studies. They found that knowledge sharing is significantly influenced by KMS self-efficacy, and organizational climate through other mediating variables such as attitude. Using socio-technical approaches, one cannot assume that the presence of a KMS alone will achieve knowledge sharing. Therefore, organizations must promote a climate of knowledge sharing which will increase KMS usage. Chen et al. provided key insight for leadership that enhances the study presented by Hamayan and Gang (2013). However, Chen et al. focused on a specific project that may not be indicative of other KMS projects. Caution should be used when attempting to generalize their results. Future studies might examine impacts of culture and climate in different contexts to understand knowledge sharing. More research is needed to explore impacts of organizational culture and climate on KMS usage.

Governance

Cao and Xiang (2012) learned that organizational sharing of knowledge is not always naturally occurring because of some of the facets of knowledge. These inherent barriers can make knowledge sharing difficult. Knowledge sharing is known to be difficult, mainly because it usually involves sharing individual tacit knowledge, which is not always easy to express or transfer. Furthermore, knowledge governance is based on a set of controls that shape and influence KM processes. Both formal and informal knowledge governance were examined in Cao and Xiang's research.

Cao and Xiang performed an experimental study using hypothesis testing and analytical frameworks in which five hypotheses were tested. Of particular importance, it was hypothesized that knowledge governance has a positive effect on individual knowledge sharing and informal knowledge governance has positive effect on individual knowledge sharing. Hypotheses were tested using surveys and interviews of 550 employees of 39 firms in China. Of these employees, 339 responses were usable. Regression analysis and SEM by SPSS AMOS were then used for data analysis and hypothesis testing. Formal knowledge governance ($\beta = 0.332$, $p<0.001$) and informal knowledge governance ($\beta = 0.385$, $p<0.001$) were both found to have a positive influence on knowledge sharing. Because knowledge governance impacted knowledge sharing among employees, it was concluded organizations should strengthen knowledge governance to influence employee knowledge sharing.

Cao and Xiang's study is limited to organizations located in central China, therefore, it may be difficult to generalize results across different countries or cultures. In the context of their study, governance of knowledge sharing was a critical component of KMS usage. If users refuse to share knowledge, they will also refuse to use tools that facilitate the sharing of knowledge. For this reason, knowledge governance should be considered an important consideration of organizational process with a key influence on KMS usage.

Knowledge sharing and collaborative learning efforts are not always successful. According to Lin, Fan, and Wallace (2013), this is partially because social aspects of knowledge community use have largely been ignored in the existing literature. Lin et al. were only able to identify a handful of studies that integrated both social and technical aspects toward understanding community usage. Although much literature exists on online knowledge sharing, only a few studies have proposed research models that integrate both the technical and social aspects of a community (Lin & Huang, 2008). Additional research will enhance understanding of how technical and social factors interact from a knowledge community context (Lin et al., 2013).

According to Lin et al., community governance was an important construct that was shown to have a strong positive relationship (0.62) with system quality. They also noted that knowledge sharing requires user satisfaction, sense of belonging, and usage (Lin et al., 2013). According to Lin et al., emerging research is recognizing that both knowledge sharing and collaborative learning require social factors (knowledge creation, storage, and sharing) along with technical factors (technology fit, usefulness). KMS encompass both technical factors and social factors that include interactions related to knowledge exchange and the development of community culture (Lin et al., 2013).

Lin et al. applied socio-technical theory to the theoretical framework of their research model. Socio-technical theory states that both technical factors (system and information quality) and social factors (governance and norms) relate to user satisfaction, sense of belonging, and system usage. Lin et al. (2013) used hypothesis testing to prove the theoretical framework. They utilized a survey from previously validated research was used for data collection. The population consisted of computer programming knowledge community from which data were collected. Because of research model complexity and relatively small sample size, PLS was used for analysis. Lin et al. noted that LISREL was not appropriate for this test because of the formative measures within the framework.

Results of the Lin et al. analysis found that all tested dimensions of system and information quality were found significant (satisfaction (0.66), sense of belonging (0.53), and usage (0.78)) and governance (0.62) $p<0.001$) and was positively correlated to system quality. Lin et al. examined the relationships between socio-technical factors, user satisfaction, sense of belonging, and usage. Community governance and pro-sharing norms were found to be social factors that impact knowledge community usage. Thus governance is a relevant construct that should be considered when trying to understand how social factors impact system usage. Findings of Lin et al. also illustrated how governance affects information quality, system quality and pro-sharing norms.

As with many other studies, Lin et al. was not without limitations. The study relied on self-reported usage measures which can ultimately introduce bias. The study was also focused on IT knowledge which limits the ability to generalize results across other types of knowledge. Future research might focus on additional types of knowledge. Future researchers can also extend the model by examining additional socio-technical factors not considered in their study.

Technology Factors of STS

System Quality

Lin (2012) investigated technology factors related to virtual learning systems (VLS), which are a type of KMS used primarily in higher education settings. Similar to KMS usage in an organizational context, VLS used in blended-learning instruction do not always lead to learning effectiveness and productivity. This study combined IS continuance theory (Bhattacherjee, 2001) with TTF (Goodhue & Thompson, 1995) to understand sustained VLS use and its impacts on learning. The technology acceptance model (TAM) was applied to understand adoption and intention while TTF was used to measure post-technology-acceptance. An experimental field study was performed to test whether perceived fit is positively related to satisfaction and VLS continuance intention. It also tested whether satisfaction is positively related to VLS continuance intention and VLS continuance intention has positive impacts on learning.

Lin collected and analyzed survey data from 165 students at a major Taiwanese university who had taken part in an IS fundamentals courses, led by two instructors and two graduate teaching-assistants. Both instructors utilized the VLS as a primary method of instruction. Their study employed PLS to analyze data. Results revealed that perceived fit is positively related to satisfaction ($\beta = 0.597$, $t=8.950$, $p<0.000$) and VLS continuance intention ($\beta =0.572$, $t=9.244$, $p<0.000$). It was also determined that satisfaction was also related to VLS continuance intention ($\beta =0.283$, $t=10.396$, $p<0.000$).

VLS continuance intention is significantly related to positive impacts perceived by learners ($\beta = 0.654$, $t = 11.015$, $p < 0.000$). Lin's structural model accounted for 43% of the variance in positive impacts on learning.

Other studies validated theories of IS continuance intention and task-technology fit. However, Lin was one of the first to empirically test a relationship by combining these two theories. Results confirm that VLS continuance intention can mediate the effect of perceived fit. Furthermore, results also confirm the significance of perceived fit and satisfaction with a VLS, in the case of the adoption of a web-based learning system. This study confirmed the significance of perceived fit and satisfaction with a VLS, in the case of adopting a web-based learning system. Both of these factors may also impact usage of other types of KMS. From a socio-technical perspective, this study provided a key insight into the importance of considering system quality when studying KMS usage.

Wang and Lai (2014) pointed out that many organizations implement KMS hoping to obtain competitive advantages. However, adoption of the KMS is still not high. According to Wang and Lai, there is still limited research addressing a comprehensive set of factors related to KMS adoption and usage in organizations (Wang & Lai, 2014). Wang and Lai further disclaimed that only a few studies assessed comprehensive measures when investigating KMS adoption (Chen, Chuang, & Chen, 2012; Lin & Huang, 2008). Even these studies still do not sufficiently address socio-technical factors in terms of system usage.

Wang and Lai suggested that system quality, information quality, and responsiveness are positively associated with system usage. Wang and Lai drew upon DeLone and McLean's IS success model, self-efficacy theory, and institutional theory.

Using a blend of these disciplines the study developed a multi-dimensional KMS adoption model incorporating technology, the individual, and the organization. An experimental study was performed and hypotheses were tested. Data were collected from 295 petroleum company employees. The data was then studied using structural equation modeling. Confirmatory factor analysis (CFA) was used to validate fit, validity, and reliability.

Of particular importance regarding their study, several key hypotheses were supported, which indicated system and information quality are determinants of user satisfaction and usage. System quality ($\beta = 0.51$) was found to be a dominant factor in the model. Results also indicated that system and information quality positively impacted user satisfaction. Wang and Lai provided additional support for the updated DeLone & McLean ISS model. Their study also confirmed the importance of considering system and information quality when exploring system usage.

Although numerous studies have been focused on KMS usage, many have been focused on technical factors like systems, but few have also addressed a comprehensive set of social factors (Wang & Lai, 2014). A key limitation of Wang and Lai's study is the ability to generalize findings because of the narrowly focused population. There is an opportunity for future studies to extend components of Wang and Lai's research model in differing contexts or using additional factors.

Information Quality

Kuo and Lee (2009) also recognized that KMS are often not used and sought to understand why. They pointed out that previous studies confirmed that lack of KMS use can be caused by ignoring social factors of the system, like information quality. The

KMS must fit the task but also be usable (Lin and Huang, 2008). This demonstrates that KMS quality and content impact system use in a significant way. Hence, information quality should be considered when studying KMS usage (Kuo & Lee, 2009).

Extending TAM, Kuo and Lee added information quality to task technology to understand KMS usage. Because companies have made large investments in KMS, it is critical to understand how usage can be increased. TAM is widely used to explain IT adoption as it consistently explains approximately 40% of the variance in system usage (Kuo& Lee, 2009). It is often modified, extended or combined with other theories like TTF (which is also widely relied upon to explain system usage). Similar to Goodhue and Thompson (1995) Kuo and Lee proposed extension of several usage theories.

A pre-tested survey was used to collect data from IT managers at 500 Taiwanese companies. In all, 151 usable responses were returned (30.2%). Reliability was then tested by using factor analysis and Cronbach's alpha (Kuo & Lee, 2009). Correlations were then tested using regression analysis. Findings of Kuo and Lee concluded information quality had a significant impact on perceived ease of use and usefulness. This suggests that information quality is worthy of further study when analyzing socio-technical factors of system usage. Kuo and Lee found a positive and significant relationship between information quality and perceived ease of use and usefulness. A moderating relationship was also confirmed between information quality and perceived usefulness when investigating TTF (Kuo & Lee, 2005). The value that Kuo and Lee provided is understanding how information quality relates to usefulness, task fit and KMS usage. When considering limitations, the response rate of Kuo and Lee was relatively low and the population narrow, so ability to generalize this study may be compromised.

Oyefolahan (2012) examined technological factors that impacted motivation to use socio-technical systems. Although technical aspects of the system are important, having a complex KMS does not guarantee success in KM initiatives. Oyefolahan focused on autonomous motivation toward KMS use (DV), hypothesizing that the type of willingness to use the system will determine how long usage can be sustained. Furthermore, autonomous motivation is contingent upon the availability of adequate technical factors. Together, system quality and knowledge richness accounted for the majority of the variance, proving that technology factors are important in determining motivation to use, which in turn is positively correlated to system usage.

Oyefolahan utilized empirical data collected via the field for hypothesis testing. The study considered whether the level of knowledge richness in KMS would significantly influence the development of autonomous motivation towards use of the system, and whether the degree of autonomous motivation to use KMS among knowledge workers will be significantly related to the actual use of the KMS. The sample consisted of 600 working class respondents that were enrolled in executive MBA in Malaysia. Of the 600 surveys distributed, 306 responses (51%) were usable. Descriptive statistics were summarized, followed by assessment of validity and reliability of the instruments. Finally, multiple regression analysis was used for testing of the hypotheses. Knowledge richness significantly influenced autonomous motivation towards use ($\beta = 0.227$ and p-value = 0.002). Autonomous motivation to use the KMS was significantly related to the actual use of the KMS ($\beta = 0.758$ and p-value = 0.000).

Oyefolahan confirmed that autonomous motivation to use had a positive relationship with KMS usage, and went beyond previous studies by building on both social and technical aspects of system usage. The study supported and substantiated the findings of other research presented in this review (Hester, 2012; He et al., 2009). It also validated the need to consider both social and technical factors as it relates to system usage.

Technology Fit

Ramayah, Ahmad, & Lo (2010) proposed refinements to the Delone and McClean IS Success model. Updates to the model consisted of: 1) the addition of service quality, 2) the addition of intention to use, and 3) the collapsing of individual impact and organizational impact into net benefits. The IS Success Model suggests system quality and information quality affect use and user satisfaction (DeLone & McLean, 2003). Intention to use and user satisfaction both can affect each other. Both use and user satisfaction influence the individual.

Ramayah et al. utilized empirical data collected via a field study for hypothesis testing. The study considered whether system quality will be positively related to behavioral intention, information quality is positively related to behavioral intention, and service quality is positively related to behavioral intention. Data were collected from 1616 undergraduate and post graduate students from public universities in Malaysia. The cross-sectional study was non-contrived, using questionnaires to gather data. Measures were taken directly or adapted from previous studies. Multiple regression analysis was used to test the hypotheses that comprised the direct effects of system quality, information quality, and service quality on intention to use. Results concluded that service quality ($\beta = 0.382$, $p < 0.01$), information quality ($\beta = 0.338$, $p < 0.01$) and system quality ($\beta = 0.175$, $p < 0.01$) were all found to have significant impacts on behavioral intention to use e-learning among undergraduates and postgraduates in Malaysian universities. Overall, these three variables explained about 59% of the variance. According to Ramayah et al., this is considered a high correlation given the nature of social science research.

Ramayah et al. confirmed that system quality, information quality, and service quality are all determinants of behavioral intention to use e-learning systems among students in public higher education. Though e-learning systems can be characterized as a KMS, its specific purpose may make results difficult to generalize across other KMS types. Furthermore, since this study is based on the result of only students in Malaysia, care should be exercised when generalizing findings to other cultures or in the workplace. In spite of its limitations, this study's findings conclude that system quality, information quality, and service quality are determinants of behavioral intention to use. These findings suggested that these technology factors should be considered when exploring socio-technical models. Continued research is needed to improve on and build upon their study.

Hester (2014) focused on relationships between actors, structure, tasks and technology. The technology was Web 2.0 technologies, which can be thought of as socio-technical systems. Specifically, a wiki used for collaborative KM was studied. Although these technologies have seen increased application, exploring usage remains a relevant topic for researching the socio-technical implications of these applications since existing studies do not sufficiently explain the social dynamics (Hester, 2014).

Hester (2014) is a study based on socio-technical systems theory (STS) put forth by Bostrom and Heinen (1977). The theory defines work systems as both social and technical. The social factors consider people, while the technical factors consider technology and task (Hester, 2014). Hester (2014) identified that IS failures often occur when social components of the system are ignored, therefore, socio-technical systems approaches are useful when investigating system usage. The study drew upon Goodhue and Thompson’s (2005) TTF model to understand technical factors of system usage.

Hypothesis testing was used to test the socio-technical relationships among Web 2.0 technologies. A survey was collected from employees of cloud computing firm that used an implementation of wiki technology. Hypotheses were then tested using PLS techniques. A key result of the test indicated that technology-structure fit (0.36 at 0.05 significance) had a significant positive relationship with system use. Based on these results, system usage is clearly linked to technical system factors. Although STS has been the basis in numerous qualitative studies, Hester (2014) quantitatively tested a model based on the.

Regarding limitations of Hester (2014), the relatively small sample size may not easily be generalized to other technologies. The socio-technical factors considered in the study are also limited, so future research might consider a more comprehensive set of factors across broader technologies. Hester (2014) presents a reasonable foundation for future studies to consider when study socio-technical factors and their implications on system usage.

Summary

Although both academics and practitioners agree that KM can provide a competitive advantage, employees are not always willing to use a KMS to share knowledge. KMS is one of the critical success factors of the organization's KM initiative. It has been established that KMS usage is important to the success of KM initiatives, and subsequently creating a competitive advantage for the organization. Research focused on KMS usage indicates the relevance of socio-technical factors, but few studies have explored all three socio-technical factors. Because knowledge sharing is a social process, a KMS can be considered a socio-technical system. He et al. (2009) confirmed the relationship between social relationship and KMS usage.

Although the individual components of socio-technical systems (people, processes, and technology) can influence KMS usage independently, the integration of all three into a single framework might provide a better understanding of KMS usage. A preponderance of studies provide examples and direct support for considering socio-technical factors when investigating KMS usage. Hester (2010) identified that some factors are important in determining adoption, while others are important in determining usage. Quality and procedural justice were determined to be relevant constructs of knowledge use by Chung and Galletta (2012). Substantial support exists for the development of a comprehensive set of factors that can shed light on increasing KMS usage. This in turn will increase the chances of successful KM projects.

Chai and Kim (2012) found that people are as significant as technology in users contributing their knowledge in the SNS. Where social networking is concerned, people factors are even more relevant than technology factors, which may also apply in the context of KM. Chen, Chuang, and Chen (2012) determined that KMS quality, KMS self-efficacy, organizational climate, and intention to share knowledge are factors that can impact KMS usage. Chen et al. (2012) found that knowledge sharing, a people-centric factor, is significantly influenced by KMS self-efficacy, and organizational climate through other mediating variables such as attitude. Therefore, even using STS approaches, the availability of a KMS will not always achieve the objective of sharing knowledge. Countless studies utilized TAM to explain system usage. However, based on the social nature of knowledge sharing, TAM cannot sufficiently explain KMS usage (Olschewski et al., 2013).

Organizational processes have also been identified as important to fostering KMS usage. Cao and Xiang (2012) identified knowledge governance as an important factor of knowledge sharing. Therefore, organizations should strengthen informal knowledge governance to influence employee knowledge sharing. Furthermore, the Kuo et al. (2011) study found that organizations should be as concerned about management and leadership style as about the technology. Xue et al. (2011) identified a correlation between team climate and empowering leadership on individuals' knowledge sharing attitude and behavior. Their study validated the need to consider these variables when examining system usage of a knowledge repository.

Lin (2012) confirmed the significance of perceived fit and satisfaction with an IS, in the context of the adopting a web-based learning system. Both of these factors may also impact usage of other types of KMS, implying the importance of considering technology in a study on KMS usage. Oyefolohan (2012) confirmed findings of other research presented in this review (Hester, 2012; He et al., 2009) and validated the need to consider both social and technical factors when investigating KMS usage. Finally, Ramayah et al. (2010) found that system quality, information quality, and service quality impact behavioral intention to use social systems. Thus, the literature suggests that technology factors are important considerations that can explain KMS usage.

There are clearly gaps in the KMS usage body of knowledge. KMS initiatives fail due to a lack of understanding of how the people, process and technology factors influence KMS usage. Additional study was needed to confirm relationships between socio-technical variables and KMS usage. A rigorous experimental analysis of the impacts of socio-technical factors on KMS usage resulted in major cognitive insights and value-added processes that can increase the organization's competitive advantage.

Chapter 3

Methodology

Overview of Research Methodology

The goal of this causal study was to investigate the relationships among certain socio-technical factors and their impacts on KMS usage. Analysis for this problem required a causal, non-contrived study, which collected information without changing the environment (Sekaran & Bougie, 2010). This section outlines the research design and describes the methods that were employed. Each of the steps that were required to satisfy the high-level methodology are described.

Specific Research Methods Employed

The goal of this study was to address two main research questions that will provides key insights toward understanding the factors that motivate KMS usage:

RQ1: What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage?

RQ2: What are the relationships among these factors and how do they influence KMS usage?

To address the first question, an extensive review of the literature was used to identify the relevant factors. The second question required an experimental study to understand the relationships among the pertinent factors. Data collection and causal modeling were required to answer the study questions and to gain a better understanding of the relationships among socio-technical factors and their impacts on KMS usage (Leedy & Ormrod, 2010). The study employed quantitative research methods.

According to Kamer (2011), quantitative research is used to determine the extent of variation in a phenomenon by measuring or classifying variables.

Review of Existing Literature

According to Levy and Ellis (2006), the literature review is essential to determining what exists in the current body of knowledge and identifying where limitations provide opportunities for continued research. Furthermore, the literature review prevents wasting time and resources on irrelevant research (Sekaran & Bougie, 2010). Levi and Ellis (2006) recommend a three stage approach to developing the literature review: 1) input, 2) processing, and 3) output. During the input stage, the relevance and quality of the literature will be examined. This is key to ensuring that sources are qualified so the output stage can be successful (Levy & Ellis, 2006). Processing is required to convert the literary facts into usable information (Levy & Ellis, 2006). Finally, output integrates the proper argumentation to define the relevance of the processing (Levy & Ellis, 2006).

Theoretical Framework

After an extensive review of existing literature was completed, the theoretical framework for the study was developed and refined. Figure 2 provides a representation of the theoretical model for use in this study. It demonstrates the linkages between socio-technical factors and their impacts on KMS usage.

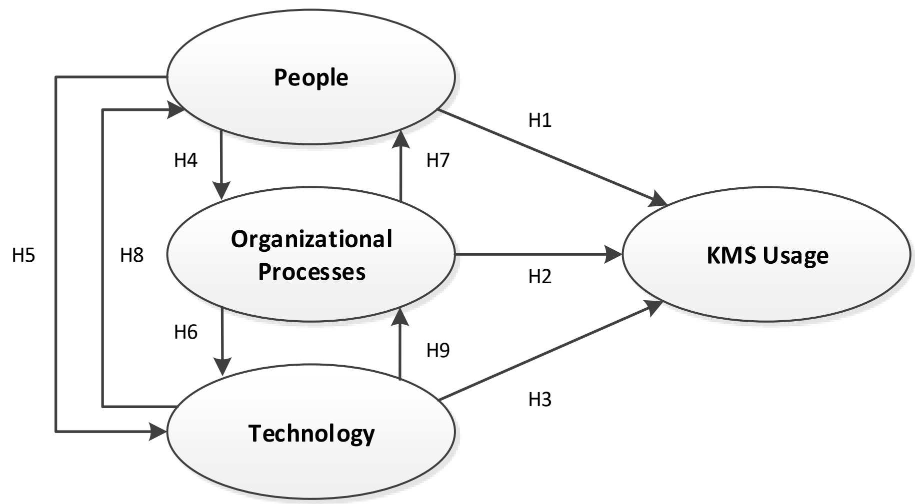

Figure 2. Theoretical Model

Based on the theoretical model, the following hypotheses were tested:

H1: More favorable people-oriented factors in an organization will promote greater KMS usage.

H2: More favorable organizational process factors in an organization will promote greater KMS usage.

H3: More favorable technology-oriented factors in an organization will promote greater KMS usage.

H4: More favorable people-oriented factors in an organization will promote a more favorable perspective of the process-oriented factors in that organization.

H5: More favorable people-oriented factors in an organization will promote a more favorable perspective of the technology factors in that organization.

H6: More favorable process-oriented factors in an organization will promote a more favorable perspective of the technology factors in that organization.

H7: More favorable process-oriented factors in an organization will promote a more favorable perspective of the people-oriented factors in that organization.

H8: More favorable technology factors in an organization will promote a more favorable perspective of the people-oriented factors in that organization.

H9: More favorable technology factors in an organization will promote a more favorable perspective of the process factors in that organization.

These hypotheses were sufficient to analyze the relationships among the relevant socio-technical factors and their influence on KMS usage.

Constructs and Measures

Based on the theoretical framework, constructs and measures for the study were developed. Constructs of the independent variables and their measures are outlined in Figure 3.

Study Constructs and Measures

Construct	Latent Variables
People	1) Self-Efficacy (Chen et al., 2012) 2) Social Ties (Chai & Kim, 2012) 3) Ease of Use/Usefulness (Olschewski et al., 2012)
Processes	1) Leadership (Kuo et al., 2011); Xue et al., 2010) 2) Organizational Culture/Climate (Xue et al., 2010) 3) Governance (Cao & Xiang, 2012)
Technology	1) System Quality (Ramayah et al., 2010; Oyefolohan et al., 2012) 2) Information Quality (Ramayah et al., 2010; Oyefolohan et al., 2012) 3) Technology Fit (Lin, 2012)

Figure 3. Study Constructs and Measures

The people construct was characterized by users contributing to and accessing the KMS. Variables that operationalized this construct were self-efficacy (Chen et al., 2012), social ties (Chai & Kim, 2012), and ease of use/usefulness (Olschewski et al., 2012). The process construct was characterized by organizational variables that promote KMS use or non-use. This construct was operationalized by leadership (Kuo et al., 2011, Xue et al., 2010), organizational culture/climate (Xue et al., 2010), and governance (Cao & Xiang, 2012). The technology construct was characterized by the appropriateness of the system for enabling knowledge sharing. Variables that operationalized this construct were system quality (Ramayah et al., 2010; Oyefolohan et al., 2012), information quality (Ramayah et al., 2010; Oyefolohan et al., 2012), and technology fit (Lin, 2012).

The dependent variable for this study was KMS usage. KMS usage was characterized by the extent to which users utilized the KMS for contributing to, or accessed the knowledge repositories for problem-solving or task completion. Measures for KMS usage included self-reported usage data collected via a questionnaire. These scales provided a robust set of measures for the KMS usage construct.

Quantitative Analysis

After completing the literature review, defining the theoretical framework, and operationalizing the constructs, the researcher determined that quantitative research was required to understand the model's relationships. When using quantitative research, the researcher must rely on numerical data (Sekaran & Bougie, 2010). The numerical data was required to provide a basis for observation and measurement that was used to compare specific variables, test hypotheses, and test the theoretical framework. This stage of the study isolated variables and causally related them to determine the extent and frequency of their relationships. A sample of voluntary responses was selected using cross-sectional data, which implies the data was collected at one point in time (Sekaran &

Bougie, 2010). Prior to instrument development and validation, the researcher was required to successfully complete CITI online training as prescribed by the Nova Southeastern University Institutional Review Board (IRB). The training was successfully completed on 2/16/2015 and a transcript can be found in Appendix A.

Instrument Development and Validation

Survey Development

The primary technique for collecting the quantitative data was a survey containing self-assessment items. This method was adopted since individual, self-reported data was required to address the second research question, and generalizing results to a larger population is necessary (Rea & Parker, 2005). The literature review did not yield an appropriate instrument to comprehensively address the proposed research hypotheses, so a survey was developed for data collection. Continued efforts were made to learn if one or more appropriate instruments become available for use in this study, but none were identified. Consequently, the researcher designed and validated the survey that was used to collect both demographic data and information about employee perceptions of the socio-technical facets of KMS usage. A panel of experts was required to ensure content validity of the survey instrument after it was developed.

Developing the survey required several steps. Kulkarni and Freeze (2006) described a four step process to develop a survey. Kulkarni and Freeze’s process was used to develop the survey instrument for use in this study. First, potential survey questions were drawn from peer-reviewed research literature, focusing on key socio-technical scales that have been previously used to measure the influence of people, processes, and technologies on KMS usage. The survey items were modified as needed to conform to the context of the current study (Appendix B). Permission to modify these questions for the current study was obtained from the original authors (Appendix C). Second, a draft of the survey was validated by the consensus of an expert panel through the Delphi technique. Expert review of the candidate questions increased the face and content validity of the instrument (Netemeyer, et al., 2003). In accordance with IRB requirements, approval of study components was required before a panel could be assembled (Appendix D). Study participants were provided a participation letter indicating they understand their involvement in the study and their completion of the questionnaire implied consent to participate (Appendix E). Third, the survey was edited to reflect the expert feedback provided by the Delphi panel. Finally, a pilot study using the same target audience as the subsequent larger study provided further indication of the appropriateness of the instrument.

A web-based survey instrument was appropriate for the proposed study, due to the characteristics of the target population. The target population was familiar with computers, email, and Internet. According to Evans and Mathur, a significant number of KM/KMS investigations have relied on a web-based survey methodology (2005). A web-based survey also has several advantages, including fast turnaround, low implementation cost, ease of data entry and analysis, ability to obtain large samples, and the multimedia capabilities (Evans & Mathur, 2005; Sue & Ritter, 2007). Another advantage of a web-based survey is that participant responses were captured in a database and could be easily transformed into numeric data for analysis. The self-assessment items were measured using a five-point Likert scale with items ranging from strongly agree to strongly disagree. Five points tend to provide a fair balance between having enough points of discrimination without having to maintain too many response options (Nunnally, 1978). Since the survey contained a number of items, the five-point scale offered simplicity that reduced the time required to complete the survey (Salkind, 2009).

Delphi Team Validation

In quantitative research, validity and reliability of the instrument are important for decreasing errors that might arise from measurement problems in the research study. Validity and reliability are important considerations associated with the development of survey instruments. Validity can be defined as the degree to which an instrument, technique, or process measures the intended concept (Sekaran & Bougie, 2010). The current study incorporated methods to improve both content and face validity.

After the analysis of the literature and initial survey development, the validity of the draft survey was confirmed by the Delphi panel. The team came together and their work commenced after the literature review and the first draft of the survey was completed. Content validity was enhanced by using experts experienced with both KMS and socio-technical factors to refine survey questions identified in the literature review. The survey was validated by tapping into the expertise of the panel and determining their consensus through the Delphi technique. The Delphi technique used in this study, allowed the panel to collaborate remotely. According to Yousuf (2007), the Delphi method can be effective even when team members are geographically separated and face-to-face meetings would be costly or prohibitive. Delphi panels are useful for individuals studying a complex problem but have no history of communication and represent diverse backgrounds in experience. The panel's experts should also be aware of survey construction and administration techniques, to ensure they can provide reviews of the survey's instruction comprehensibility (Carmines & Zeller, 1979).

Hsu and Sanford caution that proper selection of the Delphi participants is crucial to the success of the Delphi study (2007). According to Adler and Ziglio (1996), participants should meet four "expertise" requirements. First, knowledge and experience with research content. Second, panel experts must have the ability and willingness to participate. Third, members must have sufficient time for participation. Finally, Delphi panel members must have effective communication skills. Skulmoski, Hartman, and Kahn (2007) suggested that experts required knowledge of the content areas and significant expertise within a given subject area is essential. For this study, the knowledge requirement was met by selecting panel members that have helped plan, implement, or evaluate a KMS used for decision support. This criteria was evidenced by at least three years in a line or management role with direct responsibility for architecture, development, or implementation of a KMS, or at least one of the socio-technical areas contributing to the implementation or maintenance of the KMS. Panel members were also be representative of a variety of private sector industries to ensure diverse feedback.

The expert panel reviewed sentence clarity and length, and stated whether they believed the survey would capture perceptions of the selected socio-technical and KMS usage factors. For a homogenous sample, the panel should generally consist six to fifteen people (Fowler, 2008; Hsu & Sanford, 2007; Skulmoski, et al., 2007). Okoli and Pawlowski (2004) recommended a practical Delphi panel size of ten to eighteen members in size. Since the literature does not provide a definitive rule for selecting the Delphi panel size, the current study targeted eight members. Eight members would satisfy the needs recommended by the preponderance of the literature that was reviewed, while providing a buffer of at least two participants above the minimum threshold. This buffer would mitigate ramifications that may result from a panel member's inability to complete the commitments to the study.

Participants in the expert panel communicated through the online survey tool and via electronic mail for its timeliness and ease of use. Fast turnaround times help to maintain interest and participation (Skulmoski et al., 2007). Working with the panel consisted of three rounds, where two to four rounds were outlined by Hsu and Sanford (2007). The purpose of the Delphi panel was to work toward consensus on determining when the survey instrument is ready for distribution to the sample population. Determining consensus could be achieved by statistical means (Hsu & Sanford, 2007; Skulmoski et al., 2007). Consensus was achieved when the average (mean) for each question was four or more on a five-point Likert scale and no question score was two or less. Until consensus was achieved, additional rounds were required (Skulmoski et al., 2007).

The following approach was used based largely on the four round technique recommended by Hsu and Sanford:

1) Round 1 – Distributed materials to panel members including:
    a. Participation Letter (Appendix E)
    b. Email invitation to participate on Delphi Panel (Appendix F)
    c. Description of the research (Appendix G)
    d. Overview of the Delphi process (Appendix H)

e. Draft survey (Appendix I)

f. Delphi team qualifications (Appendix J)

g. Round One Questionnaire (Appendix K)

Each participant was assigned a unique planetary reference identification to ensure anonymous participation. The first round of review and feedback were completed by October 25, 2015. The survey was subsequently revised and returned to the panel.

2) Round 2 - After receiving feedback from round one, a return comment matrix of Delphi feedback from round one (Appendix J) was distributed with a revised copy of the survey and a new questionnaire (Appendix K). Hsu and Sanford advised that consensus will begin forming during this round and it was important to publish the panels' concerns and describe the actions taken to incorporate feedback. The second round feedback (Appendix L) was completed by November 11, 2015.

3) Round 3 – Feedback collected in the second round was integrated into a revised survey, and the panel had an additional opportunity to raise concerns and move toward consensus. A revised copy of the survey and a new questionnaire were provided along with a return comment matrix of Delphi feedback from round two (Appendix M). Skulmoski et al. (2007) noted that by this stage, reasons will need to be outlined if no consensus is met. However, consensus was reached, so this round provided a final opportunity for panelists to provide their judgments and feedback.

The third and final round was completed by November 16, 2015, at which time the Delphi team reached consensus on the validity of the survey. The final scores of survey items are outlined in Appendix M. This concluded the efforts of the Delphi team. Each member was thanked for their participation and offered the option to be provided with a copy of the final study at its conclusion. Appendix P contains the survey that was validated by the Delphi team and subsequently used to conduct the pilot analysis.
At the point when consensus was reached, the Delphi panel completed its contribution and the survey questions were ready for distribution.

Pilot Survey

Content validity of the survey was ensured by the content analysis of the Delphi team. The next step was to confirm face validity of the survey instrument. Face validity indicates that items measure appropriate concepts, while content validity assures that items represent all facets of the given constructs (Peat, Mellis, & Williams, 2002). Face validity was improved by presenting the instrument to a pre-test frame population (Carmines & Zeller, 1979; Sekaran & Bougie, 2010). This group reviewed the instrument and further verified that the survey items would capture the appropriate data.

A sample of participants were invited to participate in a pilot study on a small scale. Although the number of participants in a pilot study can vary, at least ten should be adequate for most studies in social research (Babbie, 2004). These participants were excluded from the subsequent major study. Each participant in the pilot received, a pre-survey notice (Appendix N), an invitation with instructions (Appendix O), a participation letter (Appendix E), and the pilot survey (Appendix P). In addition to the survey, pilot participants were asked to provide additional feedback on completion time, ambiguity, and difficulty (Appendix Q). If the desired number of responses were not achieved, a reminder notice would have been sent to invitees (Appendix R).

The pre-survey notice was sent on November 13, 2015. The pilot survey invitation containing a link to SurveyMonkey® was sent on November 21, 2013. The draft of the survey included an additional section (Appendix Q) with open-ended questions for respondents to comment on various aspects of the survey as a means to improve the questionnaire's overall quality. On November 28, 2015, a reminder notice (Appendix R) was sent to encourage those who had not yet participated to complete the survey.

On December 9, 2015 the pilot survey was closed and data collected was analyzed for functional issues and respondent feedback was reviewed and integrated. Validity of the pilot survey was not tested due the small number of participants. A total of six participants responded. The response rate for the online survey was 50%. There were no functional issues reported by the participants (Appendix S), however, one respondent noted that KMS usage factors appeared to be missing. This feedback resulted in the addition of items USSEEK and USCONT to the final survey (Appendix T).

The survey was administered to pilot subjects in exactly the same way as it was administered in the main study (Peat et al., 2002). Based on the pilot test results (Appendix S) the survey items were revised as necessary. Ambiguous, difficult, or redundant questions were modified or discarded. The results of the pilot survey helped establish internal consistency, reliability, face and content validity of the survey instrument (Peat et al., 2002).

Data Analysis

The data analysis plan for the study included descriptive and inferential statistics as recommended by Creswell (2009). Descriptive statistics include means, standard deviations, and ranges. The inferential statistics include structural equation modeling related to KMS factors.

Research Sample

Research was conducted as a field study, focusing on a cross-sectional time horizon with the individual as the unit of analysis. The population of all organizational employees is too large to study in its entirety. Therefore, a sampling of the population was employed to draw conclusions about the larger group. The study population was comprised of individuals within the United States that use a KMS for decision support within an organizational context. This type of KMS is often referred to as a decision support system (DSS). A DSS is a computer-based KMS that supports business or organizational decision-making (Sprague, 1980). According to Sprague, the DSS is typically used by mid to upper managers within operations for planning at all levels within the organization. Power (2002) defined several types of DSS:

- Communication-driven - supports groups with a shared task.
- Data-driven – supports storage and retrieval of internal and external company data.
- Document-driven – supports management, retrieval, and manipulation of unstructured data.
- Knowledge-driven - supports specialized problem-solving expertise using business rules.

- Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.

A range of KMS users was desirable for this exploratory study. Respondents should be representative of knowledge workers within various types and sizes of organizations (e.g. retail, healthcare, consumer goods, financial services, manufacturing, etc.), using a DSS. It was expected that many respondents would likely be using systems that are meant to facilitate KM initiatives or other collaborative technologies. Respondents received a brief description of the study and its objectives, and were provided with an Internet URL to access and complete the survey.

Similar to Hester (2010), participants of this study were required to be engaged in KMS usage within an organizational context and not for personal use. For the purposes of this research, KMS was clearly defined as an IS used for managing, creating, capturing, storing, and retrieving information (Hester, 2010). Furthermore, the KMS should enable employees to readily access organizational facts, information, and solutions (Hester, 2010). KMS can include expert systems, groupware, document management systems, decision support systems, database management systems, and simulation systems. This study focused specifically on decision support systems.

The sample size required for data analysis is contingent upon the methodology being used in the study. This research utilized the Partial Least Square (PLS) methodology for data analysis based on reasons outlined in a subsequent section. When using PLS, the rule of thumb recommends sample size should be equal to either: 1) ten times the scale with the largest number of formative indicators, or 2) ten times the largest number of antecedent structural paths leading to a given construct in the structural model

(Chin and Newsted, 1999). Based on this logic, 90 was the minimum reasonable size for the sample (10 * 9 antecedent constructs of KMS usage = 90). Baruch and Holton (2008) examined response rates for surveys used in organizational research and suggested a response rate of 35% could be expected. Börkan found that web-based surveys have a 13% response rate on average (2010). As a conservative measure, a 10% response rate was assumed for the current study. Therefore, an estimated minimum of 900 potential participants were needed to provide sufficient data for analysis.

Upon execution of the data collection process, multiple items were distributed to sample participants over the course of several days using a paid service called SurveyMonkey® Audience. SurveyMonkey® Audience allows researchers to buy survey responses for surveys created and administered on their site. Respondents were targeted based on specific attributes such as gender, age, income, employment status and type, and other pre-defined criteria. Each participant received a participation letter (Appendix E) and the final survey with instructions (Appendix T).

The survey was accessible via a link to the online instrument, which could be launched using common Internet browsers (e.g. Internet Explorer, Google Chrome, Mozilla Firefox, and Safari). Reminder emails were sent to those that had not completed survey. The online survey administrator collected data without the researcher's involvement, hence protecting the identity of the participants. Participants were pre-qualified before they could participate in the survey to ensure they were members of the appropriate target population. Pre-qualification required each participant to answer the following question before taking the survey:

"Are you a knowledge worker that uses any of the following decision support systems at work?"

- Communication-driven - supports groups with a shared task.
- Data-driven – supports storage and retrieval of internal and external company data.
- Document-driven – supports management, retrieval, and manipulation of unstructured data.
- Knowledge-driven - supports specialized problem-solving expertise using business rules.
- Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.

Yes or no options were presented to each participant. Depending on the selected answer, the online survey either allowed participants to continue with the survey (yes) or disqualified them (no). Disqualified participants received a notification stating: "Thank you for your participation. Unfortunately, you do not qualify for this survey. Thank you for your time".

Data Collection and Screening

To address the second research question, the final survey (Appendix T) was created online using SurveyMonkey® on January 22, 2016. The data used for this study was collected on January 25, 2016 using SurveyMonkey® Audience services. The paid service provided by the online survey administrator automatically provided a data set for analysis. Because the cost of this paid service is driven only by a number of completed responses, there is no definitive information available on how many respondents were targeted to receive the survey. To satisfy the demands of the proposed study, 90 completed responses from the target population procedurally outlined previously were requested. However, 121 total responses were received, of which 97 were fully pre-qualified, complete, and usable. There was no missing data to address in the 97 completed responses.

After data was collected it was screened and prepared for quantitative analysis using SPSS and SmartPLS 3 to analyze the data. Data screening included the descriptive statistics for all the variables, information about the missing data, linearity, normality, and outliers as these may result in poor model fit (Tabachnick & Fidell, 2007). Descriptive statistics for the questionnaire items were summarized and a frequency analysis was conducted to identify valid percent for responses to all survey questions. Data screening was performed to ensure that no duplicate surveys were received, and that no survey contained missing data. To further help limit missing data, the survey was designed to require responses to all questions before the completed survey can be submitted.

Reliability was an important concern since the researcher must avoid introducing sources of error, which can result in inappropriate or unacceptable data for analysis. Examples include coverage, non-response, and measurement errors (Fowler, 2008). A coverage error can occur when there is a mismatch between the target population and frame populations (Sekaran & Bougie, 2010). Non-response errors can result when respondents are not willing or able to complete a survey (Fowler, 2008). To limit non-response errors, the frame population could be notified via a pre-survey notice with an invitation and a reminder notice after the survey is active for a specified amount of time

(Fowler, 2008). Measurement error can result when the respondent's answers differ from their true measurement value. Issues such as wording, the flow of questions, and survey layout can have a negative effect on data collection (Fowler, 2008). Tests for reliability will be outlined in Chapter 4.

Structural Equation Modeling

There are two prominent and distinct approaches to SEM: The first is Covariance-based SEM (CB-SEM), while the alternative is Partial Least Squares (PLS-SEM), which focuses on the analysis of variance (Hwang et al., 2010; Wong, 2010). Both approaches can be modeled using computer software. Programs like AMOS and LISREL are widely used for CB-SEM modeling. Smart PLS is a popular software package for PLS-SEM. The philosophical difference between the two approaches is CB-SEM is often used for theory testing and confirmation, while PLS-SEM is typically used for prediction and theory development (Chin & Newsted, 1999; Bookstein, 1982). PLS-SEM can be compared to using multiple regression analysis (Hair et al., 2012). The primary objective of PLS-SEM is to maximize explained variance in the dependent constructs while simultaneously evaluating the data quality by examining measurement model characteristics (Hair et al., 2011; Reinartz et al., 2009).

To choose the appropriate analysis approach to path modeling, the researcher must select the approach that will provide the most benefit to a particular study. Hair et al. (2014), Rigdon (2012; 2014), and Sarstedt et al. (2014) offer rules of thumb when deciding whether to use CB-SEM or PLS-SEM (Figure 4):

Use CB-SEM if:	Use PLS-SEM if:
1. Confirming or rejecting proven theories.	1. Applications have little available theory.
2. Sample size is large.	2. Sample size is small.
3. Data is normally distributed.	3. Predictive accuracy is paramount.
4. The model is correctly specified.	4. Correct model specification cannot be ensured.
5. Goodness-of-model fit measures are required.	5. Any construct has less than 3 items

Figure 4. Choosing between CB-SEM or PLS-SEM

Based on these rules of thumb, the researcher was able to determine that PLS-SEM would provide the proper approach for the current study since all five items were applicable.

Partial Least Squares (PLS) Analysis

The Partial Least Squares (PLS) method was used to test the hypotheses. PLS is recommended for complex models focused on prediction since it allows for minimal demands on measurement scales, sample size, and residual distribution (Chin, Marcolin, & Newsted, 2003). According to Hester (2010), PLS is similar to regression, but as a components-based structural equation modeling technique, it can simultaneously model the structural and measurement paths. The PLS algorithm supports weighted measurement of each indicator in how much it contributes to the composite score of the latent variable (Hester, 2010). Similar studies on KMS usage utilized this method (Compeau & Higgins, 1995; Hester, 2010; Hester, 2012; Lin & Haung, 2008). Both Lin and Huang and Hester recommended when performing analysis for structural equation modeling, confirmatory factor analysis (CFA) to assess the model's reliability should be used, followed by examining the R^2 values of the structural relationships.

Partial least squares (PLS) is focused on the analysis of variance and can be modeled using a number of different software tools. SmartPLS is one of the prominent software applications for structural equation modeling utilizing PLS. SmartPLS was developed by Ringle, Wende, and Will (2005). The program can be freely used by students performing data analyses for non-commercial purposes. The program is user-friendly, has powerful analytical capabilities, and provides advanced reporting features (Hair et al., 2014). For these, SmartPLS 3 was selected for use in this study and downloaded from http://smartpls.de. In Hair et al.'s (2014) primer on PLS, which can be considered a companion guide for SmartPLS, they recommend a systematic eight stage procedure for applying PLS-SEM (Figure 5):

1	2	3	4	5	6	7	8
Specify the structural model	Specify the measurement models	Data preparation and examination	Path model estimation	Assess measurement model results	Assess structural model results	Advanced analyses (if required)	Interpret results and draw conclusions

Figure 5. Procedure for PLS-SEM Application (Hair et al., 2014)

The current study employed this procedure to perform the path analysis.

Stage One: Specify the Structural Model

The structural model used in the current study was derived from socio-technical systems theory, but was modified to suit the requirements of this study. Hair et al. (2014) note that to obtain useful PLS-SEM results, a sound structural model is the foundation for proper measurement of the variables. In a structural equation model there are two sub-models; the inner model (structural) specifies the relationships between the independent (exogenous) and dependent (endogenous) latent variables, whereas the outer model (measurement) specifies the relationships between the latent variables and their observed indicators (Hair et al., 2014). According to Hair et al., an exogenous variable should not have paths pointing toward it, but will have path arrows pointing outwards. Conversely, endogenous variables should have least one path leading toward it to represent the effects of exogenous variables.

The initial models for data analysis were created using SmartPLS 3. Hair et al. caution that there must be no circular relationships, causal loops, or otherwise recursive relationships in PLS models (e.g., Technology→People→Process→People). Therefore, the theoretical framework initially presented for this study could not be properly tested using a single model. A separate model was required for each endogenous variable (KMS Usage, People, Processes, and Technologies) require to test the nine hypotheses outlined in the current study.

Figure 6 depicts the structural model used to test the impacts of socio-technical factors on KMS usage. This model consists of three first order exogenous constructs – people-oriented factors, organizational process factors, and technology-oriented factors – and one second order endogenous construct, which is KMS usage. All four constructs were measured by means of multiple indicators.

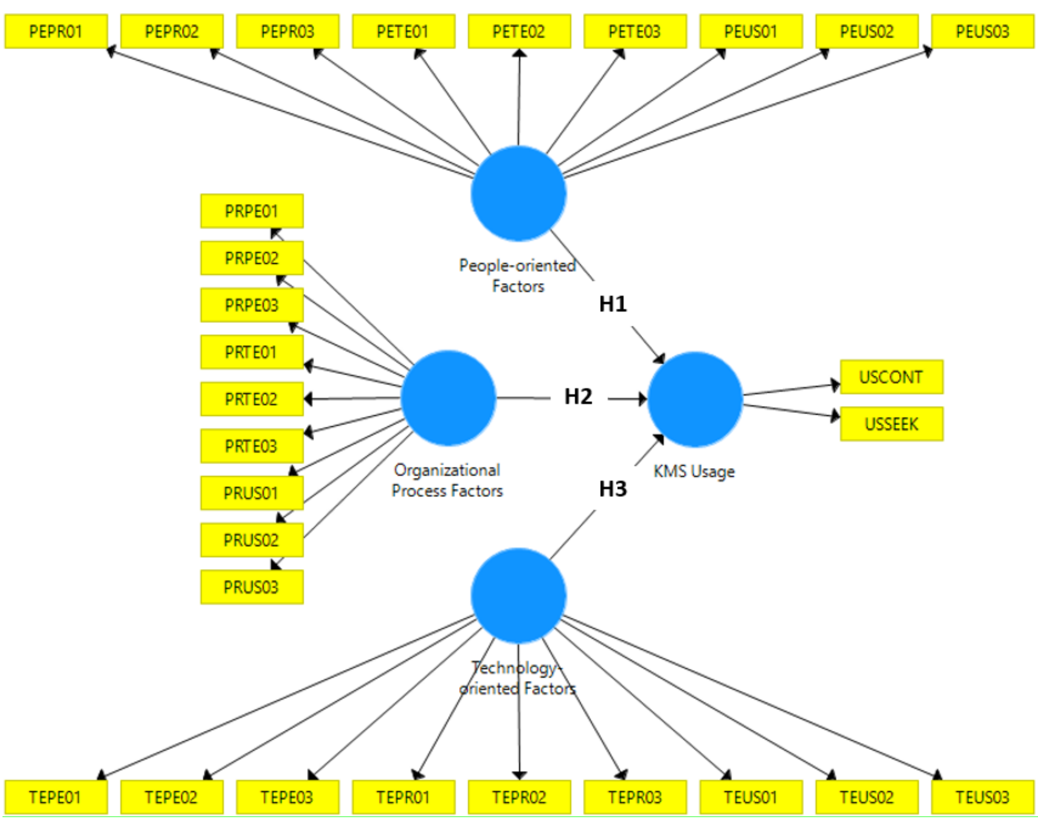

Figure 6. Structural Model for KMS Usage (H1-H3)

Paths from the exogenous variables to the endogenous variables provided a platform for analysis to determine support for hypotheses one through three. A positive relationship was expected for each of the three outlined paths.

Figure 7 depicts the structural model used to test the impacts of socio-technical factors on people-oriented factors. This model consists of two first order exogenous constructs – organizational process factors, and technology-oriented factors – and one second order endogenous construct, which is people-oriented factors. All three constructs were measured by means of multiple indicators. These indicators are discussed in detail in the next section. Paths from the exogenous variables to the endogenous variables provided a platform for analysis to determine support for hypotheses seven and eight. A positive relationship was expected for each of the outlined paths.

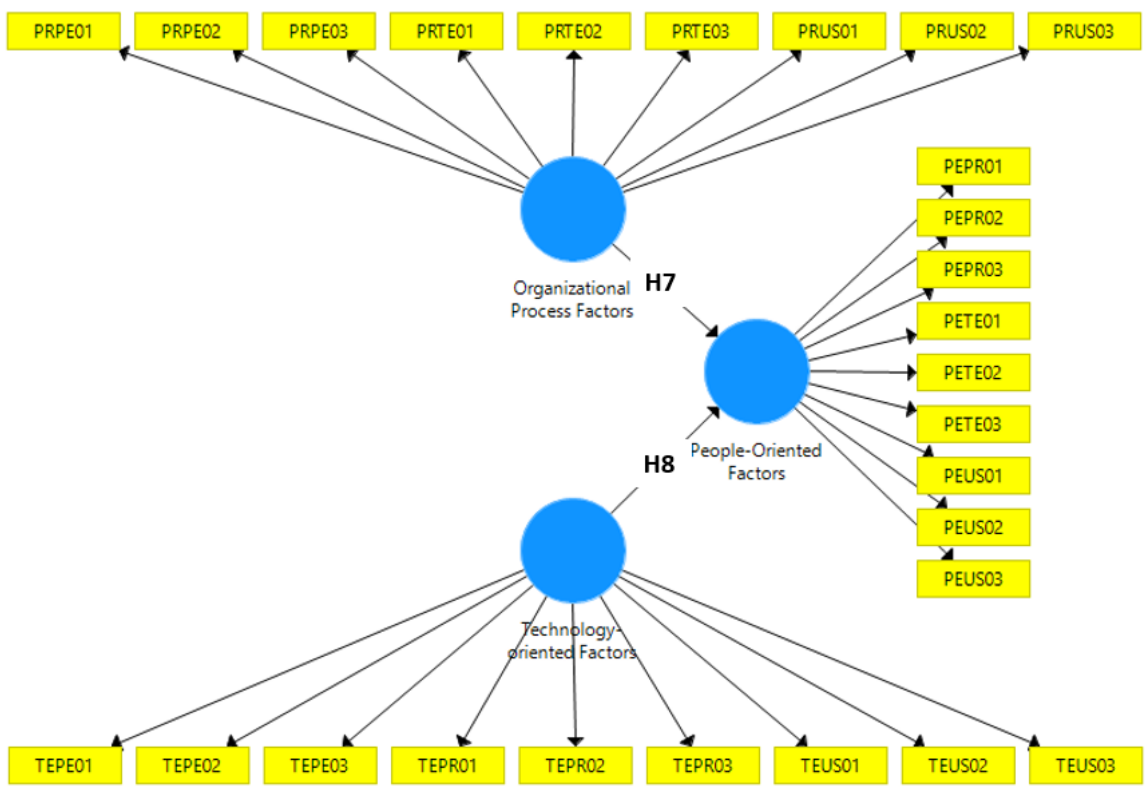

Figure 7. Structural Model for People-Oriented Factors (H7-H8)

Figure 8 depicts the structural model used to test the impacts of socio-technical factors on organizational process factors. This model consists of two first order exogenous constructs – people-oriented factors, and technology-oriented factors – and one second order endogenous construct - organizational process factors.

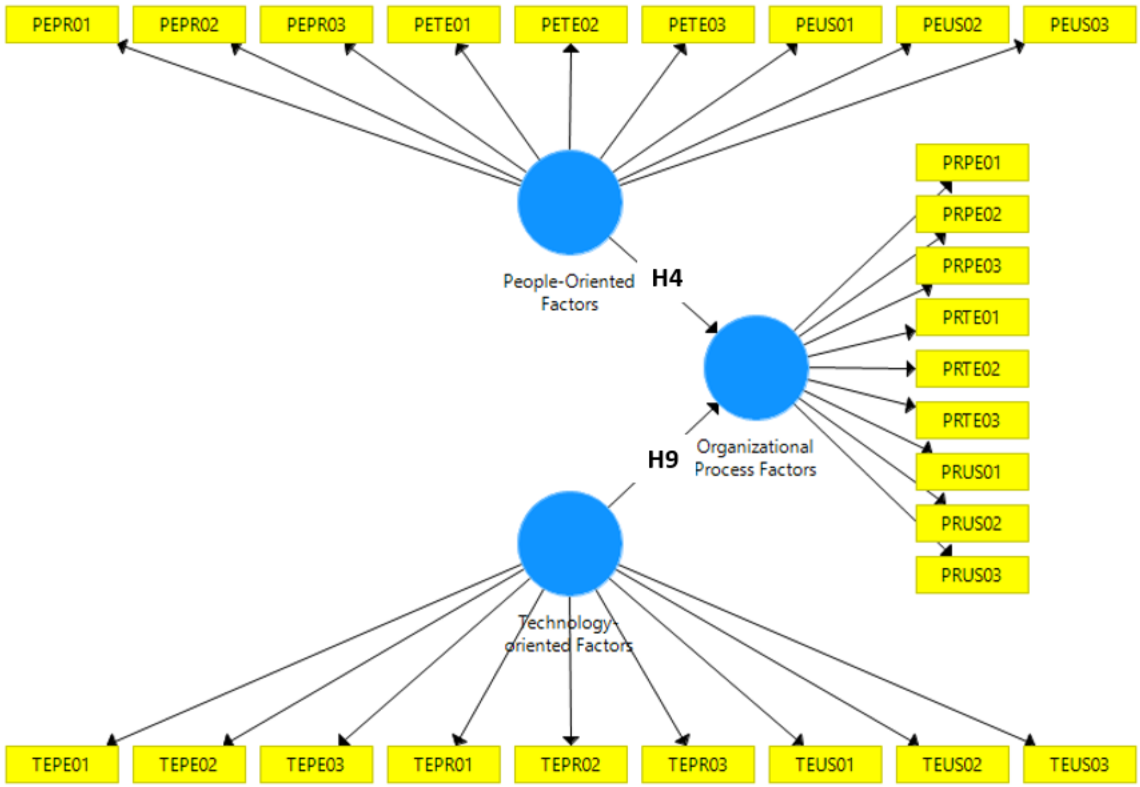

Figure 8. Structural Model for Organizational Process Factors (H4, H9)

All three constructs were measured by means of multiple indicators. Paths from the exogenous variables to the endogenous variables provided a platform for analysis to determine support for hypotheses four and nine. A positive relationship was expected for each of the outlined paths.

Figure 9 depicts the structural model used to test the impacts of socio-technical factors on technology-oriented factors. This model consists of two first order exogenous constructs – people-oriented factors, and organizational process factors – and one second order endogenous construct, which is technology-oriented factors. All three constructs were measured by means of multiple indicators. Paths from the exogenous variables to the endogenous variables provided a platform for analysis to determine support for hypotheses five and six. A positive relationship was expected for each of the outlined paths.

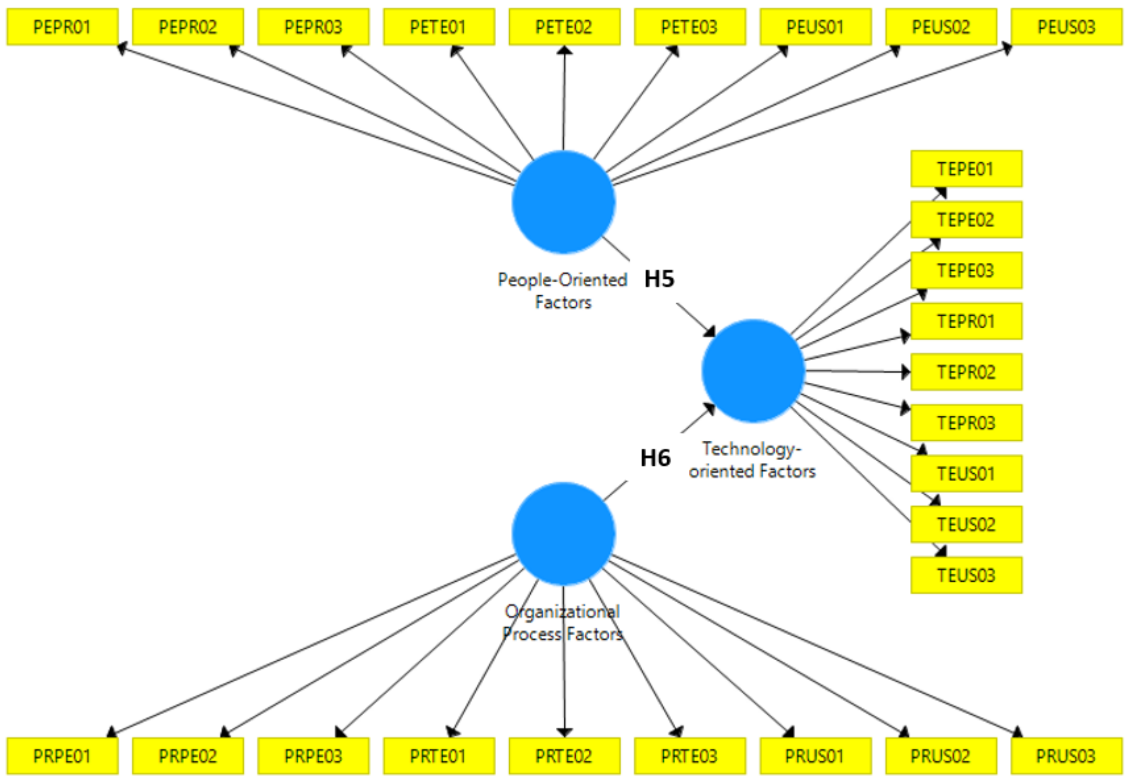

Figure 9. Structural Model for Technology-oriented Factors (H5-H6)

Stage two: Specify the Measurement Models

Specifying the measurement models involves identifying indicators for the outer model of the structure and determining whether the constructs should be measured by formative or reflective means (Hair et al., 2014). Hair et al. (2010) specify two typical measurement approaches to selecting indicators that define the outer model in PLS: 1) scales identified in prior research or scale handbooks, and 2) a new or modified existing set of scales. Existing scales to effectively measure all constructs in the current context were not identified during the literature review. Therefore, it was necessary to proceed with the second option, requiring modification of existing scales (Appendix B).

The structural model for KMS Usage, people-oriented factors had nine measured variables, PEPR01 to PEPR03, PETE01 to PETE03, and PEUS01to PEUS03. Organizational process factors also had nine measured variables, PRPE01 to PRPE03, PRTE01 to PRTE03, and PRUS01-PRUS03. Finally, technology-oriented factors had nine measured variables, TEPE01 to TEPE03, TEPR01 to TEPR03, and TEUS01 to TEUS03. And finally, KMS usage had two measured variables, USCONT and USSEEK. These indicators, as outlined earlier in this chapter, correspond to questions that were developed as variants to those that performed well in prior literature. Using a scale from one to five (strongly disagree to strongly agree), respondents were asked to indicate their level of agreement with each statement. Answers to the respective questions provided measures for each construct.

In the structural model for people-oriented factors, organizational process factors had nine measured variables, PRPE01 to PRPE03, PRTE01 to PRTE03, and PRUS01-PRUS03. Technology-oriented factors also had nine measured variables, TEPE01 to TEPE03, TEPR01 to TEPR03, and TEUS01 to TEUS03. In the structural model for organizational process factors, people-oriented factors had nine measured variables, PEPR01 to PEPR03, PETE01 to PETE03, and PEUS01to PEUS03. Technology-oriented factors also had nine measured variables, TEPE01 to TEPE03, TEPR01 to TEPR03, and TEUS01 to TEUS03. Finally, in the structural model for Technology-oriented factors, people-oriented factors had nine measured variables, PEPR01 to PEPR03, PETE01 to

PETE03, and PEUS01to PEUS03. Organizational process factors also had nine measured variables, PRPE01 to PRPE03, PRTE01 to PRTE03, and PRUS01-PRUS03.

Once indicators for the outer model were identified, the measurement model was determined. SEM distinguishes two distinct measurement models: reflective and formative (Edwards & Bagozzi, 2000). Reflective measurement attempts to maximize the overlap between interchangeable indicators, meaning the indicators are highly correlated (Edwards & Bagozzi, 2000; Hair et al., 2014). Using SmartPLS, reflective measures are indicated by arrows that point from the construct to the indicators. Formative measurement can minimize the overlap between complimentary indicators (Edwards & Bagozzi, 2000; Hair et al., 2014). Using SmartPLS, formative measures are indicated by arrows that point from the indicators to the construct. For current study, the reflective measurement model was selected. According to Jarvis, MacKenzie, and Podsakoff (2003), there were several key characterizations of the indicators that generally demonstrate the need for reflective measures:

1. The indicators are manifestations of the construct.
2. The indicators are interchangeable.
3. The indicators have the same or similar content or share common themes.
4. Dropping indicators will not alter the conceptual domain of the construct.
5. Indicators will co-vary with each other.

After identifying the indicators to be used in the outer model and specifying the measurement approach, the current study advanced to the next stage of data preparation and examination.

Stage Three: Data Preparation and Examination

The data provided by SurveyMonkey® Audience services required preparation for use with SmartPLS 3. The survey data was exported by SurveyMonkey® into a downloadable Microsoft Excel file and saved in .xlsx format (Figure 10).

	17. I can confidently explain how the system improves my performance.	18. Co-workers that use the system appear to perform better.	19. My organization sees the value of clearly defined processes.
1	Strongly Agree	Agree	Agree
2	Agree	Disagree	Strongly Agree
3	Agree	Strongly Agree	Agree
4	Neither Agree nor Di	Strongly Disagree	Strongly Agree
5	Strongly Disagree	Strongly Disagree	Strongly Disagree

Figure 10. Sample of Microsoft Excel Data

The student license for SmartPLS 3 has a limitation that does not permit extracts of survey data in formats immediately ready for consumption by popular research tools such as SPSS or SmartPLS. Therefore, transformation of the data into a consumable format was required. Since SmartPLS cannot interpret the .xlsx format directly, the data set had to be converted into a .csv (Comma Delimited) file format. To ensure SmartPLS could import the survey data properly, the .csv file was formatted with the names of the indicators (e.g., USCONT, USSEEK) placed in the first row of the dataset separated by commas (Figure 11). Each subsequent row was recorded as a numerical value representing a set of responses from each survey respondent, also separated by commas. In all the file contained 98 rows: one header row and one row for each of the 97 responses collected in the sample.

```
PEUS01,PEUS02,PEUS03,PRUS01,PRUS02,PRUS03,TEUS01,TEUS02,TE
4,4,4,5,4,4,4,4,4,5,4,4,4,4,4,4,4,5,4,4,3,3,4,3,4,4,4,4,4
4,3,3,4,4,4,4,4,4,4,2,5,5,5,5,5,5,4,4,5,3,4,5,5,5,5,5,3,4
4,3,2,5,4,4,3,4,4,4,5,4,4,5,4,4,4,5,4,3,4,5,4,3,3,4,4,5,3
4,1,1,1,1,1,3,3,3,3,1,5,5,3,5,1,3,3,1,1,3,5,5,3,5,5,5,5,5
```

Figure 11. Sample of .CSV Data Coded for SmartPLS

Before proceeding with data analysis, Hair et al. (2014) recommend examining the data for missing values, suspicious response patterns, outliers, and data distribution. Based on this survey design, respondents were required to complete all of the questions in their entirety before the survey could be submitted. This mitigated the possibility of any missing values. A visual inspection of the dataset did not reveal any straight lining, inconsistent response patterns, or otherwise invalid observations.

Outliers are characterized by extreme values in a particular question or all questions (Mooi & Sarstedt, 2011). Outliers may be excluded from the data set to prevent them from distorting the analysis (Mooi & Sarstedt, 2011; Hair et al., 2014). SmartPLS does not provide a mechanism to easily detect outliers in the raw data. Mooi & Sarstedt recommended using the "Explore" option in IBM SPSS Statistics to identify outliers by respondent number. IBM SPSS Statistics 23 was downloaded from http://www-01.ibm.com/software/analytics/spss/products/statistics/downloads.html. After installing the program, the 97 record dataset was imported into the tool. Using a tolerance of 3.29 standard deviations from the average (Hua, 2010), box plots, stem-and-leaf diagrams, and descriptive statistics all indicated that no outliners were present that should be omitted from the study.

Finally, the distributional properties of the variables were examined for skewness and kurtosis. Skewness is used to determine whether the distribution normal, while kurtosis is used to determine the relative concentration of data values (Hair et al., 2014). According to Hair et al., both skewness and kurtosis measures should be close to 1. Values greater than 1 or less than –1 for either measure indicates the distribution is non-normal and the researcher should consider removing the invalid items. SmartPLS 3 provided skewness and kurtosis measures for the current study that confirmed all included indicators were within the desired range (Appendix U).

Stage Four: PLS Path Model Estimation

After the initial data screening was completed, SmartPLS 3 was used to run the PLS algorithm for the structural models. Each time, the algorithm was run with the default values selected: Weighting Scheme set to Path, Maximum Iterations at 300, Stop Criterion (10ˆ-X) set to 7, and the Use Lohmoeller Settings option unchecked. After running the algorithm, three default results are shown: 1) outer loadings for reflective models, 2), the R^2 values of the endogenous variable, and 3) path coefficients. Hair et al. suggest reviewing these values in Stage 4 of their systematic PLS-SEM procedure. Hulland (1999) recommends an acceptable loading for the outer model should be at least 0.70 in exploratory research. Any indicators that fail to meet this criteria should not be used for further analysis. Chin (1999) suggested that the explanatory power of the structural model is considered substantial if R^2=0.67, moderate if R^2=0.33, and weak if R^2=0.19. As an estimation, path coefficients above 0.20 are usually significant, while values below 0.10 are not significant (Hair et al., 2010). However, Hair et al. caution that t-statistics generated during the bootstrapping procedure in SmartPLS are required to definitively state the significance of path coefficients.

Stage Five: Assess PLS-SEM Results of Measurement Models

In this stage, the researcher must establish the reliability, and validity of the latent variables to complete the evaluation of the structural model (Hair et al., 2014). Hair, Black, Babin and Anderson caution that factors in multivariate analysis must demonstrate adequate validity and reliability for the analysis of the causal model to yield any significant value (2010). Factors not confirmed to be valid or reliable may result in misleading results in the subsequent causal analysis. In PLS-SEM, internal consistency reliability should be determined by using composite reliability instead of the Cronbach's Alpha (Bagozzi and Yi, 1988; Hair et al., 2014). For establishing validity and reliability, Hair et al. (2010) recommended establishing several important measures: Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and Average Shared Variance (ASV).

In the social sciences, Cronbach's coefficient alpha (α) has been effective in testing internal consistency and reliability of a survey instrument (Acock, 2012). Acock recommends an acceptable alpha correlation should be at least .70 at a significance of at least $p < .05$. Any item not meeting this criteria should not be used for further analysis. Hair et al. (2014) prefer the use of composite reliability, because Cronbach's alpha underestimates internal consistency reliability. Composite Reliability, measured by the outer loadings, should be greater than 0.70 to be considered acceptable but is acceptable at 0.40 or higher for exploratory research (Hulland, 1998; Hair et al., 2014). Each latent variable's Average Variance Extracted (AVE) must be greater than 0.05 to establish convergent validity (Fornell & Larcker, 1981). Fornell and Larcker recommend using the square root of AVE in each latent variable to establish discriminant validity. The value of any particular latent variable must be larger than its correlation value to any other latent variables (Fornell & Larcker, 1981). If the results of the measurement models are satisfactory, the structural model's results will be determined in the next stage of analysis.

Convergent validity issues indicate that the model's variables are not well correlated and the latent factor is not well explained by its observed variables. Discriminant validity issues result when the latent factor is better explained by some other variables (from a different factor), than by the observed variables for that factor (Hair et al., 2010). A reliable and valid measurement model should meet the previously outlined criteria for reliability and validity. If the threshold values for reliability and validity are not met, the researcher may consider removing certain items from the measurement model and/or reallocating items to the structural model's latent variables (Urbach & Ahlemann, 2010).

Stage Six: Assess PLS-SEM Results of Structural Model

After confirming the construct measures were reliable and valid, the next stage involved assessing the model's predictive capabilities and measuring the relationships between the constructs. Hair et al. (2014) outlined a five step process for assessing the results of the structural model (Figure 12). The current study utilized these steps and the results are discussed during this stage of the data analysis.

1	2	3	4	5
Assess Collinearity	Assess Significance of Relationships	Assess the level of R^2	Assess the effect sizes of f^2	Assess the effect sizes of Q^2

Figure 12. Procedure for Assessing the Structural Model (Hair et al., 2014)

Step 1: Assess Collinearity

The first step of the procedure for assessing the structural model involves assessing the collinearity of the structural models. Collinearity, also referred to as multicollinearity, exists when there is a correlation among the predictors in a multiple regression analysis (O'Brien, 2007). This redundancy comingles the effects of the predictors, complicating the interpretation. To assess collinearity issues of the inner model, SamrtPLS provided Variance Inflation Factor (VIF) values. According to Hair et al. (2011), these values are calculated as "1/Tolerance" and should not exceed 5 (i.e., Tolerance level of 0.2 or higher) to avoid collinearity issues.

Step 2: Assess Significance

After assessing collinearity, the second step of the procedure for assessing the structural model involved examining the significance of the path relationships. SmartPLS calculated T-statistics for both the inner and outer models using a bootstrapping procedure. Bootstrapping utilizes a large number of subsamples taken from the original sample, with replacement, to calculate bootstrap standard errors (Hair et al., 2014). The errors can then estimate T-statistics for testing the significance of the structural paths. According to Hair et al., bootstrapping provides an estimate of data normality. Thresholds for significance when using a two-tailed t-test are: 1.65 at a significance level of 10%, 1.96 at a significance level of 5%, and 2.57 at a significance level of 1% (Hair et al., 2014).

Using SmartPLS, a separate bootstrapping analysis was run for each of the four endogenous variables. The bootstrapping configuration was set to: Subsamples at 500, Do Parallel Processing option was checked, No Sign Changes selected, Amount of Results set to complete bootstrapping, Confidence Interval Method was Bias-Corrected and Accelerated (BCa) Bootstrap, Test Type was Two-tailed, and Significance level was set to 0.05.

Step 3: Assess R^2

The third step of the procedure for assessing the structural model required a re-assessment of the coefficient of determination, R^2, values to confirm or restate the findings during structural model estimation recorder in Stage 4 (Hair et al., 2014). Any changes made during previous stages of the analysis, such as removing items that fail to meet certain criteria, may have impact the structural models' R^2 values. Again, the thresholds recommended by Chin (1999) explain the explanatory power of the structural model: considered substantial if R^2=0.67, moderate if R^2=0.33, and weak if R^2=0.19.

Step 4: Assess f^2

In the fourth step of the procedure for assessing the structural model, Hair et al. (2014) recommend discussing the f^2 effect size of the structural models. The f^2 effect size represents the extent to which an exogenous latent variable contributes to an endogenous latent variable's R^2 value (Hair et al., 2014). The f^2 effect size quantifies the strength of relationship between the latent variables (Chin, Marcolin, & Newsted, 1999). The model's f^2 effect sizes are assessed as small (0.02), medium (0.15), or large (0.35) (Cohen, 1988).

Step 5: Assess Q^2

In the fifth and final step of the procedure for assessing the structural model, Hair et al. (2014) recommend discussing the Q^2 (Stone-Geisser) effect size of the structural models. In addition to evaluating R^2 values as a criterion of predictive accuracy, Q^2 values should also be reviewed as an indicator of the model's predictive relevance (Hair et al., 2014). Deriving the Q^2 values requires a sample re-use technique that excludes some of the model's data and uses model estimates to predict the excluded portion of the data (Hair et al., 2014). Structural models with high predictive relevance can accurately predict the data points within reflective measurement models (Chin, 1998). To evaluate Q^2, latent variables greater than zero indicate the path model's predictive relevance for that construct (Chin, 1998). Conversely, latent variables with a Q^2 values of zero less indicate a lack of predictive relevance. Hair et al. (2014) provided guidelines for measuring predictive relevance as small (0.02), medium (0.15), or large (0.35).

SmartPLS provided Q^2 values through the blindfolding procedure. Blindfolding was completed for each of the latent endogenous variables in the study. The only blindfolding option in SmartPLS was the omission distance set to 7 (default). An omission distance between 5 and 10 is suggested for most research (Hair et al., 2012). After running the procedure, results of the target endogenous construct are reported as cross-validated redundancy values (measures of Q^2). This approach uses the path model estimates of both the structural model (scores of the antecedent constructs) and the measurement model (target endogenous constructs) (Hair et al., 2014).

Stage Seven: Advanced PLS-SEM Analyses (if required)

During this stage of the PLS-SEM analysis, Hair et al. (2014) offer several optional advanced analyses that may be used under a specific set of conditions for a particular structural model. The importance-performance matrix analysis (IPMA) can be used to assess the importance of constructs and their relevance in explaining other constructs. Mediator analysis addresses mediation and moderation of categorical and continuous variables. Finally, higher order constructs and hierarchal component model have specific applications that can be modeled using SmartPLS. The current study did not require any of these analyses, so the researcher proceeded directly to the eighth and final stage of analysis after completing the assessment of the structural model.

Stage Eight: Interpret Results and Draw conclusions

The eighth and final stage of Hair et al.'s (2014) procedure for PLS-SEM analysis required interpreting results and drawing conclusions. Chapter 4 of this study presents the results of the analysis and is strictly for narrating the research findings, without trying to interpret or evaluate them. According to Hair et al., this narrative should include graphs, figures, and tables where appropriate. Notable correlations between two variables should also be included in the results. Conclusions are drawn in Chapter 5 by means of discussing results, explaining what they mean, and speculating why correlations exist.

Researchers must thoughtfully understand and consider the advantages and disadvantages of applying different statistical techniques and methods to perform their analysis. Different approaches have been used to study the KMS usage effects of socio-technical factors. This study mainly arranged and executed the previously outlined eight-stage approach for utilizing PLS to perform the required data analysis.

Resource Requirements

Resources needed for this research include the following:

1. To address the first research question, the study was dependent on access to refereed publications and literature in the domains of research and knowledge management. This need was largely satisfied through access to the NSU electronic library. Additional requirements were met through use of the NSU physical library or other web-based research.
2. Data collection required a robust, web-based survey service that could be easily configured, satisfied all of the survey and data collections needs, and was easy for

the expert panel, pilot survey, and survey participants to access and use. The online service used was SurveyMonkey® (http://www.surveymonkey.com/).

3. The study required access to individuals with specific knowledge the area of KMS to serve on the panel of experts, also referred to as the Delphi team.
4. The study required persons with experience in work-related KMS usage to participate in the online survey.
5. A statistical modeling application to perform the PLS data analysis was also required. Similar studies have successfully used SmartPLS for analysis of the paths and structural model.

Summary

This chapter addressed the methodology approach for the study. The Levy and Ellis (2006) three-stage literature review approach was presented to demonstrate how the first research question was addressed regarding the identification of socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage. Next, a theoretical model derived from the literature review and nine hypotheses were outlined along with a definition of the constructs and measures.

Data collection methods and instrument development were outlined, along with methods for reviewing reliability and validity. The survey sample involved users that utilized KMS for work in varying contexts. A description of the survey method that was used for data collection was provided and statistical methods used to screen and analyze the surveyed data (confirmatory factor analysis and structural equation modeling) were addressed.

The screening procedure that prepared the data for quantitative analysis was outlined. Both SPSS and SmartPLS 3 were used to analyze the data. Data screening included the descriptive statistics for all the variables, information about the missing data, linearity, normality, and outliers. An eight-stage procedure for analyzing and presenting data was also described. Finally, resources required to execute the study were delineated.

Chapter 4

Results

Introduction

Chapter 4 presents results in support of answering the two research questions proposed in Chapter 3 of this study. First, key findings of the literature review and survey items that were developed are presented in support of the first research question: What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage? Next, survey results and detailed analysis of the validity, reliability, confirmatory factor analysis, and structural equation modeling using SmartPLS are provided in support of the nine hypotheses required answer the second research question: What are the relationships among these [socio-technical] factors and how do they influence KMS usage?

Levy and Ellis (2006) noted the literature review was essential to determining existing studies in the current body of knowledge and identifying where limitations provided opportunities for continued research. Furthermore, the literature review mitigated time and resources wasted on irrelevant research (Sekaran & Bougie, 2010). This study followed Levi and Ellis's recommend three stage approach to developing the literature review by assessing inputs, processing, and outputs. During the input stage, the relevance and quality of the literature were examined. This was key to ensuring that sources were qualified, increasing the chances of success of the output stage (Levy & Ellis, 2006). Processing was required to convert the literary facts into usable information (Levy & Ellis, 2006). Finally, output integrated the proper argumentation to define the relevance of the processing (Levy & Ellis, 2006).

Socio-technical and KMS Usage Factors

This section offers results of the review and work by the researcher and Delphi team to determine the definitions of the variables and validity of the scales within the literature on both socio-technical factors and KMS usage. Literature and content analysis, survey development, and validation were necessary to satisfy the first research question: What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage? Permission was obtained from the original authors to modify and use their survey items in the context of this research (Appendix C). Assessment items were measured using a five-point Likert scale with items ranging from strongly agree to strongly disagree.

People

Analysis of the literature identified self-efficacy, social ties and ease of use/usefulness as variables that have successfully explained people in terms of socio-technical and usage models. Further examination of the literature identified the following scales that were relevant for use in this study.

Self-efficacy. Compeau and Higgins (1995) determined that understanding self-efficacy can be important to the successful implementation of systems in organizations. The self-efficacy scale consisted of three items derived from Venkatesh et al. (2003):

1. (PEUS01) I generally use the knowledge management system (KMS) because someone showed me or provided training on how to do it first.
2. (PEPR01) I can confidently explain how the system improves my performance.
3. (PETE01) I am comfortable with the system since I have used similar systems before.

Social ties. Chai and Kim (2012) determined that established trust and communication enhances the social interaction among individuals and promotes knowledge sharing. The social-ties scale consisted of three items derived from Venkatesh et al. (2003):

1. (PEUS02) I generally use the knowledge management system (KMS) because people who are important to me think that I should use the system.
2. (PEPR02) Co-workers that use the system appear to perform better.
3. (PETE02) When using the system I can call someone for help if I get stuck.

Ease of use/Usefulness. System users that report perceived ease of use and usefulness to other users create a condition to increase system usage Lin and Lu (2011). Davis (1989) measured the impact of perceived usefulness on system use, and was supported by Schultz and Slevin (1975) and Robey (1979) which has similar findings. The ease of use/usefulness scale consisted of three items derived from Venkatesh et al. (2003):

1. (PEUS03) I generally use the knowledge management system (KMS) because I find the system easy to use.
2. (PEPR03) My organization sees the value of clearly defined processes.
3. (PETE03) Learning to operate the system is easy for me.

Organizational Processes

Further analysis of the literature identified leadership, organizational culture/climate, and governance as variables that have successfully explained organizational processes in terms of socio-technical and usage applications. The following scales were identified for use in measurement of organizational processes.

Leadership. The analysis and synthesis of various market conditions and organizational variables to provide vision and direction for the organization (Scovetta & Ellis, 2014). Leadership impacts KMS acceptance and use, but there has only been limited study of the specific managerial behaviors associated with adoption success (Kuo, Lai, & Lee, 2011). The leadership scale consisted of three items derived from Humayan and Gang (2013):

1. (PRUS01) I generally use the knowledge management system (KMS) because I have support from leadership.
2. (PRTE01) Leaders act as role models by using the system.
3. (PRPE01) Senior management has been helpful in the use of the system.

Organizational Culture/Climate. Xue et al. (2011) confirmed social influences arising from other people that influences an individual's social and knowledge sharing behavior. Bock, Zmud, Kim, and Lee found that team culture and climate help to shape individuals' attitudes, which in turn lead to the desired knowledge sharing behavior (2005). The organization culture and climate scale consisted of three items derived from Humayan and Gang (2013):

1. (PRUS02) I generally use the knowledge management system (KMS) because there is support within the team/organization for using the system.
2. (PRTE02) The organization has generally supported the use of the system.
3. (PRPE02) The team/organization encourages knowledge creation, sharing, and use.

Governance. Governance is considered a vital component of the KM framework. Without governance, there is no assurance that the KMS will ever be used. According to

Lin et al. (2013), and governance provides clear corporate expectations, performance management, and KM support. The governance scale consisted of three items derived from Lin et al. (2013):

1. (PRUS03) I generally use the knowledge management system (KMS) because there are specific guidelines that regulate use of the system.
2. (PRTE03) There are specific guidelines that regulate use of the system.
3. (PRPE03) It is important for contributions to the system are moderated.

Technology

Additional analysis of the literature identified system quality, information quality, and technology fit as variables that have successfully explained technology in terms of socio-technical and usage applications. The technology scales used in this study were identified in the following literature.

System Quality. Accessibility, knowledge quality, usability, and relevance are measures of the system's ability to support KM effectiveness (Kulkarni, et al., 2006). System quality is positively associated with system usage (Wang & Lai, 2014). The system quality scale consisted of three items derived from Venkatesh (2003) and Wang and Lai (2014):

1. (TEUS01) I generally use the knowledge management system (KMS) because the system is dependable.
2. (TEPE01) The quality of system determines the success of decisions made.
3. (TEPR01) The system can increase the quantity of output for the same amount of effort.

Information quality. Quality is characterized by relevance, timeliness, and comprehensibility (Kulkarni, et al., 2006). Wang and Lai (2014) suggested that information quality is positively associated with system usage. Hence, information quality should be considered when studying KMS usage (Kuo & Lee, 2009). The information quality scale consisted of three items derived from Venkatesh (2003) and Wang and Lai (2014):

1. (TEUS02) I generally use the knowledge management system (KMS) because the information provided by the KMS meets my needs.
2. (TEPE02) Information provided by the system is helpful.
3. (TEPR02) The information provided by the system improves workflows.

Technology Fit. Ramayah et al. (2010) confirmed system quality will be positively related to behavioral intention, information quality is positively related to behavioral intention, and service quality is positively related to behavioral intention. The technology scale consisted of three items derived from Venkatesh (2003):

1. (TEUS03) I generally use the knowledge management system (KMS) because the system can increase the effectiveness of performing job tasks.
2. (TEPE03) Sharing knowledge using the system improves decision making.
3. (TEPR03) Using the system improves my job performance.

KMS Usage

KMS usage. The implementation, analysis, and development of knowledge in such a way that the organization can learn and create knowledge to promote better decisions (Kulkarni et al., 2006). The KMS usage scale consisted of two items derived from Lin and Huang (2008):

1. (USSEEK) I frequently use the KMS to seek knowledge.
2. (USCONT) I frequently use the KMS to contribute knowledge.

Data Analysis

Detailed analysis of the validity, reliability, confirmatory factor analysis, and structural equation models were required to satisfy the second research question: What are the relationships among these [socio-technical] factors and how do they influence KMS usage? Basic demographic data, and results of the required confirmatory factor and PLS analyses were reviewed in this chapter. The PLS-SEM review addressed the first six stages of the eight-stage procedure recommended by Hair et al. (2010) that was outlined in Chapter 3. The optional seventh stage of this procedure did not contain any elements that were required for this study. The eighth stage was addressed in Chapter 5.

Basic Demographics

A review of demographic feedback was performed to understand the characteristics of survey respondents (Appendix U). Gender category was defined by 1 (Female), and 2 (Male). The majority (55%) of respondents completing the survey were female. Males accounted for the remaining 45% of respondents. Age category ranged from 1 (Less than 21), 2 (21-29), 3 (30-34), 4 (35-39), and 5 (40+).

The largest number (47%) of respondents completing the survey were 40 or older. Ages 21-29 accounted for another 22% of respondents. These two ages group combined represent almost 70% of all responses. Respondents less than twenty-one accounted for only 6%, making it the smallest category. Eleven responses (11%) were from DSS users between the ages of thirty and thirty-four.

Experience category ranged from 1 (1-5 years), 2 (6-10 years), 3 (11-15 years), and 4 (16+ years). A plurality (39%) of respondents completing the survey had one to five years of experience. Sixteen or more years of experience accounted for another 38% of respondents. These categories combined represent 76% of all responses. The smallest category of responses were from those with eleven to fifteen years of experience (9%).

Education category ranged from 1 (High School), 2 (College 2 years), 3 (University 4 years), and 4 (Graduate School 4+ years). The largest number (31%) of respondents completing the survey had four or more years of education, which can be considered graduate level. Another 28% of respondents have four years of education, and are considered university level. The remaining 41% of respondents are evenly split across two years of college and high school.

Principal Industry category encompassed a number of common industries and also included responses for (I am not currently employed) and (Other). A plurality (21%) of respondents work in healthcare and pharmaceuticals. Another 13% are employed in education. Financial services and nonprofits represent another 8% each. Responses from government employees accounted for 7% of responses. Technology industries and those that reported not currently being employed accounted for 6% each. Respondents employed in industries other than those categories outlined represented 4% of all responses. Advertising & Marketing, Construction & Homes, Insurance, and Utilities each represented 3% of responses. Four respondents were in the Food & Beverage (2, 2%) and Retail & Consumer Durables (2, 2%) categories) Air-related, automotive, logistics, entertainment, and transportation industries each accounted for 1% of survey responses. No respondents (0%) reported associations with the agriculture or real estate industries.

Job Role category ranged from 1 (Individual Contributor), 2 (Team Lead), 3 (Manager), 4 (Director), 5 (Vice-President), 6 (Management C/Level), 7 (Partner), 8 (Owner), and 9 (Other). Results indicated 58% of respondents completing the survey reported being individual contributors (32%) or other (26%). Team leads (11%) and managers (10%) accounted for another 21% of respondents. Management & C-Level represented 6%, Vice President were 5%, and Directors were 4%. Partners and owners had the lowest response rate with 3% each.

KMS Utilized category ranged from 1 (Communication-driven), 2 (Data-driven), 3 (Document-driven), 4 (Knowledge-driven), and 5 (Model-driven). Results indicated 55% of respondents completing the survey reported utilizing communication-driven DSS. Data-driven DSS accounted for 46% of respondents. Utilization of the remaining DSS types were: document driven (33%), knowledge driven (34%), and model-driven (17%). It is important to note that respondents were able to select more than one type of DSS. Therefore, the sum of these values were not expected to be 100%. These percentages may have implications for differing outcomes based on their groupings versus their collective values (which is the focus of the current study).

SurveyMonkey® Audience also provided interesting demographic data that was not directly solicited by the survey instrument, such as respondents' household income from last year. In some cases, economic indicators within households such as income, employment, and wealth are often useful for understanding behavior in research (Evans & Marthur, 2005). However Evans & Marthur noted that many survey studies ignore economic questions because researchers believe that respondents will not answer such questions truthfully. There was no information available for at least two survey respondents, and another 12.6% preferred not to provide information on their previous year's household income. Responses indicate 55% of those that completed the survey had a household income of less than $75k. Income brackets between $100k and $175k each had 6 responses, accounting for 19% of the total. Only 3.2% of survey respondents are in the highest category with a household income in excess of $200k.

SurveyMonkey® Audience also provided statistics on the US regions of respondents. The highest concentrations of respondents in these regions: Pacific (26%), South Atlantic (19%), West South Central (15%), and East North Central (14%). Mid Atlantic (9%), East South Central (6%), Mountain (5%), New England (5%) accounted for 25% of responses. The fewest respondents (1%) were in the West North Central region. The region of at least one respondent could not be determined.

Finally, SurveyMonkey® Audience reported 65% of the survey respondents completed the online survey using a Windows desktop or laptop. Another 25% used a smartphone or tablet. The remaining 10% used some other method to complete the survey.

PLS Path Model Estimation

Where KMS Usage was the endogenous latent variable (Figure 13), results indicated that not all items loaded on their respective construct at or above a lower bound of 0.70. Indicators of the People-oriented factors construct ranged from 0.631 to 0.852. Indicators of the Organizational process factors construct ranged from 0.705 to 0.849. Indicators of the Technology-oriented factors construct ranged from 0.780 to 0.916.

Indicators of the KMS usage construct were 0.909 and 0.921. Further screening of the initial models also identified discriminant validity issues caused by the presence of poor indicators in the people-oriented factors construct. As a result, PETE01, PETE02, PETE03 PEUS01, PEUS02, and PEUS03 were all removed before subsequent analysis was performed. The remaining three indicators of the people-oriented factors construct (PEPR01, PEPR02, and PEPR03) loaded satisfactorily (0.776-0.852) and were sufficient to complete further analysis.

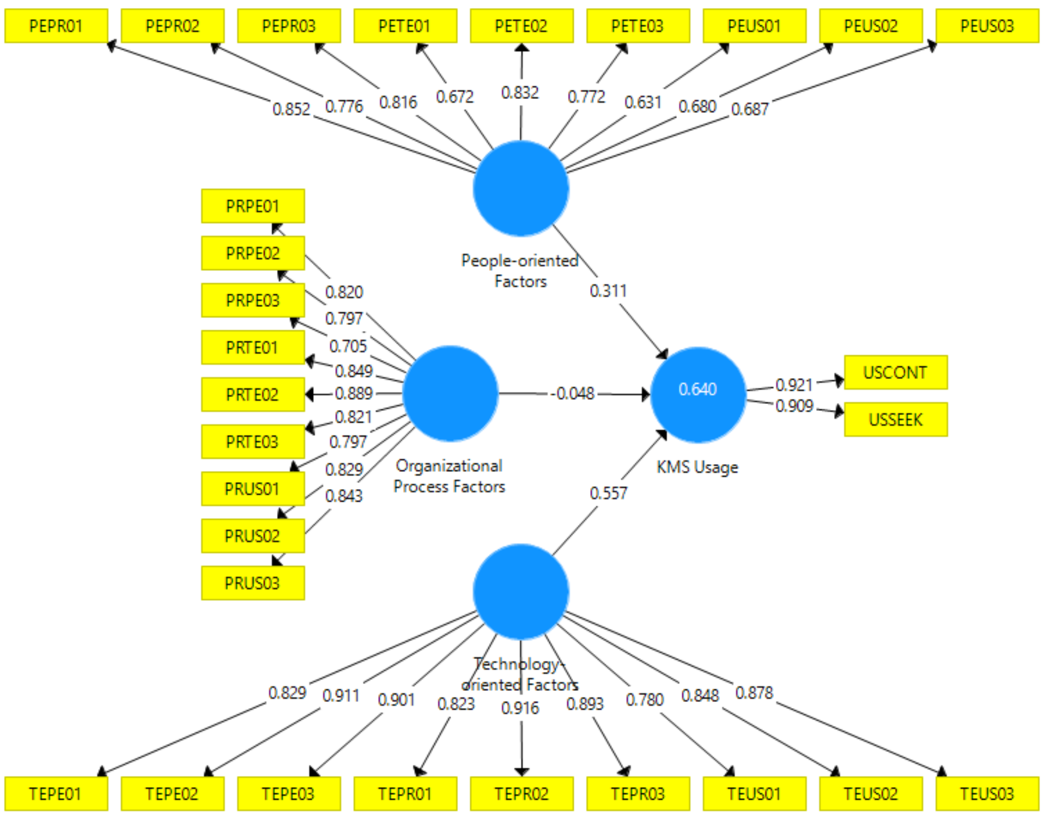

Figure 13. Path Estimation for KMS Usage

After removing indicators that failed to meet the minimum prescribed threshold, the data was re-analyzed. Where KMS Usage was the endogenous latent variable (Figure 14), results indicated that all items loaded on their respective construct at or above a lower bound of 0.70. Indicators of the People-oriented factors construct ranged from

0.826 to 0.914. Indicators of the Organizational process factors construct ranged from 0.705 to 0.889. Indicators of the Technology-oriented factors construct ranged from 0.780 to 0.916. Indicators of the KMS usage construct were 0.911 and 0.918. The coefficient of determination, R^2, was 0.625 for the KMS Usage endogenous latent variable. This means that the three latent variables (People factors, Organizational Process Factors, and Technology-oriented factors) moderately explained 62.5% of the variance in KMS Usage.

The inner model suggested that Technology-oriented factors had the strongest effect on KMS Usage (0.640), followed by People-oriented factors (0.124) and Organizational process factors (0.051).

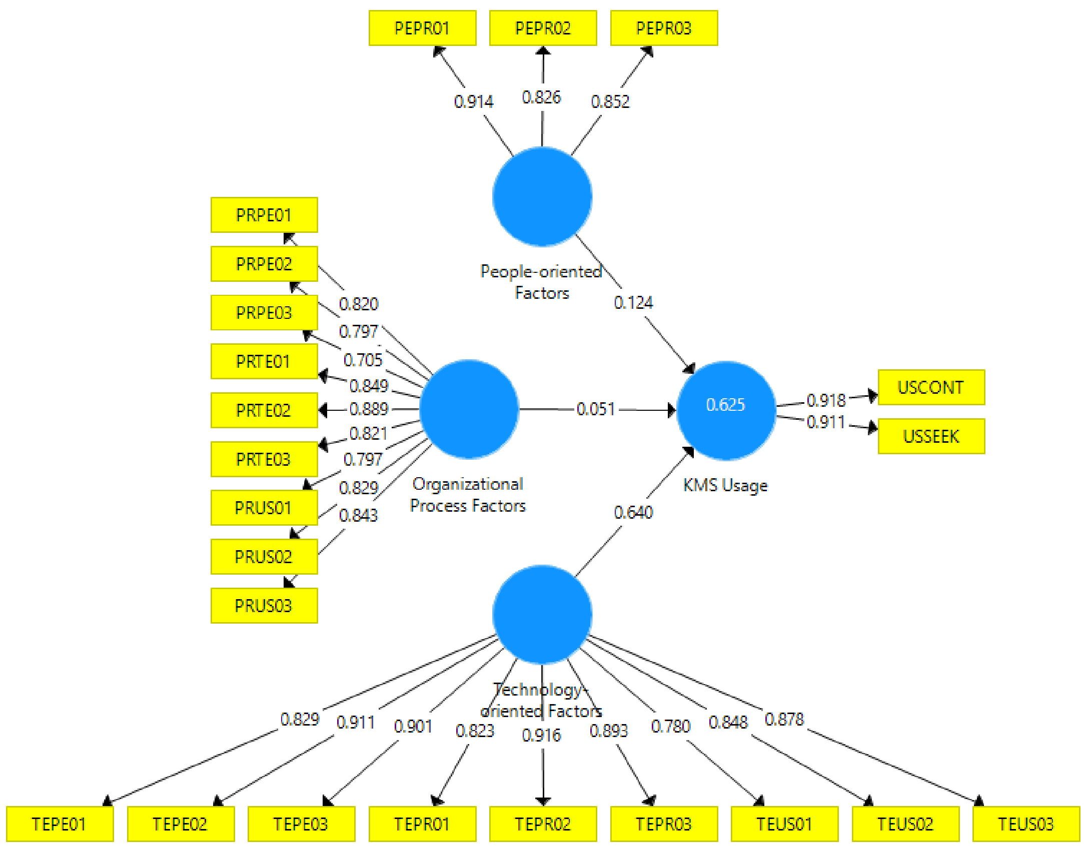

Figure 14. Revised Path Estimation for KMS Usage

Based on Hair et al.'s estimation criteria, the hypothesized path relationship between Technology-oriented factors and KMS Usage was statistically significant. However, the hypothesized path relationship between People-oriented factors and KMS Usage was not statistically significant. The hypothesized path relationship between Organizational process factors and KMS Usage was not statistically significant either. Thus, a preliminary conclusion was that technology-oriented factors were a moderately strong predictor of KMS Usage, but People-oriented and Organizational process factors did not predict KMS directly.

These preliminary results and all estimations that were made in this section required confirmation later in the study. Definitive conclusions could only be drawn after reviewing the t-statistics of the stated paths generated by the SmartPLS bootstrapping function (Hair et al., 2014).

Where People-oriented factors were the endogenous latent variable (Figure 15), results indicated that all but one items loaded on their respective construct at or above a lower bound of 0.70. The indicators of the Organizational process factors construct ranged from 0.703 to 0.888. Indicators of the Technology-oriented factors construct ranged from 0.794 to 0.911. Indicators of the People-oriented factors construct ranged from 0.826 to 0.918. The coefficient of determination, R^2, was 0.770 for the People-oriented factors endogenous latent variable. This means that the two latent variables (Organizational Process Factors and Technology-oriented factors) moderately explained 77% of the variance in People-oriented factors.

The inner model suggested that Technology-oriented factors had the strongest effect on People-oriented factors (0.652). Organizational process factors had a positive effect on People-oriented factors (0.261).

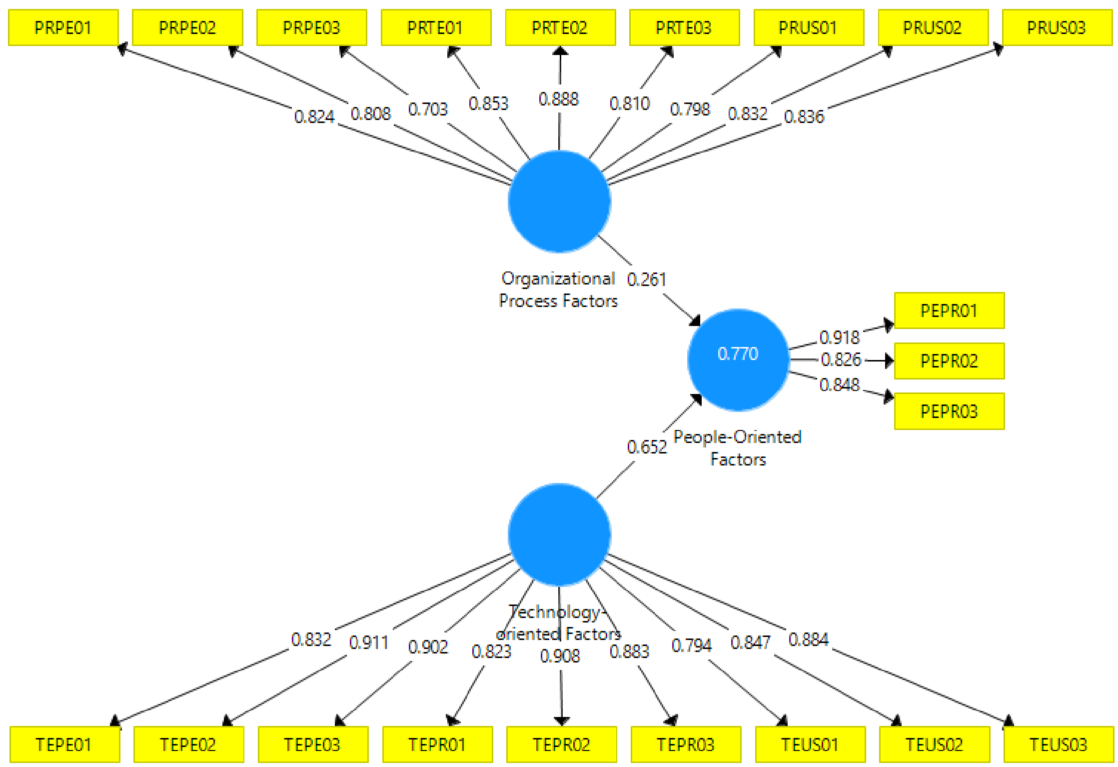

Figure 15. Path Estimation for People-oriented Factors

Based on Hair et al.'s estimation criteria, the hypothesized path relationship between Organizational process factors and People-oriented factors was statistically significant. Likewise, the hypothesized path relationship between Technology-oriented factors and People-oriented factors were also statistically significant. Thus, a preliminary conclusion was that Organizational process factors and Technology-oriented factors are predictors of People-oriented factors.

Where Organizational process factors were the endogenous latent variable (Figure 16), results indicated that all items loaded on their respective construct at or above a lower bound of 0.70. Indicators of the People-oriented factors construct ranged from

0.825 to 0.918. Indicators of the Technology-oriented factors construct ranged from 0.793 to 0.913. Indicators of the Organizational process factors construct ranged from 0.711 to 0.890. The coefficient of determination, R^2, was 0.694 for the Organizational process factors endogenous latent variable. This means that the two latent variables (People-oriented factors and Technology-oriented factors) moderately explained 69.4% of the variance in Organizational process factors.

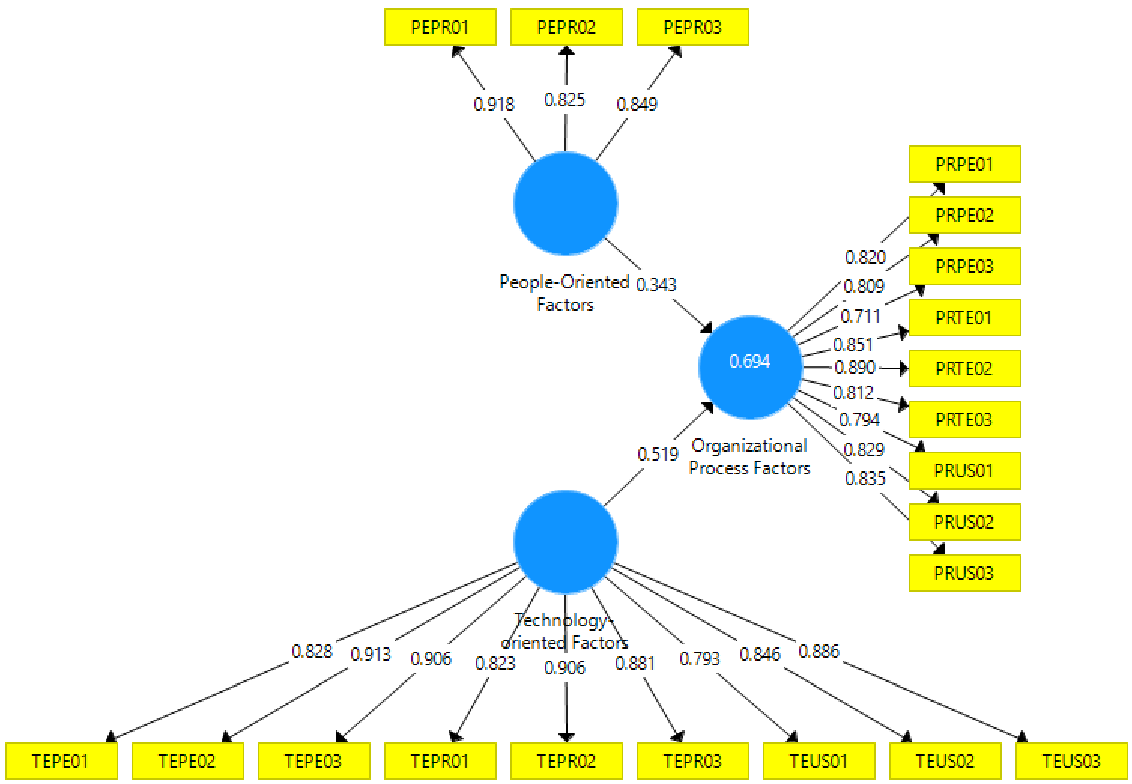

Figure 16. Path Estimation for Process-oriented Factors

The inner model suggested that Technology-oriented factors had the strongest effect on Organizational process factors (0.519). People-oriented factors also had a significant effect on Organizational process factors (0.343). Based on Hair et al.'s estimation criteria, the hypothesized path relationship between People-oriented factors and Organizational process factors was statistically significant. Likewise, the hypothesized path relationship between Technology-oriented factors and Organizational process factors was also statistically significant. Thus, a preliminary conclusion was that People-oriented and Technology-oriented factors did predict Organizational process factors.

Where Technology-oriented factors were the endogenous latent variable (Figure 17), results indicated that all items loaded on their respective construct at or above a lower bound of 0.70. Indicators of the People-oriented factors construct ranged from 0.826 to 0.918. Indicators of the Organizational process factors construct ranged from 0.715 to 0.892. Indicators of the Technology-oriented factors construct ranged from 0.794 to 0.912.

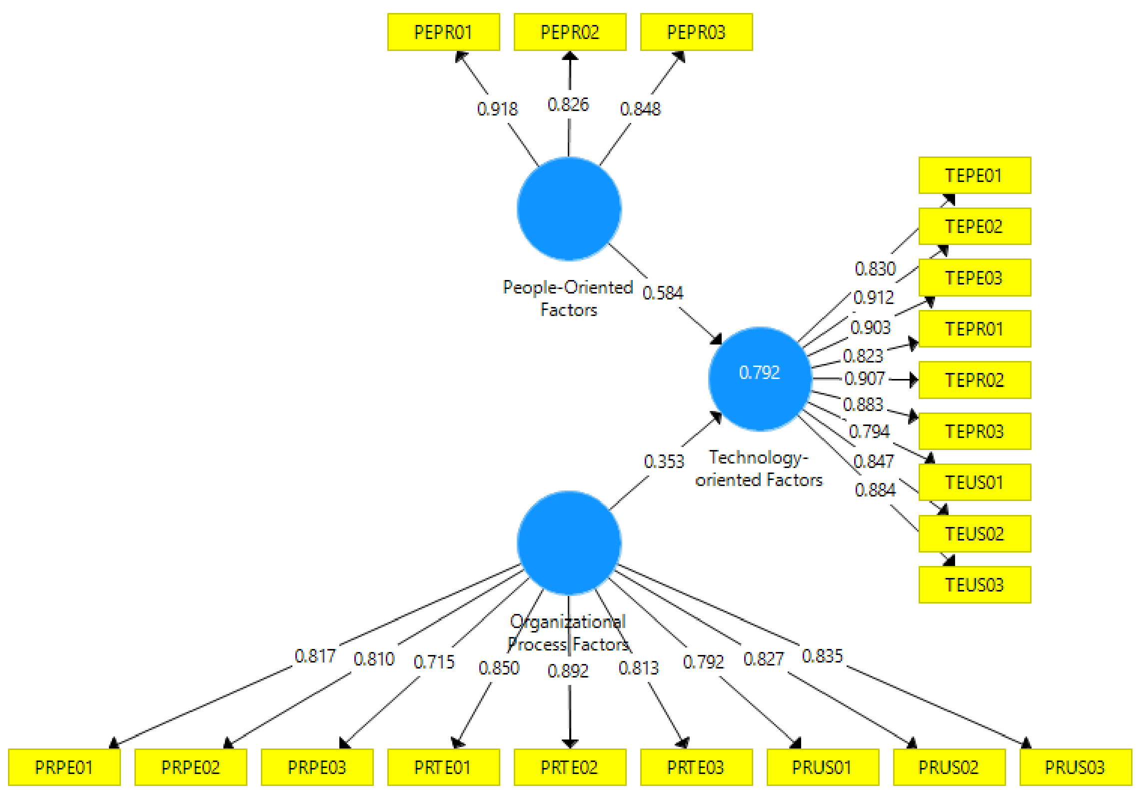

Figure 17. Path Estimation for Technology-oriented Factors

The coefficient of determination, R^2, was 0.792 for the Technology-oriented factors endogenous latent variable. This means that the two latent variables (People-oriented factors and Organizational Process Factors) moderately explained 79.2% of the variance in Technology-oriented factors.

The inner model suggested that People-oriented factors had the strongest effect on Technology-oriented factors (0.584). Organizational process factors had a significant effect on Technology-oriented factors (0.353). Based on Hair et al.'s estimation criteria, the hypothesized path relationship between People-oriented factors and Technology-oriented factors was statistically significant. Likewise, the hypothesized path relationship between Organizational process factors and Technology-oriented factors were also statistically significant. Thus, a preliminary conclusion was that People-oriented factors and Organizational process factors predicted Technology-oriented factors.

Stage 4 estimated the outer loadings, coefficients of determination and path coefficients of the structural models. Scales with outer loadings that failed to meet the minimum threshold recommended by previous studies were removed before continuing the PLS-SEM analysis. Preliminary estimations of the percentage of variance in the endogenous variable explained by the exogenous variables were also reviewed and restated if necessary. Significance of the path relationships were also estimated using Hair et al.'s rule of thumb for determining significance. The next stage of the analysis involved assessment of the measurement models.

Assessment of Measurement Models

KMS Usage. Reliability results for structural model where KMS Usage was the endogenous latent variable are shown in Table 1. The composite reliabilities of the different constructs ranged from 0.899 to 0.964, which all exceeded the recommended threshold value of 0.70. The composite reliabilities for KMS Usage (0.911), Organizational Process factors (0.948), People-oriented factors (0.899), and Technology oriented factors (0.964) indicated that all measures were acceptable in terms of their internal consistency reliability. In addition, the average variance extracted (AVE) values of the different constructs ranged from 0.669 to 0.837, which all also exceeded the recommended threshold value of 0.50. The AVE for KMS Usage (0.837), Organizational Process factors (0.669), People-oriented factors (0.748), and Technology oriented factors (0.749) indicated that all measures were acceptable in terms of their convergent validity.

Table 1. Reliability Measures for KMS Usage

	Composite Reliability	**Average Variance Extracted (AVE)**
KMS Usage	0.911	0.837
Process Factors	0.948	0.669
People Factors	0899	0.748
Technology Factors	0.964	0.749

Consistent with the thresholds prescribed by Fornell and Larcker (1981), the square roots of the AVEs, indicated within the diagonal of Table 2, were greater in all cases than the measures in their corresponding row and column. This supported the discriminant validity of the KMS Usage scales.

Table 2. Discriminant Validity for KMS Usage (Fornell-Larcker Criterion)

	KMS Usage	**Process Factors**	**People Factors**	**Technology Factors**
KMS Usage Factors	**0.915**			
Process Factors	0.663	**0.818**		
People Factors	0.714	0.788	**0.865**	
Technology Factors	0.787	0.805	0.860	**0.865**

Table 13 shows the convergent validity results for KMS Usage reported by SmartPLS. These values were obtained by extracting the factor and cross loadings of all indicator items to their respective latent constructs. Results indicated that all items loaded above the acceptable threshold 0.70, and more highly on their respective construct than on any other.

Table 3. Factor Loadings and Cross Loadings for KMS Usage

	KMS Usage	Organizational...	People-oriente...	Technology-or...
PEPR01	0.653	0.746	0.914	0.811
PEPR02	0.569	0.619	0.826	0.684
PEPR03	0.626	0.674	0.852	0.732
PRPE01	0.531	0.820	0.654	0.619
PRPE02	0.461	0.797	0.638	0.680
PRPE03	0.562	0.705	0.662	0.762
PRTE01	0.520	0.849	0.666	0.660
PRTE02	0.574	0.889	0.706	0.744
PRTE03	0.613	0.821	0.623	0.653
PRUS01	0.524	0.797	0.611	0.574
PRUS02	0.508	0.829	0.611	0.581
PRUS03	0.553	0.843	0.620	0.633
TEPE01	0.638	0.621	0.736	0.829
TEPE02	0.704	0.754	0.753	0.911
TEPE03	0.675	0.783	0.752	0.901
TEPR01	0.636	0.703	0.736	0.823
TEPR02	0.809	0.692	0.763	0.916
TEPR03	0.762	0.652	0.748	0.893
TEUS01	0.525	0.666	0.743	0.780
TEUS02	0.693	0.672	0.717	0.848
TEUS03	0.626	0.745	0.772	0.878
USCONT	0.918	0.610	0.675	0.731
USSEEK	0.911	0.602	0.629	0.708

People-oriented Factors. Reliability results for structural model where People-oriented factors were the endogenous latent variable are shown in Table 4. The composite reliabilities of the different constructs ranged from 0.899 to 0.964, which all exceeded the recommended threshold value of 0.70. The composite reliabilities for

Organizational Process factors (0.948), People-oriented factors (0.899), and Technology oriented factors (0.964) indicated that all measures were acceptable in terms of their internal consistency reliability. In addition, the average variance extracted (AVE) values of the different constructs ranged from 0.670 to 0.749, which all also exceeded the recommended threshold value of 0.50. The AVE for Organizational Process factors (0.670), People-oriented factors (0.748), and Technology oriented factors (0.749) indicated that all measures were acceptable in terms of their convergent validity.

Table 4. Reliability Measures for People-oriented Factors

	Composite Reliability	**Average Variance Extracted (AVE)**
Process Factors	0.948	0.670
People Factors	0.899	0.748
Technology Factors	0.964	0.749

The square roots of the AVEs, indicated within the diagonal of Table 5, are greater in all cases than the measures in their corresponding row and column. This supported the discriminant validity of the People-oriented factors scales.

Table 5. Discriminant Validity for People Factors (Fornell-Larcker Criterion)

	Process Factors	**People Factors**	**Technology Factors**
Process Factors	**0.818**		
People Factors	0.789	**0.865**	
Technology Factors	0.809	0.864	**0.866**

Table 6 shows the convergent validity results for Process-oriented factors reported by SmartPLS. These values were obtained by extracting the factor and cross loadings of all indicator items to their respective latent constructs. Results indicated that all items loaded above the acceptable threshold 0.70, and more highly on their respective construct than on any other.

Table 6. Factor Loadings and Cross Loadings for People-oriented Factors

	Organizational...	People-Orient...	Technology-or...
PEPR01	0.746	0.918	0.815
PEPR02	0.620	0.826	0.684
PEPR03	0.675	0.848	0.736
PRPE01	0.824	0.654	0.621
PRPE02	0.808	0.638	0.687
PRPE03	0.703	0.662	0.763
PRTE01	0.853	0.666	0.662
PRTE02	0.888	0.707	0.748
PRTE03	0.810	0.623	0.652
PRUS01	0.798	0.611	0.579
PRUS02	0.832	0.611	0.584
PRUS03	0.836	0.621	0.635
TEPE01	0.622	0.736	0.832
TEPE02	0.753	0.754	0.911
TEPE03	0.784	0.752	0.902
TEPR01	0.704	0.737	0.823
TEPR02	0.692	0.763	0.908
TEPR03	0.652	0.748	0.883
TEUS01	0.669	0.743	0.794
TEUS02	0.671	0.717	0.847
TEUS03	0.746	0.773	0.884

Process-oriented Factors. Reliability results for structural model where Organizational Process factors were the endogenous latent variable are shown in Table 7. The composite reliabilities of the different constructs ranged from 0.899 to 0.964, which all exceeded the recommended threshold value of 0.70. The composite reliabilities for Organizational Process factors (0.948), People-oriented factors (0.899), and Technology oriented factors (0.964) indicated that all measures were acceptable in terms of their internal consistency reliability. In addition, the average variance extracted (AVE) values of the different constructs ranged from 0.669 to 0.749, which all also exceeded the recommended threshold value of 0.50. The AVE for Organizational Process factors (0.669), People-oriented factors (0.748), and Technology oriented factors (0.749) indicated that all measures were acceptable in terms of their convergent validity.

Table 7. Reliability Measures for Process-oriented Factors

	Composite Reliability	**Average Variance Extracted (AVE)**
Process Factors	0.948	0.669
People Factors	0.899	0.748
Technology Factors	0.964	0.749

The square roots of the AVEs, indicated within the diagonal of Table 18, are greater in all cases than the measures in their corresponding row and column. This supported the discriminant validity of the Organizational process factors scales.

Table 8. Discriminant Validity for Process Factors (Fornell-Larcker Criterion)

	Process Factors	**People Factors**	**Technology Factors**
Process Factors	**0.818**		
People Factors	0.790	**0.865**	
Technology Factors	0.815	0.863	**0.866**

Table 9 shows the convergent validity results for Process-oriented factors reported by SmartPLS. These values were obtained by extracting the factor and cross loadings of all indicator items to their respective latent constructs. Results indicated that all items loaded above the acceptable threshold 0.70, and more highly on their respective construct than on any other.

Table 9. Factor Loadings and Cross Loadings for Process-oriented Factors

	Organizational...	People-Orient...	Technology-or...
PEPR01	0.748	0.918	0.815
PEPR02	0.620	0.825	0.681
PEPR03	0.676	0.849	0.736
PRPE01	0.820	0.654	0.623
PRPE02	0.809	0.639	0.690
PRPE03	0.711	0.662	0.764
PRTE01	0.851	0.666	0.663
PRTE02	0.890	0.707	0.751
PRTE03	0.812	0.623	0.655
PRUS01	0.794	0.611	0.580
PRUS02	0.829	0.611	0.586
PRUS03	0.835	0.621	0.638
TEPE01	0.625	0.736	0.828
TEPE02	0.758	0.754	0.913
TEPE03	0.787	0.752	0.906
TEPR01	0.706	0.737	0.823
TEPR02	0.694	0.763	0.906
TEPR03	0.655	0.748	0.881
TEUS01	0.672	0.744	0.793
TEUS02	0.673	0.717	0.846
TEUS03	0.750	0.773	0.886

Technology-oriented Factors. Reliability results for structural model where the Technology-oriented factors are the endogenous latent variable are shown in Table 10. The composite reliabilities indicate that all measures are acceptable in terms of their internal consistency reliability. The composite reliabilities of the different measures range from 0.876 to 0.940, which all exceed the recommended threshold value of 0.70. In addition, the AVE value of the different measures range from 0.542 to 0.809, which all exceed the recommended threshold value of 0.50.

Reliability results for structural model where Technology-oriented factors were the endogenous latent variable are shown in Table 20. The composite reliabilities of the different constructs ranged from 0.899 to 0.964, which all exceeded the recommended threshold value of 0.70. The composite reliabilities for Organizational Process factors

(0.948), People-oriented factors (0.899), and Technology oriented factors (0.964) indicated that all measures were acceptable in terms of their internal consistency reliability. In addition, the average variance extracted (AVE) values of the different constructs ranged from 0.669 to 0.749, which all also exceeded the recommended threshold value of 0.50. The AVE for Organizational Process factors (0.669), People-oriented factors (0.748), and Technology oriented factors (0.749) indicated that all measures were acceptable in terms of their convergent validity.

Table 10. Reliability Measures for Technology-oriented Factors

	Composite Reliability	**Average Variance Extracted (AVE)**
Process Factors	0.948	0.669
People Factors	0.899	0.748
Technology Factors	0.964	0.749

The square roots of the AVEs, indicated within the diagonal of Table 11, are greater in all cases than the measures in their corresponding row and column. This supported the discriminant validity of the Technology-oriented factors scales.

Table 11. Discriminant Validity for Technology Factors (Fornell-Larcker Criterion)

	Process Factors	**People Factors**	**Technology Factors**
Process Factors	**0.818**		
People Factors	0.791	**0.865**	
Technology Factors	0.815	0.863	**0.866**

Table 12 shows the convergent validity results for Technology-oriented factors reported by SmartPLS. These values were obtained by extracting the factor and cross loadings of all indicator items to their respective latent constructs. Results indicated that all items loaded above the acceptable threshold 0.70, and more highly on their respective construct than on any other.

Table 12. Factor Loadings and Cross Loadings for Technology Factors

	Organizational...	People-Orient...	Technology-or...
PEPR01	0.749	0.918	0.815
PEPR02	0.620	0.826	0.683
PEPR03	0.677	0.848	0.736
PRPE01	0.817	0.654	0.622
PRPE02	0.810	0.638	0.688
PRPE03	0.715	0.662	0.763
PRTE01	0.850	0.666	0.662
PRTE02	0.892	0.707	0.749
PRTE03	0.813	0.623	0.653
PRUS01	0.792	0.611	0.579
PRUS02	0.827	0.611	0.585
PRUS03	0.835	0.621	0.636
TEPE01	0.627	0.736	0.830
TEPE02	0.761	0.754	0.912
TEPE03	0.789	0.752	0.903
TEPR01	0.708	0.737	0.823
TEPR02	0.696	0.763	0.907
TEPR03	0.658	0.748	0.883
TEUS01	0.673	0.743	0.794
TEUS02	0.674	0.717	0.847
TEUS03	0.752	0.773	0.884

Stage five reviewed reliability, and validity of the latent variables to complete the evaluation of the structural model. Internal consistency reliability was assessed by composite reliability and average variance extracted (AVE). All latent variables exceeded Fornell and Larcker's minimum criteria to ensure validity and reliability of the structural models.

Assessment of the Structural Models

Step 1: Assessment of Collinearity. SmartPLS results of the structural model where KMS Usage was the endogenous variable reported Organizational process factors (3.153), People-oriented factors (4.269), and Technology-oriented factors (4.594) did not exceed the maximum VIF threshold of 5, indicating no collinearity issues. Where People-oriented factors were the endogenous variable, Organizational process factors (2.892) and Technology-oriented factors (2.892) did not exceed the maximum VIF threshold, indicating no collinearity issues. Where Organizational process factors were the endogenous variable, People-oriented factors (3.916) and Technology-oriented factors (3.916) did not exceed the maximum VIF threshold of 5, indicating no collinearity issues. And finally, where Technology-oriented factors were the endogenous variable, People-oriented factors (2.674) and Organizational process factors (2.674) did not exceed the maximum VIF threshold of 5, also indicating no collinearity issues.

Step 2: Assessment of Significance. SmartPLS results of the structural model where KMS Usage was the endogenous variable (Figure 18) indicated People-oriented factors→KMS Usage (0.707) was not significant. Organizational Process factors→KMS Usage (0.319) was not significant either. Technology-oriented factors→KMS Usage (2.714) was significant at 1%. Estimations concluded during Stage 4 determined People-oriented factors→KMS Usage and Organizational Process factors→KMS Usage were not significant. Bootstrapping results confirmed significance of this path. Significance of Technology-oriented factors→KMS Usage was confirmed as estimated.

After reviewing the T-statistics in the outer model (Figure 18), all loadings in this model were confirmed to be highly significant. Indicators of the People-oriented factors construct ranged from 14.730 to 42.035. Indicators of the Organizational process factors construct ranged from 9.018 to 33.503. Indicators of the Technology-oriented factors construct ranged from 13.783 to 48.139. Indicators of the KMS usage construct were 31.132 and 39.654. Since no indicators were removed from this structural model due to failed criteria in the estimation stage, the coefficient of determination, R^2, remained 0.625 for the KMS Usage endogenous latent variable.

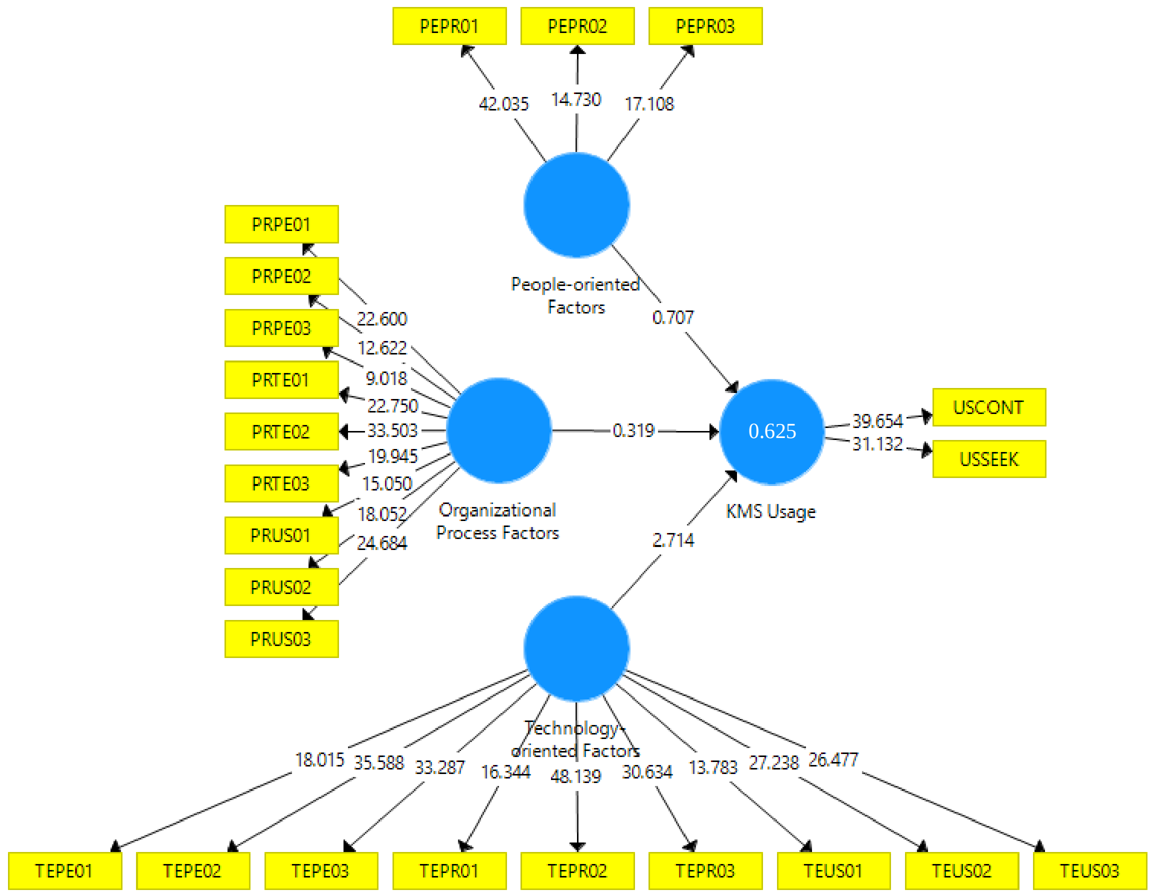

Figure 18. Structural Model for KMS Usage with T-Statistics

Results of the structural model where People-oriented factors were the endogenous variable (Figure 19) indicated Organizational Process factors → People-oriented factors (2.795) was significant at 1%. Technology-oriented factors→ People-oriented factors (7.530) was also significant at 1%. Estimations concluded during Stage 4 determined both Organizational Process factors → People-oriented factors and Technology-oriented factors→ People-oriented factors were significant. Bootstrapping results confirmed significance of both paths as estimated.

After reviewing the T-statistics in the outer model (Figure 19), all loadings in this model were confirmed to be highly significant. Indicators of the Organizational process factors construct ranged from 9.131 to 28.346. Indicators of the Technology-oriented factors construct ranged from 16.665 to 36.230. Indicators of the People-oriented factors construct ranged from 16.157 to 51.298. Since no indicators were removed from this structural model due to failed criteria in the estimation stage, the coefficient of determination, R^2, remained 0.770 for the People-oriented factors endogenous latent variable.

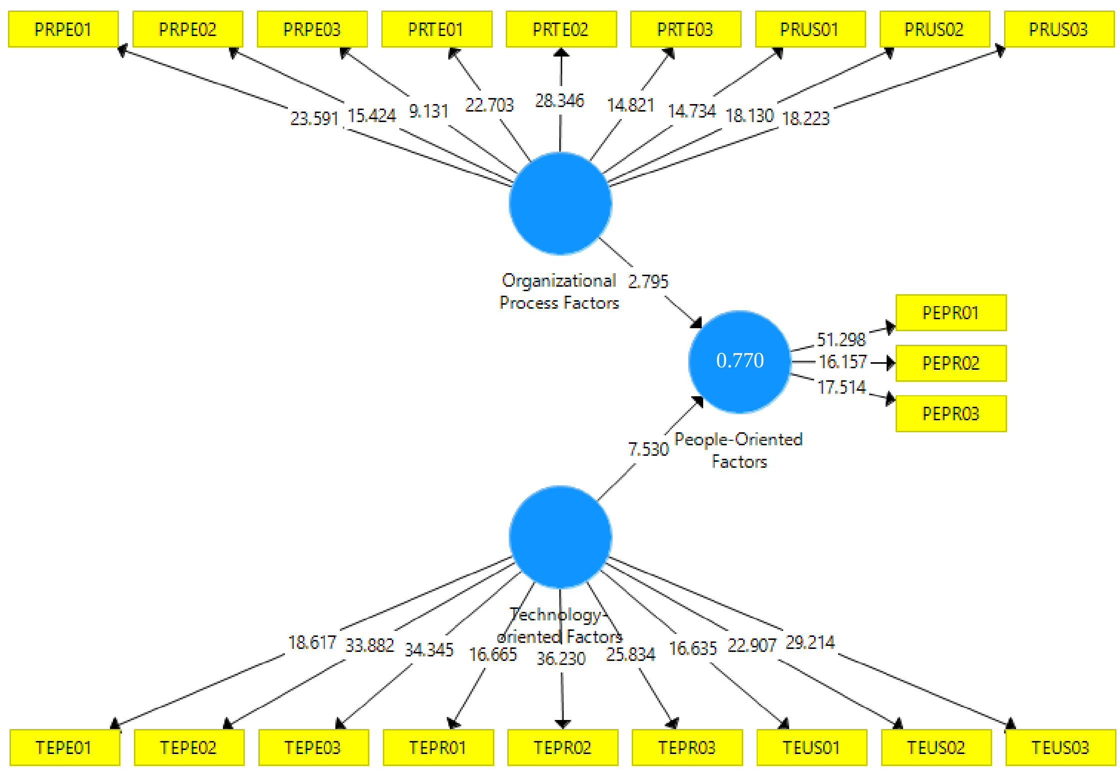

Figure 19. Structural Model for People-oriented Factors with T-Statistics

Results of the structural model where Organizational Process factors were the endogenous variable (Figure 20) indicated People-oriented factors → Organizational Process factors (1.960) was significant at 5%. Technology-oriented factors→ Organizational Process factors (2.669) was significant at 1%. Estimations concluded during Stage 4 of the analysis determined People-oriented factors → Organizational Process factors was both significant. Bootstrapping results confirmed significance of these paths as estimated.

After reviewing the T-statistics in the outer model (Figure 20), all loadings in this model were confirmed to be highly significant. Indicators of the People-oriented factors construct ranged from 16.607 to 49.825. Indicators of the Technology-oriented factors construct ranged from 17.956 to 42.719. Indicators of the Organizational process factors construct ranged from 10.224 to 29.973. Since no indicators were removed from this structural model due to failed criteria in the estimation stage, the coefficient of determination, R^2, remained 0.694 for the Organizational process factors endogenous latent variable.

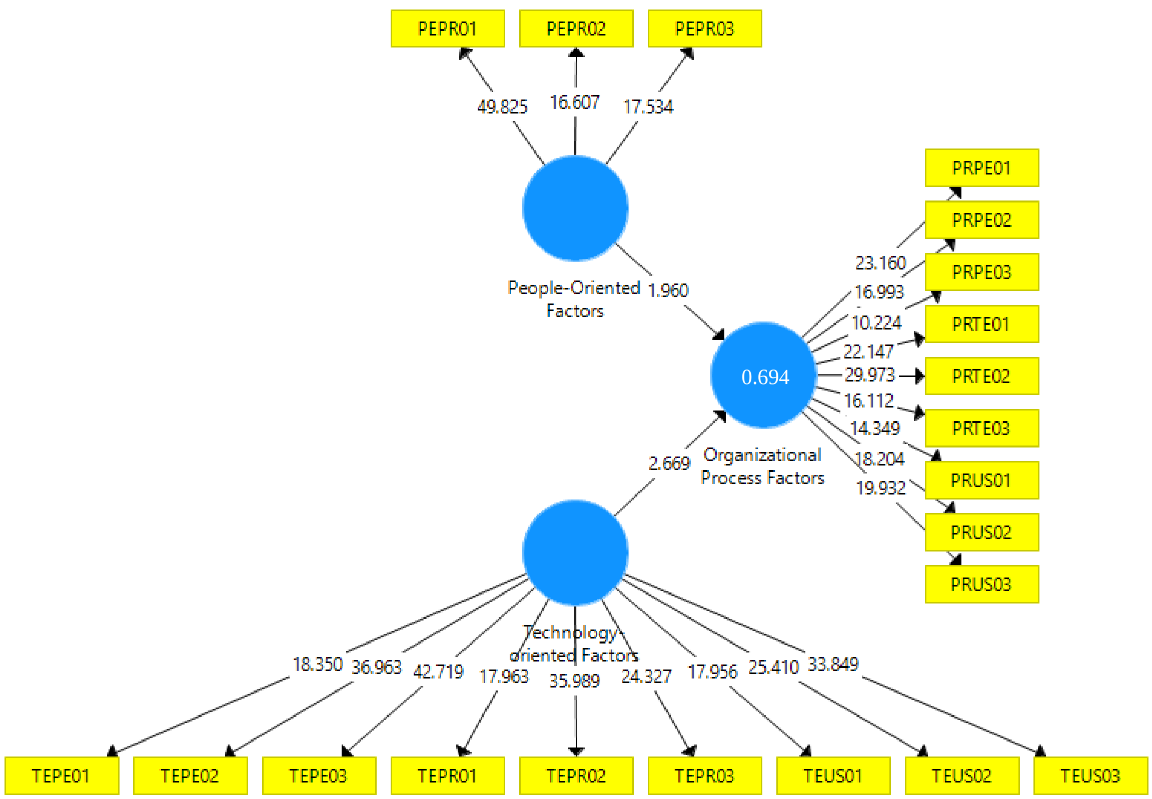

Figure 20. Structural Model for Organizational Process Factors with T-Statistics

Results of the structural model where Technology-oriented factors were the endogenous variable (Figure 21) indicated People-oriented factors → Technology-oriented factors (4.505) was significant at 1%. Organizational Process factors→

Technology-oriented factors (2.417) was significant at 5%. Estimations concluded during Stage 4 determined both these paths were significant. Bootstrapping results confirmed significance of both paths.

After reviewing the T-statistics in the outer model (Figure 21), all loadings in this model were confirmed to be highly significant. Indicators of the People-oriented factors construct ranged from 15.719 to 48.141. Indicators of the Organizational process factors construct ranged from 10.347 to 31.814. Indicators of the Technology-oriented factors construct ranged from 15.947 to 38.887. Since no indicators were removed from this structural model due to failed criteria in the estimation stage, the coefficient of determination, R^2, remained 0.792 for the Technology-oriented factors endogenous latent variable.

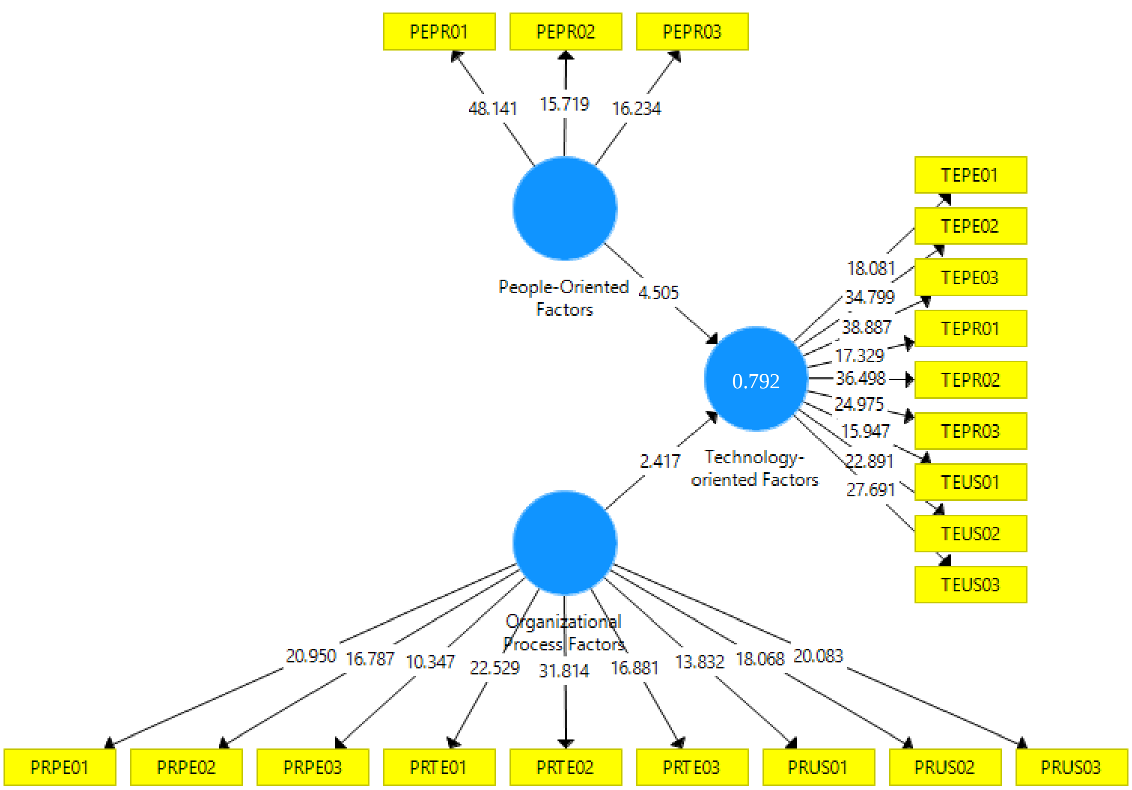

Figure 21. Structural Model for Technology-oriented Factors with T-Statistics

Step 3: Assessment of R^2. Where KMS Usage was the endogenous latent variable (Figure 17), results indicated the coefficient of determination, R^2, was 0.625 for the KMS Usage endogenous latent variable. This means that the three latent variables (People factors, Organizational Process Factors, and Technology-oriented factors) explained 62.5% of the variance in KMS Usage. Based on Chin's (1999) standard, the explanatory power of this structural model would be described as high-moderate.

Where People-oriented factors were the endogenous latent variable (Figure 18), results indicated the R^2 was 0.770 for the People-oriented factors endogenous latent variable. This means that the two latent variables (Organizational Process Factors and Technology-oriented factors) explained 77% of the variance in People-oriented factors. Based on Chin's (1999) standard, the explanatory power of this structural model would be described as substantial.

Where Organizational process factors were the endogenous latent variable (see Figure 19), results indicated the R^2 was 0.694 for the Organizational process factors endogenous latent variable. This means that the two latent variables (People-oriented factors and Technology-oriented factors) explained 69.4% of the variance in Organizational process factors. Based on Chin's (1999) standard, the explanatory power of this structural model would be described as substantial.

Finally, Where Technology-oriented factors were the endogenous latent variable (Figure 20), results indicated the R^2 was 0.792 for the Technology-oriented factors endogenous latent variable. This means that the two latent variables (People-oriented factors and Organizational Process Factors) explained 79.2% of the variance in

Technology-oriented factors. Based on Chin's (1999) standard, the explanatory power of this structural model would be described as substantial.

Step 4: Assessment of f^2. SmartPLS results of the structural model where KMS Usage was the endogenous variable indicated the f^2 effect size of People-oriented factors on KMS Usage (0.124) was small. The f^2 effect size of Organizational process-oriented factors on KMS Usage (0.051) was also small. However, the f^2 effect size of Technology-oriented factors on KMS Usage (0.640) was large.

Where People-oriented factors were the endogenous variable, the f^2 effect size of Organizational process factors on People-oriented factors (0.102) was small. However, the f^2 effect size of Technology-oriented factors on People-oriented factors (0.639) was large.

Where Organizational process factors were the endogenous variable, the f^2 effect size of People-oriented factors on Organizational process factors (0.098) was small. However, the f^2 effect size of Technology-oriented factors on Organizational process factors (0.224) was medium.

Finally, where Technology-oriented factors were the endogenous variable, the f^2 effect size of People-oriented factors on Technology-oriented factors (0.613) was large. However, the f^2 effect size of Organizational process factors on Technology-oriented factors (0.225) was medium.

Step 5: Assessment of Q^2. SmartPLS results of the structural model where KMS Usage was the endogenous variable denoted the Q^2 effect size indicated large (0.479) predictive relevance. Where People-oriented factors were the endogenous variable, the Q^2 effect size also indicated large (0.546) predictive relevance. Where Organizational process factors were the endogenous variable, the Q^2 effect size also indicated large (0.445) predictive relevance. Finally, where Technology-oriented factors were the endogenous variable, the Q^2 effect size also indicated large (0.578) predictive relevance.

Hypothesis Testing

Table 13 presents the results of the hypotheses. The “Conclusion” column indicates whether the hypothesis was: 1) supported, or 2) not supported.

Table 13. Hypothesis Test Results.

Hypotheses	Finding (Significance)	Conclusion
H1: People→KMS usage	No: (β=0.051, t=0.707)	Not Supported
H2: Processes→KMS usage	No: (β=0.640, t=0.319)	Not Supported
H3: Technology→KMS usage	Yes: (β=0.124, t=2.714, $p < 0.01$)	Supported
H4: People→Processes	Yes: (β=0.343, t=1.960, $p < 0.05$)	Supported
H5: People→Technology	Yes: (β=0.584, t=4.505, $p < 0.01$)	Supported
H6: Processes→Technology	Yes: (β=0.353, t=2.417, $p < 0.05$)	Supported
H7: Processes→People	Yes: (β=0.261, t=2.795, $p < 0.01$)	Supported
H8: Technology→People	Yes: (β=-0.652, t=7.530, $p < 0.01$)	Supported
H9: Technology→Processes	Yes: (β=0.519, t=2.669, $p < 0.01$)	Supported

Results of the study determined:

- Hypothesis 1 was not supported, indicating more favorable people-oriented factors in an organization did not promote greater KMS usage.
- Hypothesis 2 was not supported, indicating more favorable organizational process factors in an organization did not promote greater KMS usage.
- Hypothesis 3 was supported, indicating more favorable technology-oriented factors in an organization promoted greater KMS usage.
- Hypothesis 4 was supported, indicating more favorable people-oriented factors in an organization promoted a more favorable perspective of the process-oriented factors in that organization.

- Hypothesis 5 was supported, indicating more favorable people-oriented factors in an organization promoted a more favorable perspective of the technology factors in that organization.
- Hypothesis 6 was supported, indicating more favorable process-oriented factors in an organization promoted a more favorable perspective of the technology factors in that organization.
- Hypothesis 7 was supported, indicating more favorable process-oriented factors in an organization promoted a more favorable perspective of the people-oriented factors in that organization.
- Hypothesis 8 was supported, indicating more favorable technology factors in an organization promoted a more favorable perspective of the people-oriented factors in that organization.
- Hypothesis 9 was supported, indicating more favorable technology factors in an organization promoted a more favorable perspective of the process factors in that organization.

These findings constitute a summary of the initial findings based on the study results. Further interpretation and conclusions are elaborated in the next chapter of the dissertation. Chapter 5 presents conclusions that may be drawn from this study, along with a discussion of its strengths, weaknesses, and limitations.

Summary

This chapter presented keys elements of the literature used to drive the results of an eight-stage procedure recommended for the application of PLS-SEM analysis. It was organized around the two research questions that motivated this research. The first research question asked: What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage? To address this question, key literature was reviewed on socio-technical factors and KMS usage. This review identified scales that were used to measure these dimensions in the current study to provide a foundation for measuring the structural model.

The second research question of the study was: What are the relationships among these [socio-technical] factors and how do they influence KMS usage? To address this question, a survey consisting of 36 items was designed, validated by a Delphi team, and piloted before being launched via SurveyMonkey® Audience for data collection. A total of 97 usable responses were collected from the final survey. Data was then analyzed using confirmatory factor analysis and structural equation modeling techniques.

The final results demonstrated that the proposed contributors impacted KMS usage differently. People-oriented factors and Organizational processes did not have a significant positive relationship with KMS usage. Support was confirmed for all other hypothesized relationships among socio-technical factors and KMS usage.

Chapter 5

Conclusions, Implications, Recommendations, and Summary

Introduction

Many organizations rely on costly KMS as an important enabler of knowledge sharing initiatives. Although these KMS deployments can increase the organization's competitive advantage, the full benefits of the KMS can only be realized if users are willing to engage the system for knowledge seeking and contribution (Kulkarni & Freeze, 2006). Because the investment in KMS technology can be significant, the implementation is considered a failure if lack of usage prevents a return on the investment. Improper understanding, implementation, and application of KMS components can dampen usage, result in poor performance, or end in system failure (Hester, 2012).

The primary purpose of this research was to understand the relationship among socio-technical factors and delineate their relationship to KMS usage. Thus, a review of research studies and existing literature was conducted to define a set of variables which were validated by a Delphi team of experts. Next, both a pilot and subsequent larger study were administered to collect data from KMS users in the United States. These users were specifically involved with the use of decision-support systems. Finally, using statistical analysis, the validity of the survey was confirmed and the relationship among socio-technical factors and KMS Usage was determined using structural equation modeling.

Chapter 5 presents the conclusions, implications, and recommendations, and a summary of this study. The conclusions succinctly summarize findings in support of the study's two research questions and denotes the limitations of the study's results. The implications discuss the relevance of this research to the socio-technical and knowledge management bodies of knowledge, and potential value for both practitioners and researchers. Next, the recommendations outline suggestions for future research. Finally, a summary of the chapter and this research provides a neat summation of the investigation.

Conclusions

Research Questions

The first research question outlined in Chapter 3 of this study relied on literary analysis of the individual components of socio-technical systems (people, processes, and technology) and their influences on KMS usage. Numerous studies provided examples and support for socio-technical constructs to take under consideration when investigating KMS usage. These constructs have been previously identified as potentially important to fostering KMS usage. The literature revealed self-efficacy, social ties and ease of use/usefulness as variables that have successfully explained people in terms of socio-technical and usage models. Chai and Kim (2012) found that people are as significant as technology in users contributing their knowledge to the system. The literature also recognized leadership, organizational culture/climate, and governance as variables that have successfully explained organizational processes. Finally, system quality, information quality, and technology fit are variables that have successfully explained technology-oriented factors.

The second research question outlined in Chapter 3 of this study relied on quantitative analysis of the structural model using PLS-SEM. Results of the hypothesis testing were:

Hypothesis 1 was not supported (β=0.051, t=0.707), indicating more favorable people-oriented factors in an organization did not promote greater KMS usage. Therefore, assertions that self-efficacy, social ties and ease of use and usefulness will have a positive impact on KMS usage were not confirmed by the quantitative analysis in this study. This finding, in the context of this study, conflicts with findings presented by Lin and Huang (2008) and Venkatesh et al. (2003) on the people-oriented factors where a significant relationship with KMS Use was established.

Hypothesis 2 was not supported (β=0.640, t=0.319), indicating more favorable organizational process factors in an organization did not promote greater KMS usage. This means leadership, organizational culture/climate, and governance were not key drivers for knowledge contribution and retrieval. Humayan and Gang (2013) also found that certain process factors, such as leadership, did not positively impact KMS usage.

Hypothesis 3 was supported (β=0.124, t=2.714, $p < 0.01$), indicating more favorable technology-oriented factors in an organization promoted greater KMS usage. Thus, system quality, information quality, and technology fit are the major technical factors in the individual’s decision to contribute to or seek knowledge from the KMS. This finding confirms similar results presented by Wang and Lai (2014) and Venkatesh et al. (2003) on technical factors and their relationship to KMS usage.

Hypothesis 4 was supported (β=0.343, t=1.960, $p < 0.05$), indicating more favorable people-oriented factors in an organization promoted a more favorable perspective of the process-oriented factors in that organization. In other words, self-efficacy, social ties and ease of use/usefulness were factors that had a positive significant relationship with leadership, organizational culture/climate, and governance. Venkatesh et al. (2003) also found a significant positive relationship among these variables.

Hypothesis 5 was supported (β=0.584, t=4.505, $p < 0.01$), indicating more favorable people-oriented factors in an organization promoted a more favorable perspective of the technology factors in that organization. Consequently, self-efficacy, social ties and ease of use/usefulness were factors that had a positive significant relationship with system quality, information quality, and technology fit. These outcomes supported evidence presented by Venkatesh et al. (2003).

Hypothesis 6 was supported (β=0.353, t=2.417, $p < 0.05$), indicating more favorable process-oriented factors in an organization promoted a more favorable perspective of the technology factors in that organization. And so, leadership, organizational culture/climate, and governance had a positive significant relationship with system quality, information quality, and technology fit. Lin et al. (2013) and Humayan and Gang (2013) concluded similar findings.

Hypothesis 7 was supported (β=0.261, t=2.795, $p < 0.01$), indicating more favorable process-oriented factors in an organization promoted a more favorable perspective of the people-oriented factors in that organization. Consequently, leadership, organizational culture/climate, and governance had a positive significant relationship with self-efficacy, social ties and ease of use/usefulness. Again providing further confirmation of findings by Lin et al. (2013) and Humayan and Gang (2013).

Hypothesis 8 was supported (β=-0.652, t=7.530, $p < 0.01$), indicating more favorable technology factors in an organization promoted a more favorable perspective of the people-oriented factors in that organization. This means system quality, information quality, and technology fit were proven to have a positive significant relationship with self-efficacy, social ties and ease of use/usefulness. In the context presented in this study, these findings support the significant positive relationship found by Wang and Lai (2014).

Hypothesis 9 was supported (β=0.519, t=2.669, $p < 0.01$), indicating more favorable technology factors in an organization promoted a more favorable perspective of the process factors in that organization. As a result, system quality, information quality, and technology fit were found to be significant drivers of leadership, organizational culture/climate, and governance.

Significant conclusions were drawn as a result of the data collected and analyzed in this study. This research substantiated similar conclusions regarding socio-technical factors and KMS usage to findings other researchers have presented in the KMS usage literature. Furthermore, this research specified variables among people-oriented, organizational process, and technology-oriented factors. Thus, this study synthesized a common set of specific socio-technical variables that can be related to KMS usage.

Limitations

Although every effort was made to carefully plan, design, and execute this research, this study is not without limitations. The results of this study offered valuable insights into socio-technical factors and KMS usage, however these results should be interpreted in context of their limitations. First, this study did not investigate an exhaustive list of determinants that could impact knowledge workers' self-reported use of the KMS. This study applied and examined socio-technical constructs based on an extensive review of the literature at a given point in time. It is entirely possible that differing reviews of the current literature could yield differing constructs to describe socio-technical factors that contribute to KMS usage.

The second limitation resulted from the use of individual self-reported questions to capture data for measuring KMS usage. According to Lin and Huang (2008), bias sometimes results in limited validity because of the dependence on volunteers to willingly and truthfully answer the questions. Leedy and Ormrod (2010) suggested that bias can never be completely eliminated when using self-reported data. Brutus, Aguinis, and Ulrich (2013) stated that data collected by means of interviews, focus groups, or questionnaires contain several sources of potential bias. These sources are: 1) selective memory - remembering or not remembering certain past experiences or events, 2) telescoping - recalling events associated with incorrect timeframes, 3) attribution - associating positive events internally, but negative events externally, and 4) exaggeration - embellishing events as more significant than actual (Brutus et al., 2013).

The third limitation was also inherent in the use of self-reported survey questions. Although the research instrument was derived from scales that were previously validated, and were again validated in this study, there is no assurance that respondents clearly understood the intended meaning of the questions. Therefore, it can only be assumed that scales responses accurately reflect the respondent's level of agreement with each question. This is of particular concern for those respondents that may not have clearly understood the language of the questions. Because the survey required responses to all questions prior to submission, this limitation could potentially apply to the entire survey or even just portions of it.

The fourth limitation was the technological context of the study. Although there were benefits to focusing on a specific system, there may also be some setbacks. The central focus of technology observed in this study was the KMS. The structural model was derived to specifically target KMS usage, and the model was tested using data based specifically on decision support systems (DSS). Furthermore, the present study did not discriminate among different DSS but placed them all in a single category. Different DSS perform a variety of different functions, which in turn may lead to different usage behavior. Thus, the structural model used in this study may not be applicable to all types of KMS, or even IS contexts.

The fifth limitation was a result of survey respondents being spread across a number of industries that varied considerably in their characteristics. Although the inclusion of respondents from various industries might enhance the ability to generalize results, certain contexts may exhibit special circumstances that warrant further investigation. Data were collected with regard to the respondents' industry for information only, but were not factored into the analysis. Isolating industries might contribute to the constructs analyzed, particularly in the area of people-oriented factors.

Finally, the sixth limitation was due to the cross-sectional nature of the study and the collection of self-reported KMS usage data for the dependent variable. Since actual data were not used to demonstrate usage, it is possible that self-reported usage behavior might not accurately reflect actual usage behavior. In spite of these limitations, this research presented a rigorous effort to develop a structural model that examined relationships among socio-technical factors and KMS usage. Socio-technical factors and KMS usage continue to be important topics for both researchers and practitioners. This study provided measures that may reveal predictive indicators for increased knowledge management system use.

Implications

The results of this study provided insights for both researchers and practitioners on how to promote increased usage of KMS. The success of KMS depends on users' willingness to use them for both contributing and seeking relevant, reliable, and timely information (Lin & Huang, 2008). Since there are exorbitant costs related to developing, implementing, and maintaining decision-support system and KMS, infrequent or non-use of the system will not provide a return-on-investment for the organization (Doherty, 2012). In contrast, high usage is expected to provide a competitive advantage for the organization and is a key determinant of KMS success (Oyefolahan et al., 2012).

Since the success or failure of the KMS is governed by users' willingness to seek and contribute knowledge, knowledge sharing should be a key focus for the organization. He, Qiao, and Wei (2009) noted that substantial amounts of social interaction are required to facilitate knowledge sharing. Based on the social nature of knowledge sharing, the KMS should be investigated as a socio-technical system. Alignment of socio-technical factors is required for increasing system usage.

Although a plethora of the literature highlights the importance of technology factors when considering KMS usage, few have comprehensively addressed the socio-technical factors related to people and processes. By empirically testing socio-technical factors that influence continued KMS usage, the results of this study offers suggestions on how to promote KMS usage, thereby creating a competitive advantage for the organization.

Implications for Practitioners

This study indicated that KMS usage in terms of knowledge seeking and contribution requires careful consideration of several social and technical factors. Results of the study also illustrated that merely implementing a KMS will not guarantee that knowledge workers will use the system. Previous studies have identified various aspects of social and technical factors that impact KMS usage. While many studies have focused heavily on technology- oriented factors that impact use, such as system quality and fit, there is often little or no attention paid to the social dimensions relating to system use. The results of this study addressed a comprehensive set of both social and technical factors, while also scrutinizing the relationships among these factors and their impacts on KMS usage.

According to this study's findings, more favorable people-oriented factors in the organization did not promote greater KMS usage. More specifically, self-efficacy, social ties and ease of use and usefulness did not have a positive impact on KMS usage. This finding suggests that although management should identify and develop training and programs to increase the user's self-efficacy, these programs alone will not be sufficient to increase usage of the system. In addition, teambuilding activities or other methods that help encourage trust and communication could be useful in stimulating knowledge sharing, but were not found to be drivers of system use. Finally, when considering factors related to people, a belief that one's performance, productivity, and effectiveness will be enhanced by using the system did not drive usage of the system. Managers should ensure key performance indicators of productivity are visible to workers. Adopting an organizational structure that facilitates communications, social empowerment, and cross-functional interactions should be considered integral components of the organization's KM initiative but should not be relied on to drive KMS usage.

Within context, this study's findings also indicated that more favorable organizational process factors did not promote greater KMS usage. Therefore, leadership, organizational culture/climate, and governance are needed but were not key drivers for knowledge contribution and retrieval. It is important for management to understand that focusing on leadership as a means to increase KMS usage may not provide the expected benefit. Likewise, organizational culture/climate and governance are not likely to be significant motivators of KMS use either.

More favorable technology-oriented factors in an organization had a positive significant relationship with KMS usage. Therefore, a focus on system quality, information quality, and technology fit should be considered major technical factors in the user's decision to contribute or seek knowledge from the system. Increased KMS use can be expected if the system provides accessibility, knowledge quality, and relevance. The system's data should accurately represent its content as characterized by being relevant, timely, and comprehensible. Developers should take these guidelines into account when designing the KMS.

Other relationships confirmed by this study indicated that more favorable people-oriented factors in an organization will promote a more favorable perspective of the process-oriented and technology factors in that organization. In other words, the user's belief in their own ability, trust and communication, and the system effectiveness were all important factors that had a positive influence on leadership, organizational culture/climate, governance, system quality, information quality, and technology fit. Understanding the significance of these relationships is crucial for managers to make effective decisions about KMS requirements, implementation and maintenance.

More favorable process-oriented factors in an organization will promote a more favorable perspective of the people-oriented and technology factors in that organization. In turn, creating and evangelizing clear visons and directions, being cognizant of social influences, and establishing clear corporate expectations and performance management have positive significant associations with self-efficacy, social ties, ease of use/usefulness, system quality, information quality, technology fit, self-efficacy, social ties and ease of use/usefulness.

Finally, management should take note that providing an accessible and relevant system that contains relevant, timely, and comprehensible contents had a positive significant relationship with self-efficacy, social ties, ease of use/usefulness, leadership, organizational culture/climate, or governance. Managers should attempt to use technology as a means for developing people and process-oriented factors. It is equally as important to understand which factors will not yield significant value in the KM initiative as it is to understand factors that will yield value.

On a practical front, this study provided indicators to managers regarding a number of desirable and undesirable conditions that should be taken into consideration when developing or implementing knowledge management initiatives and the systems to support them. Again, positive socio-technical contributors to KMS usage have been established by this research, and the implications for practice can be incorporated in the existing and future knowledge-based frameworks and systems used to support decision-making. Since organizations are becoming increasingly more reliant on knowledge workers, it is imperative the manager understands the strategic value derived from the KMS can only be realized through promoting system use.

Implications for Researchers

This study offered an original contribution to the existing bodies of knowledge on socio-technical factors and KMS usage behavior. The constructs presented in this study highlighted the significance of social and technical relationships in understanding knowledge seeking and contribution in a decision-driven organization. The findings of this study bridged the gap between the literature on people, processes, technologies and KMS usage.

A major practical contribution of the present research is that through analysis of the literature, a comprehensive set of people-oriented (self-efficacy, social ties, and ease of use/usefulness), process-oriented (leadership, organizational culture/climate, and governance), and technology-oriented factors (system quality, information quality, and technology fit) were identified. This study also proposed a structural research model suitable for analyzing the relationships between these socio-technical factors and their impacts on KMS usage. Contrary to many previous studies that were focused primarily on technology, this study's research model sufficiently captured social and process-related aspects of KMS usage also.

A clear and repeatable methodology for applying structural equation model using PLS-SEM was also outlined. The empirical results yielded through application of the defined methods provided strong support for the proposed structural model. Both people and technology-oriented factors were found to have direct effects on KMS usage. Process-oriented factors were not confirmed as an important predictor of KMS Usage. A comprehensive set of socio-technical factors, a structural model with empirical support, and recommendations for future studies (next section) are all benefits this study provided for academics and researchers.

Recommendations

This exploratory and interpretive study offers a number of prospects for future organizational application and continued research, both in terms of theory development and validation. More research will in fact be necessary to refine and further validate the current findings of this research. This section covers next steps that practitioners might consider to support increased KMS usage within the organization and also proposes opportunities for future research.

Further than its theoretical contributions, this study provided crucial empirical value as well. Prior studies on socio-technical factors and KMS usage were mainly founded on literature reviews and theoretical frameworks or conceptual models involving KMS usage. The body of knowledge lacked empirical testing of the interactions between the socio-technical factors and their impacts on KMS usage. This study not only mitigated the gap between theories and research, but also extended the field of KMS usage as it relates to DSS. Future research might provide further empirical evidence validating or extending the structural model proposed by this research.

Since this study did not investigate an exhaustive list of determinants that could impact knowledge workers' self-reported use of the KMS, further opportunities exist to identify antecedent variables of KMS usage. Although socio-technical systems theory is founded on variables relating to people, processes, and technology, there are varying indicators that define these constructs within the literature. Future studies can apply different indicators, therefore yielding potentially improved results to describe socio-technical factors that contribute to KMS usage.

To address the limitation of this study that resulted from the use of individual self-reported questions to capture data for measuring KMS usage, future studies might focus on actual usage data mined from the DSS or KMS. The use of actual data could mitigate the bias that inherently exists when there is a dependence on volunteers to willingly and truthfully answer the questions. Actual usage data would provide a mechanism to mitigate the bias that Leedy and Ormrod (2010) suggested can never be completely eliminated in studies completely reliant upon self-reported data. Furthermore, actual usage data would also alleviate limitations of this study resulting from the respondents' inability to clearly understand the intended meaning of the questions solicited in the online survey.

The technological context of the study provides another possible avenues for future research. This study was focused on data collected from KMS users of a specific type of system, the DSS. Additionally, this study categorized all defined DSS into a single category. Since different DSS perform different functions, future studies could validate whether these differences lead to different usage behavior. Furthermore, the current study collected data for DSS at all stages of adoption. This could have resulted in a highly varied set of responses from users whose opinions might represent vastly different thought processes. According to Hester (2010), specific instances relating to the system's stage of adoption may be impacted by a different set of underlying factors that could impact usage. Alternative studies could focus on either a specific DSS technology or an entirely different category of KMS in specific stages of the implementation process.

Although respondents of the current study were from varying industries, future studies might investigate whether certain industrial contexts might provide specific insights that could yield benefits to both researchers and practitioners. Although this may reduce the ability to generalize data to differing contexts, for certain industries the benefits may outweigh the costs. Since this study is only based on information provided by 97 respondents, studies in more specific industrial contexts should strive to collect larger sample sizes to increase the statistical power of the results.

Finally, a longitudinal examination based on multiple measurements of self-reported and actual behavior at different time periods would provide a more rigorous test of the interactions among socio-technical factors and their impacts on KMS usage. The findings of this study highlighted that socio-technical factors and KMS usage are complex constructs that warrant further investigation. Given that the KMS usage literature has provided only limited or partial insights into these relationships, future research is needed advance the current body of knowledge.

Summary

The KMS is an enabler of knowledge management initiatives. Proper use of the KMS has been proven to provide a competitive advantage for individuals and organization. Kwahk and Ahn (2010) stated the social nature of knowledge transfer qualifies a KMS as a socio-technical system. Kwahk and Ahn noted that socio-technical systems (STS) consider people, process, and technology factors. Therefore, the KMS is more likely to have high utilization, and provide value to the organization, if socio-technical factors are considered during implementation and configuration. Many KMS usage studies rely on technical theories for explaining utilization, but there are few studies that have also considered a comprehensive set of social factors. This study investigated the socio-technical factors that affect KMS usage in terms of knowledge seeking and knowledge contribution.

The first research question was: What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage? An extensive review of existing literature determined that people-oriented factors could be operationalized with three latent variables: self-efficacy, social ties and ease of use/usefulness. Organizational process factors could also be operationalized with three latent variables: leadership, organizational culture/climate, and governance. Lastly, technology-oriented factors could be operationalized with three latent variables: system quality, information quality, and technology fit.

The second research question was: What are the relationships among socio-technical factors and how do they influence KMS usage? To answer this question, confirmatory factor analysis and PLS-SEM were used to examine path relationships of a modified STS structural model. Through the use of a paid service called SurveyMonkey® Audience, this study employed a 36 item survey including three sections to collect demographic and behavioral data from 97 North American users of a specific type of KMS (decision-support systems). The respondents were diverse in terms of their gender, age, experience, education, industry, job role, and type of DSS used.

Confirmatory factor analysis and structural equation modeling were used to analyze the data using SmartPLS (PLS-SEM).

This study concluded that from a socio-technical perspective, technology-oriented factors were found to most significantly affect KMS usage. This indicates that the most important concerns for increasing KMS usage are system quality, information quality, and technology fit. Results also confirmed that in the context of this study, people-oriented factors (self-efficacy, social ties, and ease of use/usefulness) and organizational process factors (leadership, organizational culture/climate, and governance) were not critical factors directly responsible for increasing KMS usage. However, the relationships among socio-technical factors all had positive significant relationships. Therefore, investments in people and process-oriented factors will create a more favorable perspective on technology-oriented factors, which in turn can increase KMS usage. In all, nine hypotheses were tested to explain the relationship among socio-technical factors and KMS usage. Seven of the nine hypotheses were confirmed. In addition to a thorough review of the study's methodology and results, implications for both practitioners and researchers were discussed, and future research opportunities were presented.

Appendix A

CITI Online Training Transcript

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Noel Wint (ID: 106448)
- **Email:** wnoel@nova.edu
- **Institution Affiliation:** Nova Southeastern University (ID: 543)
- **Institution Unit:** Graduate School of Computer and Information Sciences
- **Phone:** 321-276-6573

- **Curriculum Group:** Human Research
- **Course Learner Group:** 6. SCIS
- **Stage:** Stage 2 - Refresher Course

- **Report ID:** 15321303
- **Report Date:** 02/16/2015
- **Current Score**:** 100

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
SBE Refresher 1 – History and Ethical Principles	02/16/15	2/2 (100%)
SBE Refresher 1 – Federal Regulations for Protecting Research Subjects	02/16/15	2/2 (100%)
SBE Refresher 1 – Informed Consent	02/16/15	2/2 (100%)
SBE Refresher 1 – Research with Prisoners	02/16/15	2/2 (100%)
SBE Refresher 1 – Research in Educational Settings	02/16/15	2/2 (100%)
SBE Refresher 1 – Instructions	02/16/15	No Quiz
SBE Refresher 1 – International Research	02/16/15	2/2 (100%)
SBE Refresher 1 – Defining Research with Human Subjects	02/16/15	2/2 (100%)
SBE Refresher 1 – Assessing Risk	02/16/15	2/2 (100%)
SBE Refresher 1 – Privacy and Confidentiality	02/16/15	2/2 (100%)
SBE Refresher 1 – Research with Children	02/16/15	2/2 (100%)
Nova Southeastern University	02/16/15	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

Appendix B

Survey Questions

Survey items were measured on a five-point scale ranging from strongly agree to strongly disagree.

*Should begin with the statement, "I generally use the KMS because…".

Item	Construct	Variable	Code	Question	Citation
H1*	People	Self-efficacy	PEUS01	… someone showed me or provided training on how to do it first.	Venkatesh, et al. (2003)
H1*	People	Social Ties	PEUS02	… people who are important to me think that I should use the system.	Venkatesh, et al. (2003)
H1*	People	EOU/U	PEUS03	… I find the system easy to use.	Venkatesh, et al. (2003)
H2*	Process	Leadership	PRUS01	… I have support from leadership.	Humayan & Gang (2013)
H2*	Process	Org Culture/ Climate	PRUS02	… there is support within the team/organization for using the system.	Humayan & Gang (2013)
H2*	Process	Governance	PRUS03	… there are specific guidelines that regulate use of the system.	Lin et al. (2013)
H3*	Technology	System Quality	TEUS01	… the system is dependable.	Wang & Lai (2014)
H3*	Technology	Info Quality	TEUS02	… the information provided by the KMS meets my needs.	Wang & Lai (2014)
H3*	Technology	Technology Fit	TEUS03	… the system can increase the effectiveness of performing job tasks.	Venkatesh, et al. (2003)
H1-H3	Usage	Seeking	USSEEK	I frequently use the KMS to seek knowledge.	Lin & Huang (2008)

Item	Construct	Variable	Code	Question	Citation
H1-H3	Usage	Contributing	USCONT	I frequently use the KMS to contribute knowledge.	Lin & Huang (2008)
H4	People	Self-efficacy	PEPR01	I can confidently explain how the system improves my performance.	Venkatesh, et al. (2003)
H4	People	Social Ties	PEPR02	Co-workers that use the system appear to perform better.	Venkatesh, et al. (2003)
H4	People	EOU/U	PEPR03	My organization sees the value of clearly defined processes.	Venkatesh, et al. (2003)
H5	People	Self-efficacy	PETE01	I am comfortable with the system since I have used similar systems before.	Venkatesh, et al. (2003)
H5	People	Social Ties	PETE02	When using the sytem I can call someone for help if I get stuck.	Venkatesh, et al. (2003)
H5	People	EOU/U	PETE03	Learning to operate the system is easy for me.	Venkatesh, et al. (2003)
H6	Process	Leadership	PRTE01	Leaders act as role models by using the system.	Humayan & Gang (2013)
H6	Process	Org Culture/ Climate	PRTE02	The organization has generally supported the use of the system.	Humayan & Gang (2013)
H6	Process	Governance	PRTE03	There are specific guidelines that regulate use of the system.	Lin et al. (2013)
H7	Process	Leadership	PRPE01	Senior management has been helpful in the use of the system.	Humayan & Gang (2013)
H7	Process	Org Culture/ Climate	PRPE02	The team/organization encourages knowledge creation, sharing, and use.	Humayan & Gang (2013)

Item	Construct	Variable	Code	Question	Citation
H7	Process	Governance	PRPE03	It is important for contributions to the system are moderated.	Lin et al. (2013)
H8	Technology	System Quality	TEPE01	The quality of system determines the success of decisions made.	Wang & Lai (2014)
H8	Technology	Info Quality	TEPE02	Information provided by the system is helpful.	Wang & Lai (2014)
H8	Technology	Technology Fit	TEPE03	Sharing knowledge using the system improves decision making.	Venkatesh, et al. (2003)
H9	Technology	System Quality	TEPR01	The system can increase the quantity of output for the same amount of effort.	Venkatesh, et al. (2003)
H9	Technology	Info Quality	TEPR02	The information provided by the system improves workflows.	Venkatesh, et al. (2003)
H9	Technology	Technology Fit	TEPR03	Using the system improves my job performance.	Venkatesh, et al. (2003)

Appendix C

Requests and Responses for Permission to use Survey Items

Tue 11/17/2015 8:51 PM

Noel Wint Jr. <wnoel@nova.edu>

Permission to Use Items from Your Research

To 'vvenkatesh@vvenkatesh.us'

Dr. Viswanath Venkatesh
vvenkatesh@vvenkatesh.us

November 17, 2015

Dear Dr. Venkatesh,

My name is Noel Wint, and I am currently a doctoral student at Nova Southeastern University. During my literature review, I encountered research completed by you in 2003, entitled *User acceptance of information technology: toward a unified view*.

I would like your permission to modify and include several of the items in your research instrument in my research. An appropriate instrument was difficult to locate, and items in your instrument most closely match my needs. I would really appreciate it if you would permit me to use these items.

Please let me know by response to this email if you will grant this permission.

Thank you for your kind consideration.

Respectfully,
Noel Wint
Doctoral candidate at Nova Southeastern University
3880 Long Branch Lane
Apopka, FL 32712
wnoel@nova.edu

Fri 11/20/2015 11:52 AM

Viswanath Venkatesh <vvenkatesh@vvenkatesh.us>

RE: Permission to Use Items from Your Research

To 'Noel Wint Jr.'

Thanks for your interest. I am sorry for the delayed response which is due to a hectic travel schedule.

You have my permission.

You will find related papers at:
http://vvenkatesh.com/Downloads/Papers/fulltext/downloadpapers.htm

You may also find my book (that can be purchased for a significant student discount and faculty member discount) to be of use: http://vvenkatesh.com/book

Hope this helps.

Sincerely,
Viswanath Venkatesh
Distinguished Professor and George and Boyce Billingsley Chair in Information Systems
Walton College of Business
University of Arkansas
Fayetteville, AR 72701
Phone: 479-575-3869; Fax: 479-575-3689
Email: vvenkatesh@vvenkatesh.us
Website: http://vvenkatesh.com
IS Research Rankings Website: http://vvenkatesh.com/ISRanking

Wed 1/27/2016 11:51 AM

Noel Wint <wnoel@nova.edu>

Permission to use Items from Your Research

To cg@hit.edu.cn

Dr. Cui Gang
cg@hit.edu.cn

January 27, 2015

Dear Dr. Gang,

My name is Noel Wint, and I am currently a doctoral student at Nova Southeastern University. During my literature review, I encountered research completed by you in 2013, entitled *Impact of leadership support on KMS-based knowledge seeking behavior: Lessons learned.*

I would like your permission to modify and include several of the items in your research instrument in my research. An appropriate instrument was difficult to locate, and items in your instrument most closely match my needs. I would really appreciate it if you would permit me to use these items.

Please let me know by response to this email if you will grant this permission.

Thank you for your kind consideration.

Respectfully,
Noel Wint
Doctoral candidate at Nova Southeastern University
3880 Long Branch Lane
Apopka, FL 32712
wnoel@nova.edu

Tue 3/1/2016 9:05 AM

cg <cg@hit.edu.cn>

Re: Permission to use Items from Your Research

To Noel Wint

You replied to this message on 3/3/2016 6:23 AM.

ok I permit you to use these items.

cg

Tue 11/17/2015 8:54 PM

Noel Wint Jr. <wnoel@nova.edu>

Permission to Use Items from Your Research

To 'hlin14@depaul.edu'

Dr. Hui Lin
hlin14@depaul.edu

November 17, 2015

Dear Dr. Lin,

My name is Noel Wint, and I am currently a doctoral student at Nova Southeastern University. During my literature review, I encountered research completed by you in 2013, entitled *The effects of social and technical factors on user satisfaction, sense of belonging and knowledge community usage.*

I would like your permission to modify and include several of the items in your research instrument in my research. An appropriate instrument was difficult to locate, and items in your instrument most closely match my needs. I would really appreciate it if you would permit me to use these items.

Please let me know by response to this email if you will grant this permission.

Thank you for your kind consideration.

Respectfully,
Noel Wint
Doctoral candidate at Nova Southeastern University
3880 Long Branch Lane
Apopka, FL 32712
wnoel@nova.edu

Wed 11/18/2015 11:48 AM

Lin, Hui <HLIN14@depaul.edu>

RE: Permission to Use Items from Your Research

To Noel Wint Jr.

You replied to this message on 11/18/2015 5:11 PM.

Hello Noel,

You have my permission to use the survey items provided that you clearly reference the source of the survey items.

Good luck with your research!

Hui

Hui Lin, Ph.D.
Associate Professor
School of Accountancy & MIS
Driehaus College of Business
DePaul University
1 E Jackson Blvd. Chicago IL 60604
hlin14@depaul.edu

Wed 1/27/2016 11:33 AM

Noel Wint <wnoel@nova.edu>

Re: Permission to Use Items from Your Research

To Wei-Tsong Wang

Dr. Wei-Tsong Wang
wtwang@mail.ncku.edu.tw

November 17, 2015

Dear Dr. Wang,

My name is Noel Wint, and I am currently a doctoral student at Nova Southeastern University. During my literature review, I encountered research completed by you in 2014, entitled *Examining the adoption of kms in organizations from an integrated perspective of technology, individual, and organization.*

I would like your permission to modify and include several of the items in your research instrument in my research. An appropriate instrument was difficult to locate, and items in your instrument most closely match my needs. I would really appreciate it if you would permit me to use these items.

Please let me know by response to this email if you will grant this permission.

Thank you for your kind consideration.

Respectfully,
Noel Wint
Doctoral candidate at Nova Southeastern University
3880 Long Branch Lane
Apopka, FL 32712
wnoel@nova.edu

Wed 1/27/2016 8:16 AM

Wei-Tsong Wang <wtwang@mail.ncku.edu.tw>

RE: Permission to Use Items from Your Research

To Noel Wint Jr.

This message has been replied to or forwarded.

Dear Noel

Please feel free to use the survey items you found in my paper. Good luck.

Wei-Tsong Wang
Professor
Department of Industrial and Information
Management
National Cheng Kung University
1 University Road, Tainan 701, Taiwan
Tel: +886-6-2757575 ext. 53122
Fax: +886-6-2362162

Tue 1/26/2016 11:59 AM

Noel Wint <wnoel@nova.edu>

Permission to Use Items from Your Research

To tclin@mis.nsysu.edu.tw

Dr. Tung-Ching Lin

January 26, 2016

Dear Dr. Lin,

My name is Noel Wint, and I am currently a doctoral student at Nova Southeastern University. During my literature review, I encountered research completed by you in 2008, entitled *Understanding knowledge management system usage antecedents: An integration of social cognitive theory and task technology fit.*

I would like your permission to modify and include several of the items in your research instrument in my research. An appropriate instrument was difficult to locate, and items in your instrument most closely match my needs. I would really appreciate it if you would permit me to use these items.

Please let me know by response to this email if you will grant this permission. Items will be cited, properly recognizing you as the original author.

Thank you for your kind consideration.

Respectfully,
Noel Wint
Doctoral candidate at Nova Southeastern University
3880 Long Branch Lane
Apopka, FL 32712
[wnoel@nova.edu]wnoel@nova.edu

Wed 1/27/2016 2:06 AM

drtclin@gmail.com on behalf of 林東清 <tclin@mis.nsysu.edu.tw>

Re: Permission to Use Items from Your Research

To Noel Wint

This message has been replied to or forwarded.

OK, you have my permmision

2016-01-27 0:58 GMT+08:00 Noel Wint <wnoel@nova.edu>:

Appendix D

IRB Memorandum of Approval

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: **Noel Wint Jr., MBA**
CEC

From: **Ling Wang, Ph.D.,**
Center Representative, Institutional Review Board

Date: **September 16, 2015**

Re: **IRB #: 2015-84; Title, "An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt Category 2)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and Ling Wang, Ph.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: **Timothy J Ellis, Ph.D.**

3301 College Avenue · Fort Lauderdale, Florida 33314-7796
(954) 262-0000 · 800-672-7223, ext. 5369 · Email: *irb@nova.edu* · Web site: www.nova.edu/irb

Appendix E

Participation Letter

NOVA SOUTHEASTERN UNIVERSITY

College of Engineering and Computing

Research Study Entitled: An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage

Principal investigator
Noel Wint Jr., MBA, MA
3880 Long Branch Ln
Apopka, FL 32712
(321) 276-6573

Co-investigator
Dr. Timothy Ellis, Ph.D.
3301 College Avenue
Fort Lauderdale, FL 33314
(800) 986-2247

For questions/concerns about your research rights, contact:
Institutional Review Board
Nova Southeastern University
(954) 262-5369
(866) 499-0790
IRB@nsu.nova.edu

Site Information
Nova Southeastern University
College of Engineering and Computing
3301 College Avenue
Fort Lauderdale, FL 33314
(800) 986-2247
(954) 262-2000

Description of Study: Noel Wint Jr. is a doctoral student at Nova Southeastern University engaged in research for the purpose of satisfying a requirement for a Doctor of Education degree. The goal of this study is to develop a comprehensive understanding of socio-technical factors that impact KMS usage. Socio-technical systems (STS) consider people, process, and technology factors. Therefore, when properly configured they are usually more likely to be adopted by end users and provide value to the organization.

If you agree to participate, you will be asked to complete the attached questionnaire. This questionnaire will help the researcher identify the socio-technical factors that impact KMS usage. The questionnaire will take approximately twenty minutes to complete.

Risks/Benefits to the Participant: There may be minimal risk involved in participating in this study. There are no direct benefits to for agreeing to be in this study. Please understand that although you may not benefit directly from participation in this study, you have the opportunity to enhance knowledge necessary to maximize the use of knowledge management systems within the workplace. If you have any concerns about the risks/benefits of participating in this study, you can contact the investigators and/or the Institutional Review Board (IRB) at the numbers listed above.

Cost and Payments to the Participant: There is no cost for participation in this study. Participation is completely voluntary and no payment will be provided.

Confidentiality: Information obtained in this study is strictly confidential unless disclosure is required by law. All data will be secured in a locked filing cabinet. Your name will not be used in the reporting of information in publications or conference presentations.

Participant's Right to Withdraw from the Study: You have the right to refuse to participate in this study and the right to withdraw from the study at any time without penalty.

I have read this letter and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning this research have been answered. If I have any questions in the future about this study they will be answered by the investigator listed above or his/her staff.

I understand that the completion of this questionnaire implies my consent to participate in this study.

Appendix F

Delphi Team Invitation

Dear Colleague,

This serves as an invitation to participate on an expert panel known as a Delphi team. As part of my doctoral dissertation at Nova Southeastern University, I am forming this team to gain expert counsel prior to launching a survey to about 1,000 knowledge management system (KMS) users in organizations across the United States.

The goal of this study is to address two main research questions that will provide key insights toward understanding the factors that motivate KMS usage:

1) What socio-technical factors relating to people, processes, and technologies are relevant for consideration when investigating KMS usage?

2) What are the relationships among these factors and how do they influence KMS usage?

It is likely that the effort may consume about one hour per week for about four to five weeks. All of the work can be done from your home or office. It will not be necessary to meet in person, and Delphi team members will remain anonymous. Prior to the beginning the review, you will receive:

- A participation letter
- A description of the research
- An overview of the Delphi team process
- A copy of the instructions and survey draft that would be sent out to 1,000 KMS users
- A short questionnaire about the survey

For your information this research has been approved by the Institutional Review Board (IRB) at Nova Southeastern University. The IRB is responsible for ensuring that all academic research conducted at Nova Southeastern University is conducted in an ethical manner and respecting the rights of all participants.

Thank you in advance. If you have any questions please contact me at 321-276-6573 or wnoel@nova.edu.

Regards,

Noel Wint
Doctoral Candidate
Nova Southeastern University

Appendix G

Research Description for Delphi Team Participants

Research Problem

Although KM is accepted by both academics and practitioners as a source of competitive advantage, employees are not always willing to use a KMS. The KMS requires a significant amount of social interaction to facilitate effective knowledge sharing. Therefore, getting employees to effectively use the KMS to improve organizational performance is a challenge. Although IT and KMS have matured in the last several decades, the process of user acceptance remains difficult and complex. Systems supporting KM capabilities can add significant value, but merely having a KMS will not necessarily guarantee success in the organization's KM projects. Capturing worthwhile organizational knowledge in the KMS continues to be a problem, therefore new solutions that increase meaningful usage of the KMS must be explored.

Goal of this Research

The intention of this study is to develop a comprehensive understanding of socio-technical factors that impact KMS usage. Successful KMS usage is dependent upon both contributors of knowledge to the system, and seekers of knowledge retrieving reusable information. Because of the social nature of knowledge transfer, a KMS can be considered a socio-technical system. Socio-technical systems (STS) consider people, process, and technology factors. Therefore, when properly configured they are usually more likely to be adopted by end users and provide value to the organization.

Method

A survey will be sent to approximately 1,000 KMS users. The answers to the survey questions will permit the author to conduct statistical procedures to relate socio-technical factors to KMS usage. Your help is required to ensure that a reliable and valid survey is sent to the survey participants. To ensure reliability, respondents should generally answer the same questions in the same way over time, and the questions within the document should be consistent. To ensure validity, the survey should measure what items intended by the researcher.

Appendix H

Delphi Team Process Overview

The Delphi process is divided into rounds. Prior to each round you will receive certain information. After evaluating the survey, you will return a completed survey and the questionnaire about the survey to the researcher. The goal will be to achieve consensus that the survey is ready for distribution to the participants. Consensus will be achieved when the average (mean) for each question is four or more on a five-point Likert scale and no question's score is two or less. Until consensus is achieved, additional rounds will be required. Once consensus is achieved the process is completed.

Round One - Prior to Round one each Delphi team participant will receive the following:

- Participation letter
- Description of the research
- Overview of the Delphi process
- Draft survey with instructions
- Delphi team questionnaire
- A planetary reference which will serve as a unique identifier to ensure anonymity. For example, one team member may be identified as Mars and another as Venus.

Each Delphi team member will complete the survey and respond to the questionnaire about the survey and returns it to the researcher within one week. The researcher reviews all of the comments and prepares a matrix that includes all of the comments by question. The researcher will then act on the comments and revises the survey.

Round Two - Prior to Round two each participant receives:

- Matrix that shows by unique ID all of the comments each participant made. This matrix will show each participant that their comments were noted and action taken.
- A revised draft survey
- A new questionnaire about the survey. This time the survey will include questions that ask the team to rate the survey. Once again the participants take the survey and evaluate the survey. All comments and ideas are welcome. Within one week the Delphi team participant returns the survey and the questionnaire, and once again the researcher reviews all comments and completes a new comment matrix and revises the survey.

Rounds Three to Five (as needed)
Round three proceeds in the same way that round two did. The team takes the survey and answers the questionnaire. If a consensus is achieved before round four or five, the process will end. In any event, the process will end after five rounds in order to respect everyone's time. At this point the process is completed.

Appendix I

First Draft of Survey

Instructions: There are 52 questions in this survey draft. Some of these questions will likely be omitted from the final survey. The first five questions are used to collect demographic information. The next 47 questions require you to indicate your level of agreement with each statement. You may select strongly disagree (SD), disagree (D), neither agree nor disagree (N), agree (A), or strongly agree (SA). Please select the statement that best represents your choice. For example, if you "agree" with the statement "I generally use the KMS if I find the system easy to use" then click on the radio button below "agree." This questionnaire should not take any longer than 20 minutes to complete.

Delphi Team Round 1 Survey

<u>Section I – Demographics</u>

1. 1. What is your gender?

_ Female
_ Male

2. 2. What is your age?

_ Less than 21
_ 21-29
_ 30-34
_ 35-39
_ 40+

3. 3. How many years of experience do you have in your current position?

_ 1-5 years
_ 6-10 years
_ 11-15 years
_ 15+ years

4. 4. What is your level of education?

_ High School
_ College (2 years)
_ University (4 years)
_ Graduate School (4+ Years)

5. 5. What types of knowledge management systems (KMS) do you utilize for decision support? Please select all that apply.

_ Communication-driven - supports groups with a shared task.

_ Data-driven – supports storage and retrieval of internal and external company data.
_ Document-driven – supports management, retrieval, and manipulation of unstructured data.
_ Knowledge-driven - supports specialized problem-solving expertise using business rules.
_ Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.

<u>Section II – Socio-technical and KMS Usage Factors</u>

Place an “x” in the box that most appropriately reflects your level of agreement.

SD=Strongly Disagree, D=Disagree, N=Neither agree nor Disagree, A=Agree, SA=Strongly agree

Except for KMS usage factors, each item should begin with the statement, “I generally use the KMS because…”

People-Oriented Factors

6. "I generally use the knowledge management system (KMS) because ..."

Answer Options	**SD**	**D**	**N**	**A**	**SA**
6 … I can manage if there is no one around to tell me what to do as I go.					
7 … someone showed me or provided training on how to do it first.					
8 … I have a built-in help facility for assistance.					
9 … I can call someone for help if I get stuck.					
10 … I have used similar systems before.					
11 … people who influence my behavior think that I should use the system.					
12 … people who are important to me think that I should use the system.					
13 … senior management has been helpful in the use of the system.					
14 … the organization has generally supported the use of the system.					
15 … I find the system easy to use.					
16 … learning to operate the system is easy for me.					
17 … using the system increases my productivity.					
18 … using the system allows me to accomplish tasks more quickly.					

Process-Oriented Factors					
7. "I generally use the knowledge management system (KMS) because ..."					
Answer Options	**SD**	**D**	**N**	**A**	**SA**
19 … I have support from leadership.					
20 … leaders act as role models by using the system.					
21 … leaders encourage knowledge creation, sharing, and use.					
22 … leaders are aware that KMS use is important to business success.					
23 … my leader will praise or reward me for using the system.					
24 … there is support within the team/organization for using the system.					
25 … others in the team/organization frequently use the system.					
26 … the team/organization encourages knowledge creation, sharing, and use.					
27 … the team/organization believe KMS use is important to business success.					
28 … the team/organization will respect me for using the system.					
29 … there are specific rules that guide use of the system.					
30 … there are specific policies that guide use of the system.					
31 … there are specific guidelines that regulate use of the system.					
32 … contributions to the system are moderated.					
33 … changes to system functions are controlled.					

Technology-Oriented Factors					
8. "I generally use the knowledge management system (KMS) because ..."					
Answer Options	**SD**	**D**	**N**	**A**	**SA**
34 … the system is accessible for storing project-related knowledge.					
35 … the system allows for the searching of project-related knowledge.					
36 … the system allows for the addition of useful project-related knowledge.					
37 … the system provides fast response.					
38 … the system is dependable.					
39 … the information provided by the KMS is logical.					

	SD	D	N	A	SA
40 … the information provided by the KMS is accurate.					
41 … the information provided by the KMS is sufficient.					
42 … the information provided by the KMS is available at a time suitable for its use.					
43 … the information provided by the KMS meets my needs.					
44 … the system will have an effect on the performance of my job.					
45 … the system can decrease time needed for my important job responsibilities.					
46 … the system can increase the quality of output on my job.					
47 … the system can increase the effectiveness of performing job tasks.					
48 … the system can increase the quantity of output for the same amount of effort.					

KMS Usage Factors

9. "I generally use the knowledge management system (KMS) because ..."

Answer Options	**SD**	**D**	**N**	**A**	**SA**
49. I frequently use KMS(s) to contribute knowledge in my work.					
50. I frequently use KMS(s) to search knowledge in my work.					
51. I often use KMS(s) to contribute knowledge in my work.					
52. I often use KMS(s) to search knowledge in my work.					

The round one Delphi team questionnaire (Appendix I) will also be included for participants to complete during the pilot study.

Appendix J

Delphi Team Qualifications

	Mercury	Venus	Earth
Background/Experience	Project Manager, Business Architect	Sr. Business Systems Analyst	Vice President of Client Services (Acct Mgt)
Education	BS Computer Science	MS-Mgmt, MS-Applied Comm, DDiv-Ethics	BA in Applied Communication
Knowledge of content	Planned, implemented, evaluated, tested, and performed business analysis for decision support systems.	Familiar with KMS and survey development. Performed business analysis for decision support systems.	Business KMS user and decision-maker. Expert in planning how KMS will be used.
Willingness to participate	Informed Consent	Informed Consent	Informed Consent
Effective communication	Excellent	Excellent	Excellent

	Mars	Jupiter	Saturn
Background/Experience	Enterprise BI Architect	Sr. Project Manager	Financial Analyst
Education	BS Computer Science	BS Computer Science, MBA in International Operations	B.S. in BA, M.S. in Finance
Knowledge of content	Designed, planned, implemented, evaluated, and tested decision support systems.	Designed, planned, implemented, and purchased decision support systems.	Business KMS user and decision-maker. Expert in designing KMS logic.
Willingness to participate	Informed Consent	Informed Consent	Informed Consent
Effective communication	Excellent	Excellent	Excellent

	Uranus	Neptune
Background/Experience	Retired Military Leader	Data & Reporting Manager
Education	Doctor of Management	BS in Biology, MBA with concentration in MIS
Knowledge of content	Familiar with KMS and survey development	Designed and planned decision support systems. Focused on reporting.
Willingness to participate	Informed Consent	Informed Consent
Effective communication	Excellent	Excellent

Appendix K

Delphi Team Round One Questionnaire

Each team member completed this form and results were summarized here.

Delphi Team Round 1 Questionnaire

1. 1. How long did it take you to complete this survey?		
Answer Options	**Response Percent**	**Response Count**
Less than 10 minutes	16.7%	1
11-14 minutes	33.3%	2
15-18 minutes	16.7%	1
19-20 minutes	33.3%	2
More than 20 minutes	0.0%	0
2. 2. If you took more than 20 minutes to complete the survey, please list the factors that you believe prevented you from being able to complete the survey in less time.		
1 Oct 23, 2015 5:16 PM	Had to differentiate between my experience with KMSs and the current use in my company.	
3. 3. Were the instructions clear?		
Yes	100.0%	6
No	0.0%	0
4. 4. Was Section I – Demographics clear and understandable?		
Yes	100.0%	6
No	0.0%	0
5. 5. Was Section II – Socio-technical and KMS Usage Factors clear and understandable?		
Yes	83.3%	5
No	16.7%	1
If “No,” please provide comments		1
1 Oct 21, 2015 11:49 AM	Definitions or qualifications are implied, not stated. So subjectivity distorts the survey.	
6. 6. Please provide any overall comments or recommendations for improving the survey.		
1 Oct 23, 2015 5:16 PM	Very well developed; consider separating one's experience from one's current company's use of KMSs.	
2 Oct 19, 2015 4:09 PM	Overall the survey was very easy to follow. To improve the survey, I would add something to access the level of expertise of the survey taker. If they are the "go-to" person in their organization for answers, their responses may "skew" the results.	

Appendix L

Delphi Team Round Two and Three Questionnaire

Round Two

This matrix was completed by each Delphi team participant during round two. Each team member completed the same form and the results were compiled and summarized here. The following scale applies:

1=Unacceptable, 2=Poor, 3=Neutral/Unsure, 4=Good, 5=Excellent

Delphi Team Round 2 Survey/Questionnaire

1. 1. What is your gender?			
Comments or Recommended Changes			0
2. 2. What is your age?			
Comments or Recommended Changes			0
3. 3. How many years of experience do you have in your current position?			
Comments or Recommended Changes			0
4. 4. What is your level of education?			
Comments or Recommended Changes			0
5. 5. Which of the following best describes the principal industry of your organization?			
Comments or Recommended Changes			0
6. 6. What is your job role?			
Comments or Recommended Changes			3
Number	**Response Date**	**Comments or Recommended Changes**	**Categories**
1	**Nov 11, 2015 11:17 AM**	**Mars:** No choice for Director which is a fairly common title.	
2	**Nov 10, 2015 3:09 AM**	**Saturn**: analyst	
3	**Nov 5, 2015 11:16 AM**	**Venus**: Consultant	
7. 7. Roughly how many full-time employees currently work for your organization?			
Comments or Recommended Changes			0
8. 8. What types of knowledge management systems (KMS) do you utilize for decision support? Please select all that apply.			
Comments or Recommended Changes			0

9. "I generally use the knowledge management system (KMS) because ..."

KMS Usage Factors	**1**	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
9… someone showed me or provided training on how to do it first.	0	0	0	4	2	4.33	6
10 … people who are important to me think that I should use the system.	0	1	2	2	1	3.50	6
11… people who influence my behavior think that I should use the system.	0	0	0	4	2	4.33	6
12 … I have support from leadership.	0	0	0	2	4	4.67	6
13 … there is support within the team/organization for using the system.	0	0	0	2	4	4.67	6
14 … there are specific guidelines that regulate use of the system.	0	0	2	2	2	4.00	6
15 … the system is dependable.	0	1	2	2	1	3.50	6
Comments or Recommended Changes							1
Mercury: What is "dependable"?							
16… the information provided by the KMS meets my needs.	0	0	0	4	2	4.33	6
Comments or Recommended Changes							1
Venus: "needs" --a bit ambiguous.							
17… the system can increase the effectiveness of performing job tasks.	0	0	0	3	3	4.50	6

10. Please indicate the response which best reflects your perspective on the quality of each question. Remember in this round you are rating the quality of the survey questions, not answering them.

Socio-Technical Factors	**1**	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
18. I can confidently explain how the system improves my performance.	0	0	1	4	1	4.00	6
19. Co-workers that use the system appear to perform better.	0	1	2	1	2	3.67	6
Comments or Recommended Changes							1
Venus: subjective, but good question.							
20. My organization sees the value of clearly defined processes.	0	0	0	1	5	4.83	6
21. I am comfortable with the system since I have used similar systems before.	0	0	3	1	2	3.83	6
22. When using the system I can call someone for help if I get stuck.	0	1	2	1	2	3.67	6
23. Learning to operate the system is easy for me.	0	0	2	2	2	4.00	6

24. Leaders act as role models by using the system.	0	0	1	4	1	4.00	6
Comments or Recommended Changes							1
Venus: "Leaders" could be construed as Managers.							
25. The organization has generally supported the use of the system.	0	0	0	4	2	4.33	6
26. There are specific guidelines that regulate use of the system.	0	0	1	1	4	4.50	6
27. Senior management has been helpful in the use of the system.	0	0	1	2	3	4.33	6
28. The team/organization encourages knowledge creation, sharing, and use.	0	0	0	2	4	4.67	6
29. It is important for contributions to the system are moderated.	0	1	1	3	1	3.67	6
Comments or Recommended Changes							2
Mars: Structured poorly. Consider re-wording.							
Venus: "to be moderated"							
30. The quality of system determines the success of decisions made.	0	0	1	3	2	4.17	6
Comments or Recommended Changes							1
Venus: This is a perception question for sure. Decision "success" is ambiguous.							
31. Information provided by the system is helpful.	0	0	0	1	5	4.83	6
Comments or Recommended Changes							1
Venus: "helpful" is a good word for perception.							
32. Sharing knowledge using the system improves decision-making.	0	0	0	3	3	4.50	6
33. The system can increase the quantity of output for the same amount of effort.	0	0	2	2	2	4.00	6
Comments or Recommended Changes							2
Mars: This is a bit unclear to me. Consider making more descriptive.							
Venus: Says "system" not org or people who are needed.							
34. The information provided by the system improves workflows.	0	0	1	2	3	4.33	6
Comments or Recommended Changes							1
Venus: Says system does it (not people). Interesting.							
35. Using the system improves my job performance.	0	0	0	1	5	4.83	6

Please provide any additional comments or recommendations for improving the survey.

	Response Date	Response Text	Categories
1	**Nov 11, 2015 11:27 AM**	**Mars:** Overall, the survey is robust. There are a few questions that could be worded differently.	

2	**Nov 10, 2015 3:43 AM**	**Saturn:** The questions are well written and easy to follow. The survey is also easy to follow and well balanced across different areas.
3	**Nov 5, 2015 11:32 AM**	These are great questions for evaluating a User's perception of a KMS.

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage.

Round Three

This matrix was completed by each Delphi team participant during round three. Each team member completed the same form and the results were compiled and summarized here. Demographic information was completed in Round two and, therefore, it was not included in round three. Furthermore, panel members were only required to review any items that were revised from Round two. The following scale applies:

1=Unacceptable, 2=Poor, 3=Neutral/Unsure, 4=Good, 5=Excellent

Delphi Team Round 3 Survey/Questionnaire

9. "I generally use the knowledge management system (KMS) because ..."

KMS Usage Factors	**1**	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
10 … people who I consider successful in the organization advocate using the system.	0	0	0	2	5	4.71	7
14 … there are specific guidelines that ensure consistent output of data from the system.	0	0	0	4	3	4.43	7
Comments or Recommended Changes							1
Neptune: Not sure consistent is the correct wording. Maybe use reliable.							
15 … the system is generally available for use and provides timely responses.	0	0	0	4	3	4.43	7

10. Please indicate the response which best reflects your perspective on the quality of each question. Remember in this round you are rating the quality of the survey questions, not answering them.

Socio-Technical Factors	**1**	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
18. I can confidently explain how the system improved a decision I made.	0	0	0	2	5	4.71	7

19. Co-workers that use the system have demonstrated using it to make more informed decisions.	0	0	0	2	5	4.71	7
Comments or Recommended Changes							1
Mercury: subjective.							
21. I am comfortable using the system because I have used similar systems before.	0	0	0	3	4	4.57	7
22. When using the system, technical support is available if needed.	0	0	0	6	1	4.14	7
23. Learning to navigate the system is easy for me.	0	0	0	6	1	4.14	7
24. Leaders in my organization act as role models by using the system.	0	0	0	3	4	4.57	7
26. Specific guidelines that outline knowledge contribution/retrieval using the system are important.	0	0	0	2	5	4.71	7
27. Senior management advocates use of the system.	0	0	0	4	3	4.43	7
29. It is important for contributions to the system to be reviewed for accuracy.	0	0	0	4	3	4.43	7
30. The quality of system's output can determine the quality of decisions made.	0	0	0	4	3	4.43	7
Comments or Recommended Changes							1
Neptune: Not sure consistent is the correct wording. Maybe use reliable.							
33. The system can decrease the amount of time required to make some decisions.	0	0	0	2	5	4.71	7
34. The system provides a good mechanism for ad-hoc analysis.	0	0	0	3	4	4.57	7

Please provide any additional comments or recommendations for improving the survey.

	Response Date	Response Text	Categories
1	**Nov 16, 2015 12:56 AM**	**Jupiter:** Questions are much clearer.	
2	**Nov 15, 2015 2:52 PM**	**Saturn:** Good Work.	

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage.

Appendix M

Delphi Team Return Comment Matrices by Round

Round One

The following summary indicates feedback collected from the first round of the survey review. This feedback was used to improve the second round survey:

1. How long did it take you to complete this survey?

   Less than 10 Minutes - 1 (16.67%)
   11-14 Minutes - 2 (33.33%)
   15-18 Minutes - 1 (16.67%)
   19-20 Minutes - 2 (33.33%)
   More than 20 Minutes - 0 (0%)

2. If you took more than 20 minutes to complete the survey, please list the factors that you believe prevented you from being able to complete the survey in less time.

   Venus: Had to differentiate between my experience with KMSs and the current use in my company.
   Researcher: Added the following statement to instructions to provide clarity:

   Please use your current role as a point of reference. If you are not currently employed, use the most recent role in which you used a KMS for decision-support.

3. Were the instructions clear?

   Yes - 6 (100%)
   No - 0 (0%)

4. Was Section I – Demographics clear and understandable?

   Yes - 6 (100%)
   No - 0 (0%)

5. Was Section II – Socio-technical and KMS Usage Factors clear and understandable?

   Yes - 5 (83.33%)
   No - 1 (16.67%)

Mercury: Definitions or qualifications are implied, not stated. So subjectivity distorts the survey.
Researcher: Added list of key terms to instructions to enhance clarity. Added additional context throughout survey to remove ambiguity.

6. Please provide any overall comments or recommendations for improving the survey.

   Venus: Very well developed; consider separating one's experience from one's current company's use of KMSs.
   Researcher: Defined use of current role (where applicable) to instructions.

   Uranus: Overall the survey was very easy to follow. To improve the survey, I would add something to access the level of expertise of the survey taker. If they are the "go-to" person in their organization for answers, their responses may "skew" the results.
   Researcher: Added demographic question to characterize respondent's role in the organization.

Round Two

The following summary indicates feedback collected from the second round of the survey review. (This feedback was used to improve the third round survey). No additional changes were required for instructions or demographics:

KMS usage factors based on 6 complete responses (Highest possible score is 5):

Delphi Team Round 2 Return Comment Matrix

KMS Usage Factors	Rating Avg	Comments
9… someone showed me or provided training on how to do it first.	4.33	
10 … people who are important to me think that I should use the system.	3.50	
11… people who influence my behavior think that I should use the system.	4.33	
12 … I have support from leadership.	4.67	
13 … there is support within the team/organization for using the system.	4.67	
14 … there are specific guidelines that regulate use of the system.	4.00	
15 … the system is dependable.	3.50	**Mercury**: What is "dependable"?

16… the information provided by the KMS meets my needs.	4.33	**Venus**: "needs" --a bit ambiguous.
17… the system can increase the effectiveness of performing job tasks.	4.50	

Socio-Technical Factors	**Rating Avg**	**Comments**
18. I can confidently explain how the system improves my performance.	4.00	
19. Co-workers that use the system appear to perform better.	3.67	**Venus**: subjective, but good question.
20. My organization sees the value of clearly defined processes.	4.83	
21. I am comfortable with the system since I have used similar systems before.	3.83	
22. When using the system I can call someone for help if I get stuck.	3.67	
23. Learning to operate the system is easy for me.	4.00	
24. Leaders act as role models by using the system.	4.00	**Venus**: "Leaders" could be construed as Managers.
25. The organization has generally supported the use of the system.	4.33	
26. There are specific guidelines that regulate use of the system.	4.50	
27. Senior management has been helpful in the use of the system.	4.33	
28. The team/organization encourages knowledge creation, sharing, and use.	4.67	
29. It is important for contributions to the system are moderated.	3.67	**Mars:** Structured poorly. Consider re-wording. **Venus**: "to be moderated"
30. The quality of system determines the success of decisions made.	4.17	**Venus**: This is a perception question for sure. Decision "success" is ambiguous.
31. Information provided by the system is helpful.	4.83	**Venus**: "helpful" is a good word for perception.
32. Sharing knowledge using the system improves decision-making.	4.50	
33. The system can increase the quantity of output for the same amount of effort.	4.00	**Mars:** This is a bit unclear to me.

		Consider making more descriptive. **Venus**: Says "system" not org or people who are needed.
34. The information provided by the system improves workflows.	4.33	**Venus:** Says system does it (not people). Interesting.
35. Using the system improves my job performance.	4.83	

Please provide any additional comments or recommendations for improving the survey.

	Response Date	Response Text	Categories
1	**Nov 11, 2015 11:27 AM**	**Mars:** Overall, the survey is robust. There are a few questions that could be worded differently.	
2	**Nov 10, 2015 3:43 AM**	**Saturn:** The questions are well written and easy to follow. The survey is also easy to follow and well balanced across different areas.	
3	**Nov 5, 2015 11:32 AM**	These are great questions for evaluating a User's perception of a KMS.	

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage.

Round Three

The following summary indicates feedback collected from the second round of the survey review. (This feedback was used to improve the current round survey). No additional changes were required for instructions, demographics, or study factors:

KMS usage factors based on 7 complete responses (Highest possible score is 5):

Delphi Team Round 3 Return Comment Matrix

KMS Usage Factors	Rating Avg	Comments
10 … people who I consider successful in the organization advocate using the system.	4.71	
14 … there are specific guidelines that ensure consistent output of data from the system.	4.43	**Neptune**: Not sure consistent is the correct wording. Maybe use reliable.
15 … the system is generally available for use and provides timely responses.	4.43	

Socio-Technical Factors	**Rating Avg**	**Comments**
18. I can confidently explain how the system improved a decision I made.	4.71	
19. Co-workers that use the system have demonstrated using it to make more informed decisions.	4.71	**Mercury**: subjective.
21. I am comfortable using the system because I have used similar systems before.	4.57	
22. When using the system, technical support is available if needed.	4.14	
23. Learning to navigate the system is easy for me.	4.14	
24. Leaders in my organization act as role models by using the system.	4.57	
26. Specific guidelines that outline knowledge contribution/retrieval using the system are important.	4.71	
27. Senior management advocates use of the system.	4.43	
29. It is important for contributions to the system to be reviewed for accuracy.	4.43	
30. The quality of system's output can determine the quality of decisions made.	4.43	**Neptune**: Not sure consistent is the correct wording. Maybe use reliable.
33. The system can decrease the amount of time required to make some decisions.	4.71	
34. The system provides a good mechanism for ad-hoc analysis.	4.57	

Please provide any additional comments or recommendations for improving the survey.

	Response Date	**Response Text**	**Categories**
1	**Nov 16, 2015 12:56 AM**	**Jupiter:** Questions are much clearer.	
2	**Nov 15, 2015 2:52 PM**	**Saturn:** Good Work.	

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage.

Appendix N

Pre-Survey Notice

Dear Colleague,

In approximately two weeks you will receive an e-mail, with an Internet URL that will allow you to participate in an assessment to develop a comprehensive understanding of socio-technical factors that impact knowledge management system (KMS) usage. As a professional that uses KMS, you are uniquely positioned to assist in this research. Your input is very important and your participation will be anonymous. The survey will be distributed via SurveyMonkey®.

Please do not hesitate to contact me with any questions or concerns.

Sincerely,

Noel Wint
Doctoral Candidate, Nova Southeastern University
(321) 276-6573
wnoel@nova.edu

Research supervised by:
Dr. Timothy Ellis
Nova Southeastern University
Fort Lauderdale, FL 33315
(800) 986-2247

Appendix O

Pilot Study Invitation

Dear Colleague,

Your assistance is need to help validate a survey that forms part of my dissertation research towards developing a comprehensive understanding of socio-technical factors that impact knowledge management system (KMS) usage. You were selected because you are a user of a decision support system (DSS). A DSS is a computer-based KMS that supports business or organizational decision-making. This invitation highlights the very important research I, a college student, am conducting at Nova Southeastern University.

There are 35 questions in this survey draft. After completing the survey, please use the companion questionnaire to provide feedback about the survey.

You will find the survey, along with a short questionnaire at the following link:

https://www.surveymonkey.com/r/wint-pilot-study

Should you have any questions you may contact me at wnoel@nova.edu or by phone at 321-276-6573. Thank you in advance for helping with this very important study.

Noel Wint

Doctoral Candidate
Nova Southeastern University

Appendix P

Survey for Pilot Study

An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage

Key Terms

Decision support system (DSS) - A computer-based KMS that supports business or organizational decision-making.

Knowledge Management System (KMS) - A technology used to support and enhance organizational knowledge management for the purpose of gaining a competitive advantage.

Socio-technical System (STS) - An approach to complex organizational work and system design that recognizes the interaction between people, processes, and technologies.

Instructions

There are 35 questions in this survey draft. The first eight questions are used to collect demographic information. The next 27 questions require you to indicate your level of agreement with each statement. You may select strongly disagree (SD), disagree (D), neither agree nor disagree (N), agree (A), or strongly agree (SA). Please use your current role as a point of reference. If you are not currently employed, use the most recent role in which you used a KMS for decision-support.

1. What is your gender?	
Female	
Male	

2. What is your age?	
Less than 21	
21-29	
30-34	
35-39	
40+	

3. How many years of experience do you have in your current position?	
1-5 years	

6-10 years	
11-15 years	
15+ years	

4. What is your level of education?	
High School	
College (2 years)	
University (4 years)	
Graduate School (4+ Years)	

5. Which of the following best describes the principal industry of your organization?	
Advertising & Marketing	
Agriculture	
Airlines & Aerospace (including Defense)	
Automotive	
Business Support & Logistics	
Construction, Machinery, and Homes	
Education	
Entertainment & Leisure	
Finance & Financial Services	
Food & Beverages	
Government	
Healthcare & Pharmaceuticals	
Insurance	
Manufacturing	
Nonprofit	
Retail & Consumer Durables	
Real Estate	
Telecommunications, Technology, Internet & Electronics	
Transportation & Delivery	
Utilities, Energy, and Extraction	
I am currently not employed	
Other	

6. What is your job role?	
Individual Contributor	
Team Lead	
Manager	
Senior Manager	
Regional Manager	
Vice President	
Management / C-Level	

Partner	
Owner	
Other	

7. Roughly how many full-time employees currently work for your organization?	
50 or Less	
51-200	
201-500	
501-1,000	
1,001-4,999	
5,000+	
I am currently not employed	

8. What types of knowledge management systems (KMS) do you utilize for decision support? Please select all that apply.	
Communication-driven - supports groups with a shared task.	
Data-driven – supports storage and retrieval of internal and external company data.	
Document-driven – supports management, retrieval, and manipulation of unstructured data.	
Knowledge-driven - supports specialized problem-solving expertise using business rules.	
Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.	

"I generally use the knowledge management system (KMS) because ..."					
Answer Options	**SD**	**D**	**N**	**A**	**SA**
9… someone showed me or provided training on how to do it first.					
10 … people who I consider successful in the organization advocate using the system.					
11… people who influence my behavior think that I should use the system.					
12 … I have support from leadership.					
13 … there is support within the team/organization for using the system.					
14 … there are specific guidelines that ensure consistent output of data from the system.					
15 … the system is generally available for use and provides timely responses.					
16… the information provided by the KMS meets my needs.					

17… the system can increase the effectiveness of performing job tasks.					

Please indicate the response which best reflects your perspective on each question.					
Answer Options	**SD**	**D**	**N**	**A**	**SA**
18. I can confidently explain how the system improved a decision I made.					
19. Co-workers that use the system have demonstrated using it to make more informed decisions.					
20. My organization sees the value of clearly defined processes.					
21. I am comfortable using the system because I have used similar systems before.					
22. When using the system, technical support is available if needed.					
23. Learning to navigate the system is easy for me.					
24. Leaders in my organization act as role models by using the system.					
25. The organization has generally supported the use of the system.					
26. Specific guidelines that outline knowledge contribution/retrieval using the system are important.					
27. Senior management advocates use of the system.					
28. The team/organization encourages knowledge creation, sharing, and use.					
29. It is important for contributions to the system to be reviewed for accuracy.					
30. The quality of system's output can determine the quality of decisions made.					
31. Information provided by the system is helpful.					
32. Sharing knowledge using the system improves decision-making.					
33. The system can decrease the amount of time required to make some decisions.					
34. The system provides a good mechanism for ad-hoc analysis.					
35. Using the system improves my job performance.					

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage!

Appendix Q

Pilot Study Questionnaire

This questionnaire will be completed (as optional) by each participant in the pilot study.

Pilot Study Questionnaire

1. 1. How long did it take you to complete this survey?	
Less than 10 minutes	
11-14 minutes	
15-18 minutes	
19-20 minutes	
More than 20 minutes	

2. If you took more than 20 minutes to complete the survey, please list the factors that you believe prevented you from being able to complete the survey in less time.

3. Were the instructions clear?	
Yes	
No	

4. Was Section I – Demographics clear and understandable?	
Yes	
No	

5. Was Section II – Socio-technical and KMS Usage Factors clear and understandable?	
Yes	
No	

6. Please provide any overall comments or recommendations for improving the survey.

Appendix R

Reminder Notice

Dear Colleague,

You have recently received a survey seeking your input in develop a comprehensive understanding of socio-technical factors that impact KMS usage. The purpose of this reminder notice is to re-emphasize the importance of this study. It is also an opportunity for you to express your needs and concerns. Your input could have a direct impact on understanding socio-technical factors influencing KMS usage.

If you have already completed the survey, thank you for your response. If you have not yet completed your survey, your immediate response will be greatly appreciated.

Thank you for your assistance in this very important project.

Sincerely,
Noel Wint
Doctoral Candidate, Nova Southeastern University
(321) 276-6573
wnoel@nova.edu

Appendix S

Pilot Study Questionnaire Response Summary

This questionnaire was completed (as optional) by each participant in the pilot study.

Pilot Study Questionnaire

1. 1. How long did it take you to complete this survey?	
Less than 10 minutes	**1** (25%)
11-14 minutes	**3** (75%)
15-18 minutes	**0** (0%)
19-20 minutes	**0** (0%)
More than 20 minutes	**0** (0%)

2. If you took more than 20 minutes to complete the survey, please list the factors that you believe prevented you from being able to complete the survey in less time.
0 (100%)

3. Were the instructions clear?	
Yes	**4** (100%)
No	**0** (0%)

4. Was Section I – Demographics clear and understandable?	
Yes	**4** (100%)
No	**0** (0%)

5. Was Section II – Socio-technical and KMS Usage Factors clear and understandable?	
Yes	**4** (100%)
No	**0** (0%)

6. Please provide any overall comments or recommendations for improving the survey.
Response 1 (1/22/2016 6:26 AM) - How will KMS usage be measured? **(Two additional questions were added to the final survey to address this concern)**. **Response 2** – (12/9/2015 9:26 PM) - Questions on KMS usage could have varying answers based on the role and employer. Struggled with how to answer some items **Response 3** (11/30/2015 1:50 PM) - Noticed some replication of questions (still the same answers given.)

Appendix T

Final Survey

An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage

Pre-Qualification

Are you a knowledge worker that uses any of the following decision support systems at work?	
• Communication-driven - supports groups with a shared task. • Data-driven – supports storage and retrieval of internal and external company data. • Document-driven – supports management, retrieval, and manipulation of unstructured data. • Knowledge-driven - supports specialized problem-solving expertise using business rules. • Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.	
Yes	
No	

Key Terms

Decision support system (DSS) - A computer-based KMS that supports business or organizational decision-making.

Knowledge Management System (KMS) - A technology used to support and enhance organizational knowledge management for the purpose of gaining a competitive advantage.

Socio-technical System (STS) - An approach to complex organizational work and system design that recognizes the interaction between people, processes, and technologies.

Instructions

There are 36 questions in this survey draft. The first 7 questions are used to collect demographic information. The next 29 questions require you to indicate your level of agreement with each statement. You may select strongly disagree (SD), disagree (D), neither agree nor disagree (N), agree (A), or strongly agree (SA). Please use your current role as a point of reference. If you are not currently employed, use the most recent role in which you used a KMS for decision-support.

1. What is your gender?	
Female	
Male	

2. What is your age?	
Less than 21	
21-29	
30-34	
35-39	
40+	

3. How many years of experience do you have in your current position?	
1-5 years	
6-10 years	
11-15 years	
15+ years	

4. What is your level of education?	
High School	
College (2 years)	
University (4 years)	
Graduate School (4+ Years)	

5. Which of the following best describes the principal industry of your organization?	
Advertising & Marketing	
Agriculture	
Airlines & Aerospace (including Defense)	
Automotive	
Business Support & Logistics	
Construction, Machinery, and Homes	
Education	
Entertainment & Leisure	
Finance & Financial Services	
Food & Beverages	
Government	
Healthcare & Pharmaceuticals	
Insurance	
Manufacturing	
Nonprofit	

Retail & Consumer Durables	
Real Estate	
Telecommunications, Technology, Internet & Electronics	
Transportation & Delivery	
Utilities, Energy, and Extraction	
I am currently not employed	
Other	

6. What is your job role?	
Individual Contributor	
Team Lead	
Manager	
Senior Manager	
Regional Manager	
Vice President	
Management / C-Level	
Partner	
Owner	
Other	

7. What types of knowledge management systems (KMS) do you utilize for decision support? Please select all that apply.	
Communication-driven - supports groups with a shared task.	
Data-driven – supports storage and retrieval of internal and external company data.	
Document-driven – supports management, retrieval, and manipulation of unstructured data.	
Knowledge-driven - supports specialized problem-solving expertise using business rules.	
Model-driven - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.	

"I generally use the knowledge management system (KMS) because ..."

Answer Options	**SD**	**D**	**N**	**A**	**SA**
8… someone showed me or provided training on how to do it first.					
9 … people who I consider successful in the organization advocate using the system.					
10… people who influence my behavior think that I should use the system.					
11 … I have support from leadership.					

12 … there is support within the team/organization for using the system.					
13 … there are specific guidelines that ensure consistent output of data from the system.					
14 … the system is generally available for use and provides timely responses.					
15… the information provided by the KMS meets my needs.					
16… the system can increase the effectiveness of performing job tasks.					

Please indicate the response which best reflects your perspective on each question.					
Answer Options	**SD**	**D**	**N**	**A**	**SA**
17. I can confidently explain how the system improved a decision I made.					
18. Co-workers that use the system have demonstrated using it to make more informed decisions.					
19. My organization sees the value of clearly defined processes.					
20. I am comfortable using the system because I have used similar systems before.					
21. When using the system, technical support is available if needed.					
22. Learning to navigate the system is easy for me.					
23. Leaders in my organization act as role models by using the system.					
24. The organization has generally supported the use of the system.					
25. Specific guidelines that outline knowledge contribution/retrieval using the system are important.					
26. Senior management advocates use of the system.					
27. The team/organization encourages knowledge creation, sharing, and use.					
28. It is important for contributions to the system to be reviewed for accuracy.					
29. The quality of system's output can determine the quality of decisions made.					
30. Information provided by the system is helpful.					
31. Sharing knowledge using the system improves decision-making.					
32. The system can decrease the amount of time required to make some decisions.					
33. The system provides a good mechanism for ad-hoc analysis.					

34. Using the system improves my job performance.					
35. I frequently use the KMS to seek knowledge.					
36. I frequently use the KMS to contribute knowledge.					

Thank you for your participation in An Investigation of Socio-technical Components of Knowledge Management System (KMS) Usage!

Appendix U

Demographic Feedback Summary

1. What is your gender? (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) Female	54.6%	53
(2) Male	45.4%	44

2. What is your age? (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) Less than 21	6.2%	6
(2) 21-29	21.6%	21
(3) 30-34	11.3%	11
(4) 35-39	13.4%	13
(5) 40+	47.4%	46

3. How many years of experience do you have in your current position? (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) 1-5 years	39.2%	38
(2) 6-10 years	14.4%	14
(3) 11-15 years	9.3%	9
(4) 16+ years	37.1%	36

4. What is your level of education? (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) High School	20.6%	20
(2) College (2 years)	20.6%	20
(3) University (4 years)	27.8%	27
(4) Graduate School (4+ Years)	30.9%	30

5. Which best describes the principal industry of your organization? (N=97)		
Answer Options	**Response Percent**	**Response Count**
Advertising & Marketing	3.1%	3
Agriculture	0.0%	0
Airlines, Aerospace, and Defense	1.0%	1
Automotive	1.0%	1

Business Support & Logistics	1.0%	1
Construction and Homes	3.1%	3
Education	13.4%	13
Entertainment & Leisure	1.0%	1
Finance & Financial Services	8.2%	8
Food & Beverages	2.1%	2
Government	7.2%	7
Healthcare & Pharmaceuticals	20.6%	20
Insurance	3.1%	3
Manufacturing	4.1%	4
Nonprofit	8.2%	8
Retail & Consumer Durables	2.1%	2
Real Estate	0.0%	0
Telecom, Tech, Internet & Electronics	6.2%	6
Transportation & Delivery	1.0%	1
Utilities, Energy, and Extraction	3.1%	3
I am currently not employed	6.2%	6
Other	4.1%	4

6. What is your job role? (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) Individual Contributor	32.0%	31
(2) Team Lead	11.3%	11
(3) Manager	9.3%	9
(4) Director	4.1%	4
(5) Vice President	5.2%	5
(6) Management / C-Level	6.2%	6
(7) Partner	3.1%	3
(8) Owner	3.1%	3
(9) Other	25.8%	25

7. What types of knowledge management systems (KMS) do you utilize for decision support? If you do not use any of these systems, then you do not qualify to complete this survey. Please select all that apply. (N=97)		
Answer Options	**Response Percent**	**Response Count**
(1) **Communication-driven** - supports groups with a shared task.	54.6%	53
(2) **Data-driven** – supports storage and retrieval of internal and external company data.	45.4%	44

(3) **Document-driven** – supports management, retrieval, and manipulation of unstructured data.	33.0%	32
(4) **Knowledge-driven** - supports specialized problem-solving expertise using business rules.	34.0%	33
(5) **Model-driven** - supports storage, retrieval, and manipulation of statistical, financial, optimization, or simulation models.	16.5%	16

How much total combined money did all members of your HOUSEHOLD earn last year? (N=95)		
Answer Options	**Response Percent**	**Response Count**
$0 to $9,999	7.4%	7
$10,000 to $24,999	8.4%	8
$25,000 to $49,999	22.1%	21
$50,000 to $74,999	16.8%	16
$75,000 to $99,999	6.3%	6
$100,000 to $124,999	6.3%	6
$125,000 to $149,999	6.3%	6
$150,000 to $174,999	6.3%	6
$175,000 to $199,999	4.2%	4
$200,000 and up	3.2%	3
Prefer not to answer	12.6%	12

US Region (N=97)		
Answer Options	**Response Percent**	**Response Count**
New England	5.2%	5
Middle Atlantic	9.4%	9
East North Central	13.5%	13
West North Central	1.0%	1
South Atlantic	18.8%	18
East South Central	6.3%	6
West South Central	14.6%	14
Mountain	5.2%	5
Pacific	26.0%	25

Device Types (N=96)		
Answer Options	**Response Percent**	**Response Count**
iOS Phone / Tablet	12.4%	12
Android Phone / Tablet	12.4%	12
Other Phone / Tablet	0.0%	0
Windows Desktop / Laptop	64.9%	63
MacOS Desktop / Laptop	4.1%	4
Other	6.2%	6

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