FACILITATING KNOWLEDGE MANAGEMENT SYSTEM SUCCESS: ROLES OF
TECHNOLOGIES, MANAGEMENT AND SOCIAL NETWORKS

FACILITATING KNOWLEDGE MANAGEMENT SYSTEM SUCCESS: ROLES OF
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A dissertation submitted in partial fulfillment
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By

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ABSTRACT

The implementation of knowledge management systems (KMSs) is expected to help organizations create valuable assets for sustained competitive advantage and growth in today's business environments that are characterized by high-velocity and intense competition. Yet, KMSs fail at an alarming rate. Prior research indicates that information technologies and social processes play important roles in affecting KMS implementation success, but the questions of why and how have not been adequately addressed. This dissertation, organized as three essays, seeks to address this gap by examining the independent and joint effects of technological and social factors on KMS implementation. Essay 1 presents a three-level model that incorporates KMS use and leadership as facilitators of employees' awareness network, an important driver of knowledge sharing that contributes positively to job outcomes. Essay 2 develops a three-level model that examines the interdependent effect of KMS use and IT governance structure on employees' friendship network, an important facilitator of peer support that positively affects job outcomes. Essay 3 examines the mediational processes and contingency factors that link KMS use to job performance. I collected multi-waves of data from over 1400 employees at a large corporation in the financial industry. The results lent support to the proposed models. Together, these essays contribute to a richer understanding of KMS implementations in organizations.

This dissertation is approved for
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DEDICATION

Dedicated with love and gratitude to

My parents and my sister,

Mr. Chuanying Zhang, Ms. Yaojuan Zeng and Ms. Xiaodong Zhang,

for sharing my ups and downs and being there for me all the time!

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

The importance of organization-wide knowledge management is obvious, as evidenced by the continued growth of organizational investment in knowledge management systems (KMSs). Spending on knowledge management software in U.S. companies alone would grow from $73 billion in 2007 to about $85 billion in 2008, translating into an average of $1224 per employee in 2008 (AMR Research 2007). Knowledge management software that facilitates the creation of business and social intelligence is estimated to be one of the main components of IT spending in 2010 (Gartner 2009). KMSs offer several benefits, such as fostering innovation, improving customer service, boosting revenues, enhancing employee retention rates, streamlining operations and reducing costs (CIO.com). However, it was estimated over 70% of the projects that implemented KMSs failed (e.g., Butler and Murphy 2007; Lumpur 2009).

Prior research in organizational behavior, social psychology and IS literatures has focused on understanding the various social factors, such as social networks, and technology factors, such as KMS design and use, that affect KMS implementation success. Prior research has examined these two sets of factors separately (e.g., Kankanhalli et al. 2005; Poston and Speier 2005), but little research has developed an integrated view of these two factors to understand knowledge management. There is increasing awareness that social and technology factors may complement to each other to shape knowledge management efforts (Sambamurthy and Subramani 2005). Therefore, the main purpose of this research is to develop an integrated view that incorporates social and technology factors to understand KMS implementation.

Essay 1 presents a three-level model that integrates social and technology factors, conceptualized at different levels, to understand knowledge sharing and subsequent job outcomes, i.e., job performance and job satisfaction. It identifies KMS use and leadership as two potential facilitators of employees' awareness network, an important driver for knowledge sharing that contributes positively to job outcomes. It theorizes not only about the direct impact of KMS use on employees' awareness network, but also about the interdependent role of KMS use and leadership in affecting employees' awareness network. This essay will thus help us better understand of interactive effect of social and technology factors in affecting knowledge management and job outcomes.

Essay 2 develops a three-level model that incorporates KMS use, IT governance structure and friendship network, conceptualized at individual level, business unit level and dyadic levels respectively, to understand peer support and subsequent job outcomes. It theorizes about the role of IT governance structure in strengthening the effect of KMS use on friendship network. Then, it examines two relationships, one between friendship network and peer support and the other between peer support and job outcomes. Thus, this essay helps us develop a better understanding of the nomological network related to peer support, an enabler of successful KMS implementation.

Essay 3 focuses on understanding the mediational and contingency factors that relate KMS use to job performance. It identifies the capability to leverage explicit knowledge and capability to leverage tacit knowledge as important mediators of the use-performance relationship. In addition, it argues that employee's centrality in the advice network plays a critical role in affecting the extent to which employees can leverage various features of a KMS to strengthen their capability to leverage explicit and tacit

knowledge. This essay thus helps us gain a better understanding of the interdependent role of social and technology factors in affecting knowledge management and job performance.

CHAPATER 2

ESSAY 1

KNOWLEDGE SHARING IS POWER: A MULTI-LEVEL APPROACH TO UNDERSTAND THE ROLE OF AWARENESS AND LEADERSHIP IN FACILITATING KMS SUCCESS

ABSTRACT

By integrating information systems and management literatures, this paper advances research on knowledge management system (KMS) implementation. Specifically, I develop a three-level model that incorporates KMS use (individual level), social network (dyadic level) and leadership (business unit level) to understand knowledge sharing and job outcomes. I theorize that the use of KMS features that support employees' interactions will be positively related to employees' awareness of others' areas of expertise, and such a relationship will be stronger with greater transformational leadership. In addition, I further theorize that awareness of others' areas of expertise will be positively related to knowledge sharing and knowledge sharing will be positively related to job outcomes. The model was largely supported in a field study among 1,441 employees in a large financial company. The paper concludes with theoretical and practical implications.

INTRODUCTION

Organizations today leverage and use knowledge management as part of their strategic and IT initiatives (Kankanhalli et al. 2005; Kulkarni et al. 2006; Massey and Montoya-Weiss 2006; Quigley et al. 2007). To facilitate knowledge management, organizations have made significant investments in building knowledge management systems (KMSs)—"a class of information systems applied to managing organizational knowledge" (Alavi and Leidner 2001, p. 114). Estimates indicate that U.S. companies spend over $50 billion dollars per year on KMSs, with an average of over $1,000 per employee (AMR 2007). The successful implementation of a KMS contributes positively to job outcomes, i.e., job performance and job satisfaction (DeLone and McLean 1992, 2003; Seddon 1997). However, prior studies have found an alarming failure rate of KMS projects over 70% (Akhavan et al. 2005; Butler and Murphy 2007). Research that can address this problem or reap the benefits of KMSs will thus be of great value to both academia and practice.

A critical reason why KMS projects have failed to enhance job outcomes is that they did not facilitate knowledge sharing (e.g., Bordia et al. 2006; He et al. 2008; Kankanhalli et al. 2005; Wasko and Faraj 2005; Watson and Hewett 2006). Knowledge sharing is defined as employees' knowledge seeking and knowledge providing behaviors (e.g., Bock et al. 2005) that have been found to positively affect job outcomes (e.g., Quigley et al. 2007; Morrison 2002). To understand knowledge sharing, prior research has drawn from a variety of theoretical perspectives, e.g., transactive memory theory (Austin 2003; Faraj and Sproull 2000; Lewis 2003, 2004; Moreland and Myaskovsky 2000), social exchange theory (Bandura 1986; Blau 1964) and social network theory

(Brass et al. 2004; Burt 1992; Butler 2001; Coleman 1988, 1990; Newman 2002). I employ social network theory given that knowledge sharing is essentially an interpersonal behavior and social network theory can be used to examine how employees are connected, how they interact with each other and how such interactions affect various outcomes (e.g., Baldwin et al. 1997; Borgatti and Cross 2003; Cho et al. 2007; Obstfeld 2005; Reagans and McEvily 2003; Yang and Tang 2003), thus shedding light on our understanding of how employees share knowledge.

Among the various types of networks, e.g., advice (e.g., Sparrowe et al. 2001; Yang and Tang 2003), friendship (e.g., Baldwin et al. 1997; Mehra et al. 2001), communication (e.g., Ahuja et al. 2003; Ortiz et al. 2004) and awareness (e.g., Borgatti and Cross 2003; Cross and Cummings 2004), awareness networks are most relevant because prior research indicates they are positively related to knowledge seeking (e.g., Borgatti and Cross 2003; Cross and Cummings 2004). Awareness is defined as a person's perception of another person's area of expertise (Borgatti and Cross 2003; Cross and Cummings 2004). Awareness networks focus on examining dyadic relationships. Employees' levels of awareness of others' expertise, rendering awareness to be a dyadic construct, represent their awareness networks. For example, if an individual has 10 contacts in his or her awareness network, the individual knows, with varying degree, the areas of expertise of each of these 10 contacts. But little or limited research has studied the facilitators of individuals' awareness of others' areas of expertise.

To address these related gaps, I propose to study KMS use and leadership as potential facilitators. I chose KMS use because some features of a KMS are specifically designed to facilitate employees' interactions (Zhang 2008a, 2008b). When an employee

uses these features, it is possible that he or she interacts more with others and thus knows others' expertise better. KMS use is conceptualized at the individual level and is represented by individual-level use of specific features. Another potential facilitator is leadership because it is an important factor that explains behavioral outcomes in an organizational context (e.g., Meindl 1990). It affects the thought processes of employees and influences how employees use a KMS to interact with others. Prior research has indicated poor management support, such as inadequate or ineffective leadership, during the implementation of a KMS could lead to KMS project failure (e.g., Pettersson 2008). Therefore, it is possible that leadership could play a role in this context. Leadership has mainly been conceptualized at the individual level to understand the dyadic leader-follower relationship (e.g., Dvir et al. 2002; Piccolo and Colquitt 2006; Rubin et al. 2005). In this study, I conceptualize leadership at a higher level, i.e., business unit, to gain a better understanding of its broader impact on employees' behavioral outcomes (e.g., Colbert et al. 2008). Further, use of specific KMS features and leadership could synergistically affect knowledge sharing such that leadership can strengthen or depress the effects of use of specific design features on knowledge sharing. If such synergies exist, unearthing them will go a long way toward helping designers and managers to work toward fostering KMS success. Against this backdrop, the key objectives of this paper are to:

(1) Identify and theorize about the role of specific KMS features that could affect employees' awareness of others' areas of expertise;

(2) Theorize about the interdependent role of use of specific KMS features and leadership in affecting knowledge sharing;

(3) Theorize about the impact of employees' awareness networks on knowledge sharing and job outcomes; and

(4) Test the proposed holistic multi-level model in a field study.

This work is expected to make important theoretical contributions. First, this work will contribute to research on KMS implementation by identifying important KMS features and leadership style that contribute positively to knowledge sharing and subsequent job outcomes. The second contribution of this research will be to expand the nomological network related to job outcomes by linking it to technology. Third, this work will extend research on knowledge management by incorporating multiple theoretical perspectives, conceptualized at different levels, to develop a holistic understanding of knowledge sharing and job outcomes.

THEORETICAL BACKGROUND

This section presents a brief review of the literature in the major streams of research on which I draw: knowledge management system use, awareness network and transformational leadership.

Knowledge Management System Use

Given that knowledge is distributed, complex and evolving (Markus et al. 2002), a key objective of KMS implementation is to facilitate knowledge sharing among employees (e.g., Alavi and Leidner 2001). To share knowledge, employees need to interact with each other by either seeking knowledge from or providing knowledge to other employees (e.g., Cabrera et al. 2006; De Vries et al. 2006; Kim and Lee 2006). Therefore, it is important to understand the motivational mechanisms underlying such interpersonal behaviors (DePaulo and Fisher 1980; Moon and Park 2002) and how

8

technology is designed to facilitate such interpersonal behaviors. Prior research indicates people interact with each other to fulfill their psychological need of relatedness (e.g., Zhang 2008a, 2008b). Such an innate desire to belong drives people to interact with others and technologies can be designed to facilitate human-human interaction to make people feel they are better connected (Zhang 2008a).

Employees in organizations have this same psychological need of relatedness and they are likely to fulfill such a need by interacting with others to resolve work-related problems (e.g., Greguras and Diefendorff 2009). To facilitate interaction among employees, KMSs have been designed to provide features that help employees discuss work-related problems more efficiently and effectively. Among the various features discussed in prior literature about KMS (e.g., Alavi et al. 2005; McAfee 2006; Poston and Speier 2005; Revere et al. 2007; Wagner 2004), I chose *posting, making comments, rating and search* because they have been found to support employees' interaction in resolving work-related problems (e.g., Gonzalez-Reinhart 2005; Grudin 2006; Kane and Fichman 2009). *Posting* is a feature designed to help employees express their thoughts and ideas online. When employees post knowledge, they initiate a dialog about certain work-related topics with other employees (e.g., Alavi et al. 2005; Kankanhalli et al. 2005). *Making comments* is a feature that allows employees to provide feedback to others' ideas and thoughts. When employees make comments on others' postings, they respond to others and continue the dialog about certain work-related topics (e.g., McAfee 2006). *Rating* is a feature that allows employees to evaluate the importance and usefulness of others' ideas and thoughts. When employees rate others' postings, they show interest about certain work-related topics that could facilitate dialog on existing

topics or generate new dialog (e.g., Poston and Speier 2005). *Search* is a feature that helps employees locate required knowledge. When employees search for information relevant to work-related topics, they are likely to interact with others more efficiently and effectively (e.g., Revere et al. 2007).

Awareness Network

Awareness network is one type of social network that describes pattern of interactions among people as a graph of connections (Newman 2002) and focuses on the dyadic relationships of a focal individual in that it captures the focal individual's level of awareness of each of his or her dyads' level of expertise (e.g., Borgatti and Cross 2003; Cross and Cummings 2004; Hansen et al. 2005). Specifically, a focal individual knows the areas in which his or her ties possess expertise, thus affording the opportunity for the focal individual to not possess that expertise (Borgatti and Cross 2003; Cross and Cummings 2004). The concept of awareness is similar to the concept of interpersonal awareness of others' knowledge discussed in transactive memory systems (Wagner 1986). But transactive memory systems mainly focus on understanding the antecedents and consequences of awareness at a collective level, such as groups. For example, one prior study has examined how transactive memory systems emerged and developed to affect team performance (Lewis 2004). The focus of an awareness network is at the dyadic level. For instance, prior work has found individuals who have better knowledge of their contacts' areas of expertise (dyadic level) are more likely to seek knowledge from their contacts (Borgatt and Cross 2003).

Transformational Leadership

Leaders play an important role in achieving strategic goals for their organizations by motivating organizational members to put in more effort (e.g., Colbert et al. 2008; Messick 2005). Different leaders may apply different leadership styles and leadership has been used to explain how certain state of affairs or set of organizational outcomes were produced (Meindl 1990). There are many definitions of leadership and such definitions mainly differ in who exerts influence, the purpose of influence and the manner in which influence is exerted (Yukl and Van Fleet 1992). Transformational leadership has received the spotlight over the past two decades in order to understand leader effectiveness (e.g., Divr et al. 2002; Piccolo and Colquitt 2006). Transformational leadership is defined as "the process of influencing major changes in the attitudes and assumptions of organization members (organization culture) and building commitment for major changes in the organization's objectives and strategies" (Yukl and Van Fleet, p. 174). The assumption of transformational leadership theory is that leaders can behave in certain ways to stimulate and inspire followers (Bass 1985; Burns 1978). Transformational leaders play an important role in affecting employees' perceptions of their jobs (Griffin et al. 1987; Piccolo and Colquitt 2006; Salancik and Pfeffer 1978) by using verbal persuasion to influence followers' judgment of their work environment or develop followers' work goals to be congruent with their own values (Bono and Judge 2003; Shamir 1993).

Transformational leaders motivate followers to do things beyond expectations by using different mechanisms, such as articulating a vision for the future to broaden and elevating followers' goals, supporting followers' needs and providing them with confidence (e.g., Dvir et al. 2002; Piccolo and Colquitt 2006; Rubin et al. 2005). There

are 4 dimensions of transformational leadership (Piccolo and Colquitt 2006): *idealized influence*, i.e., the degree to which leaders behave in characteristic ways that cause followers to identify with them, *inspirational motivation*, i.e., the degree to which leaders articulate visions that are appealing to followers, *intellectual stimulation*, i.e., the degree to which leaders challenges assumptions, take risks, and solicit followers' ideas, and *individual consideration*, i.e., the degree to which leaders attend to followers' needs, act as mentor or coaches, and listen to followers' concerns. Although there are four dimensions, prior research has largely treated transformational leadership as a single construct and found a positive association between transformational leadership and followers' behaviors (e.g., Dvir et al. 2002; Fuller et al. 1996; Judge and Piccolo 2004; Lowe et al. 1996; Piccolo and Colquitt 2006). Given that the importance of transformational leadership in affecting employees' behaviors and outcomes, I incorporate it in this study to understand its role in the context of KMS implementation.

MODEL DEVELOPMENT

Figure 1 presents the three-level model that incorporates technology, i.e., KMS use, and social factors, i.e., leadership and awareness network, to understand knowledge sharing and job outcomes. Specifically, I seek to understand how KMS use (individual level) affects awareness of others expertise (dyadic level), and how transformational leadership (business unit level) moderates the relationship between awareness and knowledge sharing (dyadic level) that in turn affects job performance (individual level).

Figure 1: Research Model
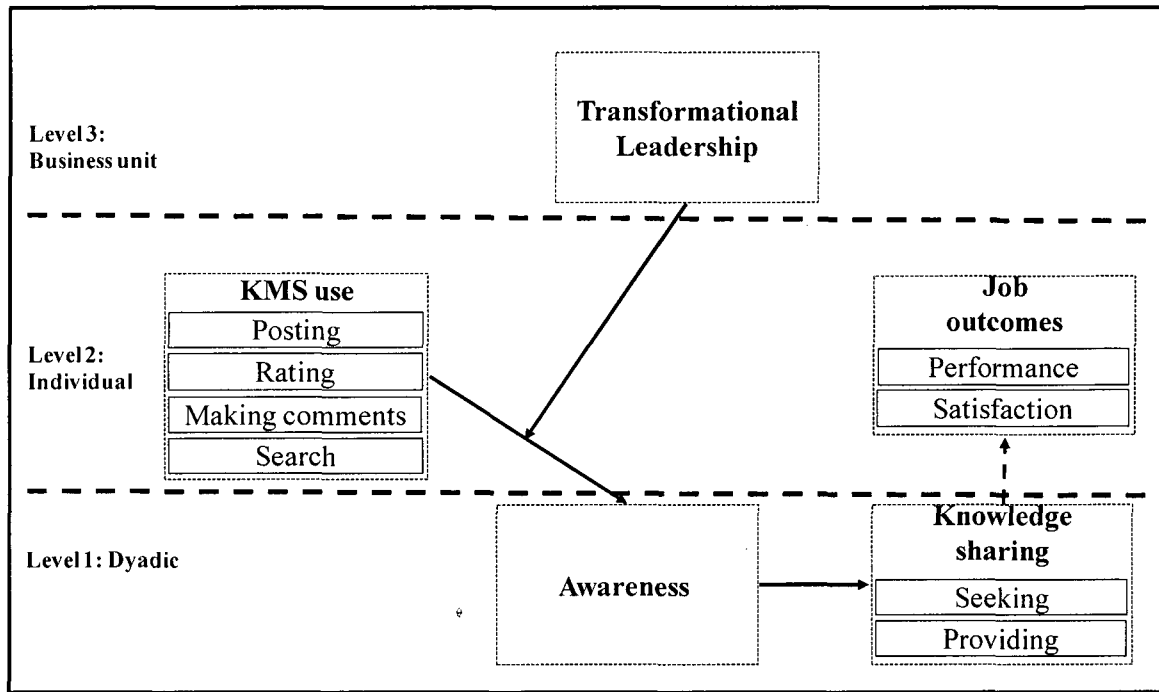
Posting

When employees use the KMS feature of posting, they try to convey a message to the potential readers of the message. One of the major purposes of posting is to express ideas or thoughts on certain topic so as to initiate dialog with other employees on the topic (e.g., Alavi et al. 2005; Kankanhalli et al. 2005). Most of the posters want to know about other employees' points of view on their postings. To generate responses, the posters need to make other employees interested in their postings that in turn foster a desire or even an impulse to respond to the postings. This requires the posters to learn more about other employees who could be the potential respondents. Such a learning process may involve collecting information about other employees, such as finding out other employees' interests and their areas of expertise. As a result, posters are likely to know more about the areas of expertise of other employees. For example, to post knowledge about how to use a KMS to optimize task management, the posters may need

13

to find out who may be interested in this topic. It is likely to be employees who will benefit from such optimization. If the posters collect more information about these employees, such as task types, task knowledge or work flow, and incorporate such information into their postings, the postings are likely to be more appealing, thus generating more responses. In the meantime, the process of collecting information about other employees makes the posters more aware of other employees' areas of expertise. Thus, I hypothesize:

Hypothesis 1a (H1a): Use of the feature posting will be positively related to employees' awareness networks.

I further argue the positive effect of posting on awareness will be strengthened in the presence of transformational leadership. Transformational leaders will clearly communicate the values of the organization's missions and help employees view the organizational goals as congruent with their own values (Bono and Judge 2003; Piccolo and Colquitt 2006; Shamir et al. 1993). When implementing a KMS, transformational leaders will make employees understand that the KMS plays an important role in promoting the organization's values, such as helping the organization grow and prosper. As a result, employees perceive their tasks differently. Prior research has found transformational leadership was positively related to employees' perceptions of core job characteristics, such as job significance, i.e., the perceived importance of the job, and job variety, i.e., the different skills and talents required for accomplishing the job (Piccolo and Colquitt 2006). When posting knowledge, posters may perceive the task of posting to be of great value to the organization. This could motivate the posters to improve quality of the postings by collecting more information about the potential readers, such as their areas of expertise, so as to make the postings more relevant and interesting to potential

readers. In order to better perform the task of posting, posters may also acquire various skills that could help them gain a better understanding of other employees' areas of expertise. Consequently, the effect of posting on awareness will be strengthened. Thus, I hypothesize:

Hypothesis 1b (H1b): Transformational leadership will positively moderate the relationship between use of the feature posting and employees' awareness networks.

Making Comments

In addition to posting knowledge, employees can make comments on others' postings. I argue that making comments will positively affect an individual's awareness of others' areas of expertise. In order to provide useful comments, employees are likely to pay more attention to the postings on which they are going to make comments. The fact that employees want to make comments on certain postings indicates their interest in certain topics. Such heightened attention and interest motivate employees to work harder (Locke 1997; Malone 1981; Mitchell 1997), such as exploring the knowledge domain related to the postings to gain a better understanding of the postings before making comments. Consequently, they are likely to be better aware of the persons who posted in the first place. For example, when a software developer wants to make comments on a posting about how to fix a bug, he or she may need to find out more information about the solutions discussed in the posting. Consequently, the software developer will be better aware of the poster's area of expertise. Thus, I hypothesize:

Hypothesis 2a (H2a): Use of the feature making comments will be positively related to employees' awareness networks.

I further argue the positive relationship between making comments and awareness will be strengthened by transformational leadership. Transformational leaders motivate employees by broadening and elevating their goals and providing them with confidence

15

to perform beyond the expectations (Dvir et al. 2002). Influenced by transformational leaders, employees are likely to be intrinsically motivated. For example, prior research has indicated transformational leadership causes intrinsically motivated behaviors, such as organizational citizenship behaviors (Fuller et al. 1996; Judge and Piccolo 2004; Lowe et al. 1996; Piccolo and Colquitt 2006). When employees are intrinsically motivated, they are likely to put in more effort (Locke 1997; Malone 1981; Mitchell 1997) in understanding and internalizing the postings. As a result, they are likely to develop a better understanding of the postings and the persons who post. Thus, I hypothesize:

Hypothesis 2b (H2b): Transformational leadership will positively moderate the relationship between use of the feature making comments and employees' awareness network.

Rating

Rating is a feature designed to help employees evaluate the quality of others' postings or comments (Poston and Speier 2005). When employees provide ratings, they get to know more about the people for whom and postings for which they provide ratings. Similar to making comments, employees need to understand the contents of the postings or comments in order to provide accurate ratings. In order to give an accurate assessment of the quality of the postings and comments, employees will spend time figuring out the quality of the postings and comments by perusing relevant domain knowledge or finding out more information about the posters' or the commenters' areas of expertise. For example, to give an accurate rating on a posting about how to use a KMS to search certain knowledge, the rater may need to check the knowledge in this domain as well as gain a better understanding of the areas of expertise of the poster. Consequently, the rater will gain a better understanding of the areas of expertise of the poster and the commenter. Thus, I hypothesize:

16

Hypothesis 3a (H3a): Use of the feature rating will be positively related to awareness network.

I further argue the positive relationship between rating and awareness will be strengthened by transformational leadership. Influenced by transformational leaders, followers are likely to develop higher level of morality manifested as an internalization of the organization's moral values and orientation of collectivistic values that transcend self-interest for the sake of the team or organization (Bass 1985; Dvir et al. 2002; Shamir 1991; Wagner 1995). They may think that giving inaccurate ratings is immoral and giving accurate ratings is an organizational citizenship behavior that contributes positively to individual- and organizational-level outcomes (Podsakoff et al. 2009). In order to provide accurate ratings, these employees are likely to spend more time to understand the postings and comments, such as learning and verifying the domain knowledge of the employees who post the knowledge or make the comments. Consequently, the effect of rating on awareness will be stronger in the presence of transformational leadership. Thus, I hypothesize:

Hypothesis 3b (H3b): Transformational leadership will positively moderate the relationship between use of the feature rating and employees' awareness networks.

Search

Search is a feature designed to help employees find information or knowledge contributed to the KMS by other employees to resolve work-related problems. When employees search for information or knowledge, they get to know better the people who provide the knowledge. When employees find the information or knowledge they are looking for, they will not only pay attention to the content of the information and the knowledge, but also to the person who provides such knowledge. For example, when employees want to know about how to use the KMS to manage a project, they can search

17

all the postings and comments related to this topic in the KMS. By reading and internalizing all these postings and comments, they will not only gain a better understanding of the contents of the postings and comments but also of those who post the knowledge and make the comments. The more employees use the search feature, the more likely they will be exposed to different knowledge and get to know more about those who contribute such knowledge. Thus, I hypothesize:

Hypothesis 4a (H4a): Use of the feature search will be positively related to employees' awareness networks.

Transformational leaders transform their followers, helping them reach their full potential and attain the highest performance (Dvir et al. 2002). Influenced by transformational leaders, employees are likely to feel a heightened level of empowerment in terms of independent thinking, active engagement in the task and increased self-efficacy (Dvir et al. 2002). I argue that the empowered employees are more capable of leveraging the search feature to develop their awareness network. First, transformational leaders enhance followers' capacity to think on their own (Bass and Avolio 1990). Employees who can think on their own are more likely to use the right criteria to search, find the relevant information and make a good assessment of the areas of expertise of those who provide the knowledge as well as the usefulness of the knowledge. Second, transformational leaders influence their followers by making them actively engage in their tasks. When employees take initiative or participate actively in their tasks, they are likely to go above and beyond the tasks (Dvir 2002). In performing the search task, they are more likely to find the answers and know better those who provide the knowledge. Third, transformational leaders increase followers' self-efficacy (Avolio and Gibbons 1988; Shamir et al. 1993). When employees are more confident, they are more likely to

18

accomplish the search task by finding the right answers and better judging the areas of expertise of those who provide the knowledge. Influenced by transformational leadership, employees will feel a heightened level of empowerment that strengthens the positive effect of search on awareness. Thus, I hypothesize:

Hypothesis 4b (H4b): Transformational leadership will positively moderate the relationship between use of the feature search and employees' awareness networks.

Awareness and Knowledge Sharing

Prior research has indicated a positive relationship between awareness and knowledge seeking. For example, Borgatti and Cross (2003) found that the decision to seek information from others was influenced by one's perception of other people's expertise. If people know more about others' expertise, the likelihood for them to see the value of others' expertise increases. When employees find out others' areas of expertise is useful in resolving their own work-related problems, they are more likely to seek knowledge from others. This is consistent with the transactive memory systems literature that considers awareness as a basic requirement of performance in distributed knowledge systems (Hollingshead 1998; Moreland et al. 1996; Rulke and Galaskiewicz 2000; Weick and Roberts 1993). Thus, I hypothesize:

Hypothesis 5a (H5a): Awareness network will be positively related to knowledge seeking.

While prior research has examined the relationship between awareness and knowledge seeking, little or no research has examined the relationship between awareness and knowledge providing. I argue that awareness is positively related to knowledge providing. Employees will feel discomfort if they provide wrong answers to others because providing wrong answers could reveal ignorance and thus, negatively affect others' views of an employee's competence (e.g., Lee 1997, 2002; Shapiro 1983).

19

In contrast, employees are more likely to provide knowledge to others if such behaviors could enhance the others' image of their knowledge and helpfulness (Kankanhalli et al. 2005; Wasko and Faraj 2005). When employees know more about others' expertise, they can better explain the solutions by relating such solutions to others' expertise. For example, if an employee knows the other employee has strong quantitative skills, the employee can present his or her solution using some algorithms and formulas that fall under the domain of the other one's expertise such that other employee is more likely to understand the solution. When employees can help others better resolve work problems, they are more likely to be viewed favorably by their coworkers and supervisors (e.g., Sparrowe et al. 2001). Consequently, such employees will be more willing to provide knowledge to maintain their positive image. Thus, I hypothesize:

Hypothesis 5b (H5b): Awareness network will be positively related to knowledge providing.

Knowledge Sharing and Job Performance

Prior research has found a positive relationship between knowledge seeking and job performance (e.g., Hunter and Thatcher 2007; Morrison 2002; Schmidt and Hunter 2004). Knowledge seeking helps employees develop their knowledge base. Throughout the process of seeking knowledge, knowledge seekers acquire, internalize and then apply such knowledge to resolve work-related problems, thereby enhancing their performance. In addition, knowledge seeking helps clarify task uncertainty. Seeking knowledge from others helps employees develop more efficient and effective problem-solving tactics. More importantly, asking for help may reveal some critical issues that may have been ignored in one's own thought-process on how to resolve a problem. Thus, I hypothesize:

Hypothesis 6a (H6a): Knowledge seeking will be positively related to job performance.

20

The relationship between knowledge providing and job performance has not been adequately understood. I argue that knowledge providing will contribute favorably to job performance. Providing knowledge to others may help others resolve work-related problems and those who get help will generally return the favors they receive. Such reciprocal helping behaviors are likely to result in stronger relationships and/or higher levels of trust between the knowledge providers and the recipients. Prior research indicates trust and strong ties ease the transfer of complex knowledge (e.g., Levin and Cross 2004; Reagans and McEvily 2003), thus facilitating problem-solving and enhancing job performance. Moreover, helping others resolve a problem may advance a knowledge provider's understanding of a problem and refine the provider's own thinking about the problem. Thus, I hypothesize:

Hypothesis 6b (H6b): Knowledge providing will be positively related to job performance.

Knowledge Sharing and Job Satisfaction

I argue both knowledge seeking and knowledge providing contribute positively to job satisfaction. Knowledge seeking helps employees acquire knowledge or experience that contributes positively to job performance (Hunter and Thatcher 2007; Schmidt and Hunter 2004). When employees perform better, they are more likely to get promoted and receive pay increases, making them feel they are important in the organizations and such feelings enhance job satisfaction (Stamper and Masterson 2002). In addition, when employees seek knowledge from other coworkers and receive assistance, they are likely to perceive an organizational climate where employees are willing to help each other (Bock et al. 2005). Given such perceptions, they are less likely to be intimidated in face of challenging situations because they know they are not working alone and there are

other coworkers they can turn to for advice and assistance. Such a working climate is more likely to make them more satisfied with their jobs. Thus, I hypothesize:

Hypothesis 7a (H7a): Knowledge seeking will be positively related to job satisfaction.

Likewise, I argue that knowledge providing will contribute favorably to job satisfaction. Providing knowledge to coworkers, such as helping coworkers resolve work-related problems, is likely to be positively viewed by supervisors and coworkers as being supportive, willing to forgo personal interests for the sake of the collective, or cooperate in order to make a positive contribution to the workplace (e.g., Piccolo and Colquitt 2006; Podsakoff et al. 1990). When supervisors or coworkers have such favorable perceptions about knowledge providers, they are more willing to support the career advancement, e.g., promotion, of these providers, thus making these providers feel more satisfied with their jobs (Stamper and Masterson 2002). In addition, knowledge providers may develop a sense of achievement or feel they are valuable to the organization because their knowledge is useful in helping coworkers to resolve work problems. Such a sense of achievement and self-worth are likely to make them feel more content with their jobs. Thus, I hypothesize:

Hypothesis 7b (H7b): Knowledge providing will be positively related to job satisfaction.

METHOD

This section provides information about the participants, measurement and data collection procedure.

Participants and Data Collection

This study was conducted in a large financial company in the context of the rollout of a new KMS. The sampling frame comprised 1,757 workers in seven business units, i.e., finance and budgeting, accounting, personnel, customer management, sales,

22

advertising and public relations and government liaison. Of the 1,757 workers, 1,441 provided usable responses, resulting in a response rate of 82%, which is above the 80% response rate threshold required for network analysis (Wasserman and Faust 1994). Of the respondents, 1,051 were men, with age ranging from 21 to 64 ($M = 38.55$ years, $SD = 7.76$ years). I checked for non-response bias and found no significant differences in demographics between respondents and non-respondents.

Three waves of data were collected (Figure 2). Right before the implementation of the KMS, I collected data related to individuals' demographics, e.g., age and gender, and other control variables, e.g., computer experience, computer self-efficacy and conscientiousness. About 9 months after the implementation of the KMS, I collected data about KMS use, leadership, awareness network and knowledge sharing. The timing of 9 months was chosen because prior literature indicates that when organizations implement large information systems, such as enterprise resource planning system or KMS, they will experience a shakedown phase (e.g., Markus and Tanis 2000). During this period, employees will encounter many problems due to the lack of familiarity with the new system and they will experience a steep learning curve that prevents them from using the new system efficiently and effectively. After about 6 to 9 months, employees will have a better understanding of the new system and develop better skills to use the system.

The manager of each business unit gave us the names of all the employees in the business unit from which I created a roster to collect the awareness network data. Specifically, I asked employees to respond to questions about other employees on the roster. Such a roster-based approach to network data collection is common and is the preferred method to ensure that the respondents can readily remember all members of the

network (Wasserman and Faust 1994). Data were collected during normal business hours and the participants were asked to return the completed survey within two weeks. The company allowed participants to fill out the survey during the work day. The average time to fill out a social network survey was about 2 hours.

Figure 2: Data Collection Schedule

O	X	X	O	X	O
Demographics	KMS	KMS	Leadership	KMS	Job Performance
Control Variables	Implementation	Use	Use of Design Features	Use	Job Satisfaction
			Awareness Network		
			Knowledge Sharing		

Measurement	Measurement	Measurement
2 week	9 months	11 months

Employees' job performance and job satisfaction data were collected 11 months after the implementation of the KMS and to match the timing of when the company conducted their annual performance evaluations. With respect to job performance, supervisors, coworkers and subordinates of the employees and employees themselves all evaluated each employee's job performance. This methodology is commonly used in today's organization to prevent bias and gain a more accurate assessment of performance, and is referred to as 360-degree evaluation. When employees provided self-assessments of their job performance, they also filled out the job satisfaction survey. The organization then sent out the performance and satisfaction data to an external agency who then aggregated the data to protect employee confidentiality. I received the data from the external agency. Once I matched the performance and satisfaction data with my survey data, the employees' names were destroyed to respect the confidentiality of the employees.

KMS Use

I obtained use data of each KMS feature from the system log. The counts of the number of postings, comments, ratings and searches were generated. Such frequency counts as a measure of use is commonly used in the IS literature (Straub et al. 1995; Venkatesh et al. 2008).

Knowledge Sharing

For each pair of employees *(i, j), knowledge seeking* is assessed on a 5-point scale as the extent to which employee i turned to employee j for knowledge using the item "Please indicate the employees below that you typically turn to for knowledge on work-related topics" (Borgatti and Cross 2003; Cross and Cummings 2004). *Knowledge providing* is assessed as the extent to which employee j indicated that employee i turned to him/her for knowledge using the item "Please indicate the employees below that typically turn to you for knowledge on work-related topics" (Cross and Cummings 2004).

Awareness Network

Using the same scale as knowledge sharing, awareness was measured by asking employees to indicate how well they knew about each other person's areas of expertise. The question used was "I understand this person's knowledge and skills. This does not necessarily mean that I have these skills or knowledgeable in these domains but that I understand what skills this person has and domains in which they are knowledgeable." This is consistent with the measurement approach of Cross and Cummings (2004).

Transformational Leadership

Transformational leadership was measured using the Multifactor Leadership Questionnaire (MLQ Form 5X; Bass and Avolio 1995) that captures the four dimensions of transformational leadership, i.e., intellectual stimulation, inspirational motivation, individualized consideration and idealized influence. Transformational leadership was measured at the employee level but aggregated to the business unit level because the theory development for this construct was at the business unit level. Employees in a business unit were asked to rate the extent to which their leader exhibits transformational leadership. The measures of agreement among individuals' ratings produced a median r_{wg} of .78, an ICC(1) of .17 and an ICC(2) of .77. All these aggregation statistics were within the acceptable range of values summarized in the literature (Bliese 2000; James 1982).

Job Performance

Job performance was obtained using a 5-item scale that was used in the organization. The scale is adapted from prior research (e.g., Kraimer et al. 2005; Welbourne et al. 1998) to focus on overall job effectiveness. The data were gathered from the supervisor, peer coworkers, subordinates and the employees themselves. The multiple evaluators' ratings on these five items were aggregated and reported as a final rating ranging from excellent (7), very good (6), good (5), acceptable (4), needs improvement (3) to varying levels of probation (2, 1).

Job Satisfaction

Job satisfaction was measured using a 3-item scale (Morris and Venkatesh 2010).

Control Variables

The control variables included gender (coded as men=0), organizational tenure, rank and conscientiousness as control variables. Gender, organizational tenure and rank

have been included in prior research that examines individual performance (Cross and Cummings 2004; Mehra et al. 2001). Conscientiousness is included because this personality trait is a consistent predictor of individual performance (Tett and Burnett 2003). It was measured using a short, 5-item version on a 7-point scale of the conscientiousness scale developed by Gosling et al. (2003).

RESULTS

Preliminary Analysis

I conducted factor analysis and the results confirmed the convergent and discriminant validity of the various scales. Table 1 presents the reliabilities, descriptive statistics and correlations. As shown in Table 1, Cronbach alpha of all scales were greater than .70, suggesting internal consistency. As expected, each KMS feature was positively correlated to awareness. Awareness was positively correlated to knowledge seeking and knowledge providing. Knowledge seeking and knowledge providing were correlated to job performance and job satisfaction. Transformational leadership was correlated to job performance.

Hierarchical Linear Modeling

Given that variables were measured at different levels, i.e., awareness and knowledge sharing at the dyadic level, KMS use, job outcomes and control variables at the individual level, and leadership at the business unit level, hierarchical linear modeling (HLM) was used to analyze the data. I used HLM because it takes into account the nonindependence of observations, and adjusts the degrees of freedom to account for relationships (dyads) nested within individuals, and individuals nested within business units (Bryk and Raudenbush 1992; Singer and Willett 2003). A prerequisite for running

Table 1: Descriptive Statistics and Correlations

	Mean	S Dev	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	38.55	7.76	NA																
2. Gender (0: men)	.27	.44	.02	NA															
3. Tenure	4.45	1.20	.24***	-.15*	NA														
4. Rank (grades 1 to 16)	7.78	4.40	.23***	-.17**	.24***	NA													
5. Computer experience	12.40	6.80	.07	-.13*	.05	-.10	NA												
6. Computer self-efficacy	3.95	2.12	-.15*	-.24***	-.16*	-.13*	.23***	.70											
7. Conscientiousness	5.10	0.87	.13*	.08	.14*	.08	.07	.04	.74										
8. Awareness	17.50	8.21	.20***	.04	.21***	.03	.02	.02	.02	NA									
9. Knowledge seeking	4.10	1.81	.17**	.05	.19**	.05	.04	.04	.16**	.13*	.75								
10. Knowledge providing	4.23	1.55	.17**	.10	.20***	.02	.07	.10	-.13*	.16**	.17**	.73							
11. Posting	21.08	10.50	-.13*	-.15*	-.12*	-.10	.13*	.15*	.12*	.12*	.15*	.17**	NA						
12. Rating	15.50	9.41	-.15*	-.23***	-.14*	-.13*	.12*	.10	.13*	.15*	.18**	.20***	.17**	NA					
13. Making comments	17.10	6.31	-.16**	-.15*	-.14*	-.07	.15*	.16**	.15*	.14*	.20***	.14*	.23***	.20***	NA				
14. Search	33.50	13.67	.05	.08	.03	-.02	.17**	.19**	.14*	.18***	.14*	.12*	.20***	.21***	.17**	NA			
15. Transformational leadership	4.21	1.38	.17**	.09	.14*	.15*	.02	.02	.10	.02	.08	.07	.07	.05	.14*	.03	.75		
16. Job performance	4.89	1.71	.14*	-.10	.16**	.15*	.03	.08	.17**	.14*	.23***	.25***	.17**	.15*	.16**	.12*	.13*	.80	
17. Job satisfaction	4.13	1.53	.17**	.11*	.17**	.13*	.01	.03	.15*	.15*	.21***	.24***	.19**	.21***	.19**	.14*	.10	.28***	.84

Notes:
1. n = 1,441.
2. Cronbach's alpha coefficients appear on the diagonal.
3. * p < .05; ** p < .01; *** p < .001.

28

HLM models is significant higher level unit variance in the outcome measure (Hofmann 1997; Hofmann et al. 2000). In this paper, this means it is necessary to examine if there is significant between-individual variance and between-business unit variance in awareness. A NULL three-level model with no predictors of awareness showed that significant variance was explained between business units and between individuals.

Model Testing

Table 2 presents the results of the model testing. The control variables explained 5% of variance in awareness. Adding the use of four KMS features explained significantly more variance (i.e., 13%) in awareness. Among the four KMS features, making comments ($\gamma_{making\ comments} = .15$, $p < .05$) and search ($\gamma_{search} = .14$, $p < .05$) were positively related to awareness, thus supporting H2a and H4a. Posting ($\gamma_{posting} = .04$, $p > .05$) and rating ($\gamma_{rating} = .02$, $p > .05$) were positively related to awareness, but the relationships were not significant, thus hypotheses H1a and H3a were not supported. Adding leadership as a cross-level moderator explained an additional 10% of variance in awareness over and above the model with only control variables and design features. Transformational leadership significantly moderated the effect of posting ($\gamma_{posting\ x\ transformational} = .17$, $p < .01$), making comments ($\gamma_{making\ comments\ x\ transformational} = .13$, $p < .05$) and search ($\gamma_{search\ x\ transformational} = .15$, $p < .05$) on awareness, thus supporting hypotheses H1b, H2b and H4b.

To better understand the pattern of the interaction between use of KMS features and transformational leadership, significant interactions were plotted by following Aiken and West's (1991) guidelines. Figure 3 shows the plots of the three significant

Table 2: Model Testing

Dependent variables →	Awareness			Knowledge seeking		Knowledge providing		Job performance		Job satisfaction	
R^2	.05	.13	.23	.13	.26	.14	.28	.13	.29	.07	.26
ΔR^2	.05**	.08***	.10***	.13**	.13**	.14**	.14**	.13**	.16**	.07**	.19**
Control variables											
Age	.12*	.04	.02	.13*	.05	.10	.07	.08	.03	.12*	.07
Gender (0: men)	.02	.01	.00	.12*	.10	.15*	.12*	-.13*	-.07	.07	-.03
Tenure	.14*	.13*	.07	.04	.03	.05	.02	.14*	.04	.04	.02
Rank	.03	.02	.01	.03	.02	.03	.01	.05	.07	.06	.01
Computer experience				.05	.03	.14*	.09	.02	.01	.00	.00
Computer self-efficacy				.08	.04	.05	.02	.02	.02	.01	.00
Conscientiousness				.14*	.13*	-.20***	-.14*	.17**	.13*	.13*	.05
Main effects											
Posting		.04	.02								
Making comments		.15*	.13*								
Rating		.02	.01								
Search		.14*	.12*								
Awareness					.20***		.17**				
Knowledge seeking									.24***		.12*
Knowledge providing									.15*		.17**
Interaction effects											
Transformational leadership			.13*								
Posting x Transformational leadership			.17**								
Making comments x Transformational leadership			.13*								
Rating x Transformational leadership			.02								
Search x Transformational leadership			.15*								

Note:
1. If the area is in grey, variables are not included in the model test.
2. *p < .05; ** p < .01; *** p < .001.

Figure 3: Interaction Plots

Figure 3(a). Effects of posting and transformational leadership on awareness
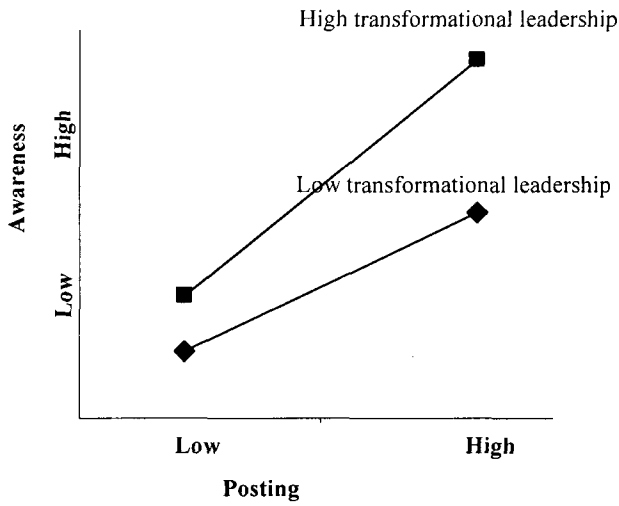
Figure 3(b). Effects of making comments and transformational leadership on awareness

High transformational leadership

Low transformational leadership

Awareness

High

Low

Low   High

Posting

High transformational leadership

Low transformational leadership

Awareness

High

Low

Low   High

Making comments
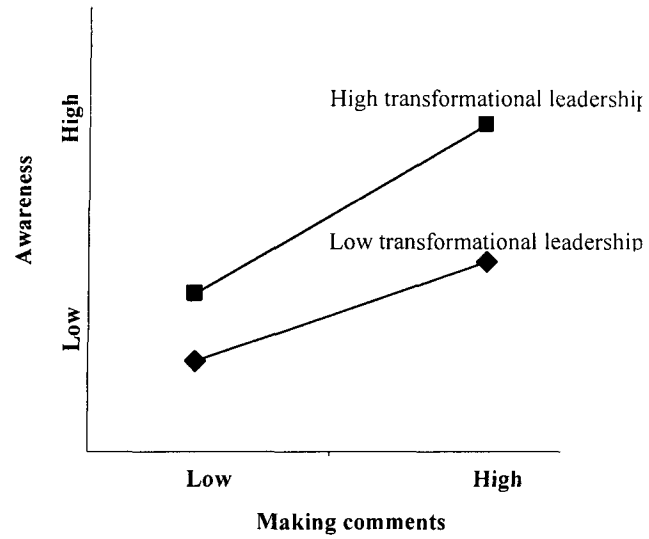
Figure 3(c). Effects of search and transformational leadership on awareness

High transformational leadership

Low transformational leadership

Awareness

High

Low

Low   High

Search
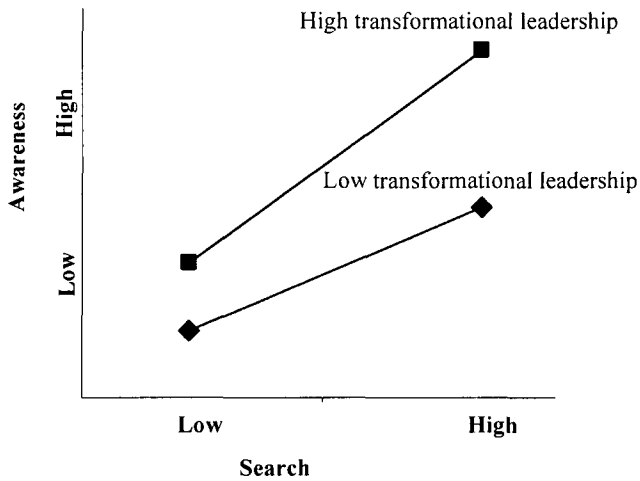
interactions. The pattern is quite similar in that the positive effect of use of KMS features on awareness is stronger for high levels of transformational leadership than it is for low levels of transformational leadership, thus suggesting transformational leadership strengthens the positive effect of use of KMS features on awareness. This effect is particularly strong for posting. Although the direct effect of posting on awareness was not significant, the interaction was positive and significant, indicating when transformational leadership is performed, it can greatly increase the effect of posting on awareness. Following Aiken and West (1991) and Dawson and Richter (2006), I also tested the slopes of the lines representing transformational leadership at one standard deviation below and above the mean. Based on a t-test, both slopes were found to be significantly different from zero, indicating the significant effect of design on awareness, and the difference between the two slopes was also significant, indicating awareness varied across employees with different levels of transformational leadership.

Consistent with prior research (Borgatti and Cross 2003), awareness was positively related to knowledge seeking and the relationship was significant ($\beta= .20$, $p <$ .001), thus supporting hypothesis 5a. Awareness was positively related to knowledge providing and the relationship was significant ($\beta= .17$, $p < .01$), thus supporting hypothesis 5a. With regard to the relationship between knowledge sharing and job outcomes, knowledge sharing was positively related to job outcomes and the relationship was significant after controlling for individual differences. Specifically, knowledge seeking ($\beta= .24$, $p < .001$) and knowledge providing ($\beta= .15$, $p < .05$) were positively and significantly related to job performance, with the effect of knowledge seeking on job performance slightly stronger, thus supporting hypotheses 6a and 7a. Similarly,

knowledge seeking (β= .12, p < .05) and knowledge providing (β= .17, p < .01) were positively related to job satisfaction, with the effect of knowledge providing on job satisfaction slightly stronger, thus supporting hypotheses 6b and 7b.

DISCUSSION

The broad objective of this research was to enhance our understanding of KMS implementation success. To achieve this objective, I drew from KMS design, social network, leadership and management literatures to understand the interdependence of the social and technology factors derived from these literatures. The results provided evidence that both social and technology factors play an important role in affecting KMS success. With respect to the technology factors, KMS use needs to focus on features that support interaction among employees. Such features have a positive impact on knowledge sharing by helping employees better know others' expertise. In addition, an important social factor, i.e., transformational leadership, is effective in motivating employees to leverage KMSs to gain better knowledge of others' expertise. Moreover, awareness plays an important role in affecting knowledge sharing that contributes positively to job performance and job satisfaction.

Theoretical Implications

This work contributes to research in several ways. The primary contribution of this work adds to the body of research related to KMS implementations. One important objective of a KMS implementation is to facilitate knowledge sharing (Alavi and Leidner 2001) that has been found to be very difficult and challenging (e.g., Bordia et al. 2006; He et al. 2008; Kankanhalli et al. 2005; Wasko and Faraj 2005; Watson and Hewett 2006). To understand how KMS could facilitate knowledge sharing, this paper focused

on identifying important KMS features that facilitate interaction among employees by drawing from KMS design and social network research. Particularly, I chose four KMS features, i.e., posting, making comments, rating and search. This study indicated the positive impact of use of certain KMS features on knowledge sharing via the development of employees' awareness network. Thus, this research suggests a new avenue for identifying critical KMS features, i.e., integrating KMS design literature and social network research to identify the features that can contribute positively to knowledge sharing.

Related yet distinct from the first contribution is the second contribution of this work—i.e., gaining a better understanding of knowledge sharing by integrating KMS use and leadership into the knowledge management literature. This study found the important role of transformational leadership in strengthening the relationship between use of specific KMS features and the development of employees' awareness network that contributes positively to knowledge sharing. This indicates that transformational leaders play an important role in facilitating the successful implementation of a KMS by motivating their employees to better leverage the KMS in developing their awareness network.

The third contribution of this research is that it expands the nomological network related to job outcomes by linking it to technology. We gain a better understanding of employees' job outcomes by incorporating IS research into management research. While management research has noted the positive impact of knowledge sharing on job outcomes, e.g., job performance (e.g., Morrison 2002; Quigley et al. 2007), little or limited research has integrated IS literature to understand the role of technology in

facilitating knowledge sharing and job outcomes. This paper identifies the role of technology, i.e., KMS use, in facilitating job outcomes via the development of awareness network, indicating the importance of incorporating IS research into management research to extend our understanding of job outcomes. The interdependent role of KMS use and leadership in facilitating the development of employees' awareness network provides us with further evidence that we gain insights about job outcomes by incorporating IS research into management research.

Fourth, this research extends our understanding of the role of transformational leadership in affecting job performance. While prior research has mainly focused on the direct effect of transformational leadership on job outcomes (e.g., Dvir et al. 2002) and its indirect effect mediated by other behavioral factors (e.g., Srivastava et al. 2006), this study complements prior research by examining transformational leadership as a moderating variable, thus providing us a more holistic understanding of the role of transformational leadership in affecting organizational behaviors. Particularly, I seek to understand the moderating role of transformational leadership in altering the effect of KMS use on the development of employees' awareness network that contributes positively to knowledge sharing and subsequent job performance. This study found that the positive impact of KMS use on the development of employees' awareness network was stronger at higher levels of transformational leadership.

Finally, the paper responds to research that calls for multi-level theorizing to gain a better understanding of the phenomena being investigated (Aubert et al. 2008; Hitt et al. 2007). It is important to understand the variance in the dependent variable explained by factors at the same level and those at higher levels (Hofman 1997; Klein and Kozlowski

2000). Prior research primarily takes a two-level approach in developing theory--e.g., individual and team levels or individual and organizational levels. This paper extends this type of work to a three-level approach for theory development. By integrating IS and management research related to KMS design, social network, knowledge sharing and leadership, I developed a three-level model to understand knowledge sharing and job outcomes. At the lowest level (i.e., dyadic), I sought to understand how awareness of dyads' areas of expertise affects knowledge sharing. At the next higher level (i.e., individual), I sought to understand how KMS use affects the development of employees' awareness network. At the highest level (i.e., business unit), I sought to understand how leadership shapes the relationship between KMS use and the development of employees' awareness network. Therefore, the three-level model helps us develop a holistic understanding of how different social and technology factors independently and interdependently affect knowledge sharing and job outcomes.

Limitations and Future Research

First, this research indicates it is important to use KMS features that facilitate interaction among employees. Future research should explore other features that can support interaction among employees and examine how leadership plays a role in affecting employees' use of those features to facilitate knowledge sharing. Second, to gain a more nuanced understanding of transformational leadership, future research should examine the sub-dimensions of transformational leadership, i.e., idealized influence, inspirational motivation, intellectual stimulation and individual consideration, instead of treating it as a unitary construct. Particularly, future research should examine how the effect of use of different KMS features on awareness of others' expertise varies across

different dimensions of transformational leadership. This may help us gain a richer

understanding of which sub-dimensions of transformational leadership are more effective

in strengthening the effects of various design features. Third, future research should

examine other contingency factors at different levels, e.g., team empowerment, team

cohesion and organizational climate, that may play a key role in shaping the relationships

between KMS design and awareness of others' expertise.

Practical Implications

As more and more organizations implement KMSs to facilitate knowledge

management, a strategic initiative to obtain competitive advantage, it is important for

organizations to reap the benefits of implementing such systems, e.g., enhance

employees' job outcomes, which has not been very successful in most organizations. One

major barrier to KMS success lies in the difficulties in leveraging KMSs to facilitate

knowledge sharing. This paper focuses on resolving such a barrier to KMS success. One

of the proposed solutions to organizations is that organizations should facilitate effective

use of a KMS, e.g., use the right features that would lead to positive job outcomes. In this

paper, I demonstrate use of three such KMS features, i.e., posting, making comments and

search, play an important role in facilitating knowledge sharing that contributes positively

to job outcomes. Organizations should facilitate the use of these KMS features that

support interaction among employees. Given that blogging and Wiki provide the above

mentioned features and blogging and Wiki have been incorporated as major components

of KMSs (e.g., Kane and Fichman 2009; McAfee 2006), organizations should encourage

their employees to blog or to use Wiki. Moreover, organizations should encourage

employees to use other KMS features that support interaction among employees.

A second suggestion for organizations is to provide effective management support during a KMS implementation. This work shows business unit leaders play a key role in affecting how employees use a KMS to facilitate knowledge sharing. Specifically, transformational leaders were effective in helping their employees better leverage a KMS. Organizational leaders should consider behaving in ways that exhibit transformational leadership actions, especially at times when they want to facilitate use of KMSs to facilitate knowledge sharing. Organizations should also consider planning ahead to construct an effective management team before the implementation of a KMS. They should consider hiring experienced leaders with transformational leadership from internal or external sources. Moreover, organizations should provide training to leaders to develop transformational leadership, especially during the implementation phase.

This study indicates the effect of knowledge seeking and knowledge providing on employee's job performance is both positive and significant, with the effect of knowledge seeking being slightly stronger on job performance than the effect of knowledge providing. While employees may understand performance enhancement as a result of seeking knowledge, they may not be aware that knowledge providing can also lead to better performance. Managers should consider advocating this benefit to motivate knowledge contribution. This study also indicates the effect of knowledge seeking and knowledge providing on employee's job satisfaction is both positive and significant, with the effect of knowledge providing being slightly stronger on job satisfaction than the effect of knowledge seeking. Managers can have employees who actively participate in knowledge providing share their experiences, e.g., why they feel more satisfied with their

jobs after contributing knowledge. When other employees learn that providing

knowledge can be satisfying, they may be more likely to contribute knowledge.

CONCLUSIONS

Given that knowledge management is of great importance to organization in

obtaining competitive advantage, it is critical for organizations to successfully implement

KMSs. This paper adds to the body of research on KMS implementations by addressing

one of the major challenges during the implementation a KMS, i.e., using KMS to

facilitate knowledge sharing. It integrates different theoretical perspectives related to

KMS design, social network, leadership and knowledge management to understand the

social and technology factors that affect knowledge sharing and job outcomes. It

conceptualizes these factors at three different levels—i.e., dyadic, individual and business

unit—to gain a holistic understanding of the phenomenon, thus helping organizations

better reap the benefits of a KMS. By addressing one of the major challenges of KMS

implementation, this research is of great value to both academia and practice.

CHAPTER 3

ESSAY 2

WE NEED FRIENDS: A MULTI-LEVEL APPROACH TO UNDERSTAND THE ROLE OF PEER SUPPORT IN FACILITATING KMS SUCCESS

ABSTRACT

A major challenge of knowledge management system (KMS) implementation lies in the knowledge barriers of learning the new technology. This paper focuses on examining one important social factor, i.e., peer support, that could help employees overcome such barriers. This paper develops a three-level model to understand the antecedents and consequences of peer support by incorporating technology, social and environmental factors. Specifically, this paper argues use of KMS features that support employees' interaction at the individual level will affect friendship building at the dyadic level, and IT governance structure in the form of employee participation at the business unit level will positively moderate this relationship. In addition, this paper theorizes a positive relationship between friendship tie strength and peer support at the dyadic level and positive relationships between peer support and job outcomes at the individual level. The model was largely supported in a field study among 1,441 employees in a large financial company. The paper concludes with theoretical and practical implications.

INTRODUCTION

Implementation of large scale of information technologies creates significant challenges for users because users need to overcome the knowledge barriers to learn the complex technologies with numerous features (Kanter 2000; Sykes et al. 2009). If users cannot overcome the knowledge barriers, they are less likely to leverage the technologies to their full functional potential. As a result, organizations would fail to realize the benefits of making large investment on the technologies (Davis and Venkatesh 2004; Jarsperson et al. 2005). Knowledge management systems (KMSs)—"a class of information systems applied to managing organizational knowledge" (Alavi and Leidner 2001, p. 114) are usually large and complex systems incorporated various technologies, such as graphical display, database, communication, and networking (Lee and Hong 2002), with hundreds and thousands of features. The alarming failure rate, i.e., over 70%, of KMS implementation (Akhavan et al. 2005; Butler and Murphy 2007) has made companies realized the importance of addressing this issue.

A commonly adopted approach by most organizations in helping employees overcome knowledge barriers is to offer employees formal training, usually right before the implementation of a new KMS (Sharma and Yetton 2007). One limitation of formal training is that employees may not be able to find time to attend the training (Goldman 2009; Goldstein 2000). Another limitation is that this type of training may not be able to cover all the problems employees would encounter in real jobs. The training section is not very long, usually one or two weeks. During such a short period of time, only the topics related to the basic or main features of the KMS are covered. Task variety requires

employees to use different features with varying proficiency levels but it is very difficult to deliver customized knowledge to different users in such a short period of training time.

While formal support mechanisms, such as IT help desks, can assist employees to resolve some problems of using a new KMS, the role of IT help desks is limited due to their high volume of workload and lack of business domain knowledge (Sykes et al. 2009). Under such circumstance, peer coworkers become an important and possibly the only resort employees can turn to. An important advantage of seeking help from coworkers is that coworkers have similar business knowledge and working experience that would ease the transfer of knowledge (Regans and McEvily 2003). Prior research has indicated the importance of peer support during system implementation (e.g., Sykes et al. 2009). In this paper, peer support is defined as seeking help from or providing help to coworkers during KMS implementation. Providing help to others is not without cost considering the time and effort one needs to spend (Markus 2001). Likewise, requesting help can incur interpersonal risks, such as acknowledgement of ignorance in certain areas (Borgatti and Cross 2003; Lee 1997; Tynan 2005), fear of loss of power and status (Gary 2001; Kankanhalli et al. 2005). People are more willing to provide help to and request help from those they have good relationships with due to higher level of trust that minimizes the interpersonal risks associated with peer support (e.g., Kane and Alavi 2008; Staples and Webster 2008). Friendship network indicates the strength of relationships among employees (e.g., Baldwin et al. 1997; Cho et al. 2007; Mehra et al. 2001; Yang and Tang 2003), thus shedding light on our understanding of how employees would seek help from and provide help to their coworkers, particularly in resolving the knowledge barriers of using a new KMS. Given that friendship network examines the

friendship tie strength between two individuals, i.e., a dyad, and peer support examines help seeking and providing between two individuals, both friendship network and peer support are conceptualized as dyadic-level constructs.

Prior research has identified many social factors that contribute to the development of friendship network, such as homophily (Ibarra 1992; McPherson et al. 2001) and social support (Krackhardt 1992). But the role of technology in affecting friendship networks has not been adequately understood. This becomes a pertinent and important research question in the context of KMS implementations because technology can be designed to facilitate employees' interaction (Zhang 2008a, 2008b). When employees use features of a KMS that supports employees' interaction, they are likely to interact with each other and hence, build friendships. This is consistent with prior research that examines the change of social structures as a result of technology implementations (DeSanctis and Poole 1994; Fulk and DeSanctis 1995; Jones and Karsten 2008). Thus, it is important to incorporate technology and examine its impact on friendship networks. In the context of a KMS implementation, we seek to understand how the use of specific KMS features affects employees' friendship networks. KMS use is conceptualized at the individual level and is represented by individual-level use of specific features.

The extent to which technology will affect a social structure, such as a friendship network, is largely dependent on the rules and procedures that govern the implementation of the technology (Jones and Karsten 2008). Given that IT governance establishes such rules and procedures with regard to decision-making authority, such as who makes IT decisions and who provides input for such decisions (Weill and Ross 2004), we include

IT governance structure to gain a better understanding of the impact of technology on friendship networks. Further, technology and IT governance could synergistically affect friendship networks such that IT governance can strengthen or depress the effect of technology on friendship network. If such synergies exist, unearthing them will go a long way toward helping organizations to better leverage KMS. IT governance structure is conceptualized at the business unit level such that we can gain a better understanding of its impact on the whole business unit.

In addition to understanding the role of technology and IT governance in affecting friendship networks, this study examines how friendship network facilitates peer support and how peer support affects job outcomes, i.e., job performance and job satisfaction. This work is expected to make important theoretical contributions. First, this work will contribute to research on KMS implementation by gaining a better understanding of how the technology, i.e., use of specific KMS features, and environmental, i.e., IT governance structure, factors affect friendship network. The second contribution of this research will be to develop a better understanding of the role of peer support in the context of KMS implementation. Third, this work will help develop a better understanding of the nomological network that links technology use to job outcomes.

THEORETICAL BACKGROUND

This section presents a brief overview of the literature in the major streams of research on which I draw: KMS use, friendship network and IT governance.

Knowledge Management System Use

KMSs are integrated set of IT tools used to facilitate organizational learning by capturing and disseminating knowledge (Damodaran and Olphert 2000). KMSs

incorporate diverse technological features to facilitate knowledge management (Alavi and Leidner 2001; Lee and Hong 2002). Use of certain KMS features lead to increased interaction among employees. When employees interact more with others, they are more likely to build relationships. Among the various features discussed in prior literature about KMS (e.g., Alavi et al. 2005; McAfee 2006; Poston and Speier 2005; Revere et al. 2007; Wagner 2004), I chose to examine *posting, making comments, rating* and *search* because they have been found to support employees' interaction (e.g., Gonzalez-Reinhart 2005; Grudin 2006; Kane and Fichman 2009). *Posting* is a feature designed to help employees express their thoughts and ideas online (e.g., Alavi et al. 2005; Kankanhalli et al. 2005). *Making comments* is a feature that allows employees to provide feedback to others' ideas and thoughts (e.g., McAfee 2006). *Rating* is a feature that allows employees to evaluate the importance and usefulness of others' ideas and thoughts (e.g., Poston and Speier 2005). *Search* is a feature that helps employees to locate required knowledge (e.g., Revere et al. 2007). Use of above features could facilitate dialog on existing topics or generate new dialog with other employees, resulting in more interaction with other employees and hence more opportunities to build relationships (Balkundi and Harrison 2006).

Friendship Network

Social network theory seeks to understand interpersonal interactions and relationships and provide analytical tools for studying these relationships (Bowler and Brass 2006). Friendship network is one type of social network, and examines the interrelationships that depict the affective bonds people develop for one another (Fehr 1996). It indicates the extent to which two people like each other, have similar

perspectives and outlooks on the importance of their relationship (Venkataramani and Dalal 2007). A strong relationship provides trust that leads to reciprocity (Dirks and Ferrin 2002; Levin and Cross 2004; Nahapiet and Ghoshal 1998), eases communication and increases confidence when interacting with others (Sturdy et al. 2006), all of which contribute positively to social exchange between two people, such as help seeking or help providing (Chia et al. 2006; Settoon and Mossholder 2002; Venkataramani and Dalal 2007).

IT Governance

IT governance refers to mechanisms of work systems that support IT implementation. It represents an organization's IT-related authority patterns with regard to directing, controlling and coordinating different IT activities, such as decisions on software/hardware platforms and application prioritization (Sambamurthy and Zmud 1999). Given that effective IT governance will enable firms to exploit the business potential of IT (Sambamurthy and Zmud 1999), IT governance plays an important role in affecting the success of IT implementations (Jasperson et al. 2005; Orlikowski 2000). The central goal of IT governance is to understand what the best structure or mode is for IT decision-making (Tiwana 2009). In the context of KMS implementation, decisions, especially in the initial phase of the implementation, on various issues, such as when and how to launch the new KMS and how to provide training, are generally made by the top management after consulting IT specialists. However, the ongoing use of a KMS is by employees from different business units. When they use the system, they develop better knowledge about the system, including the pros and cons of the system. They will have
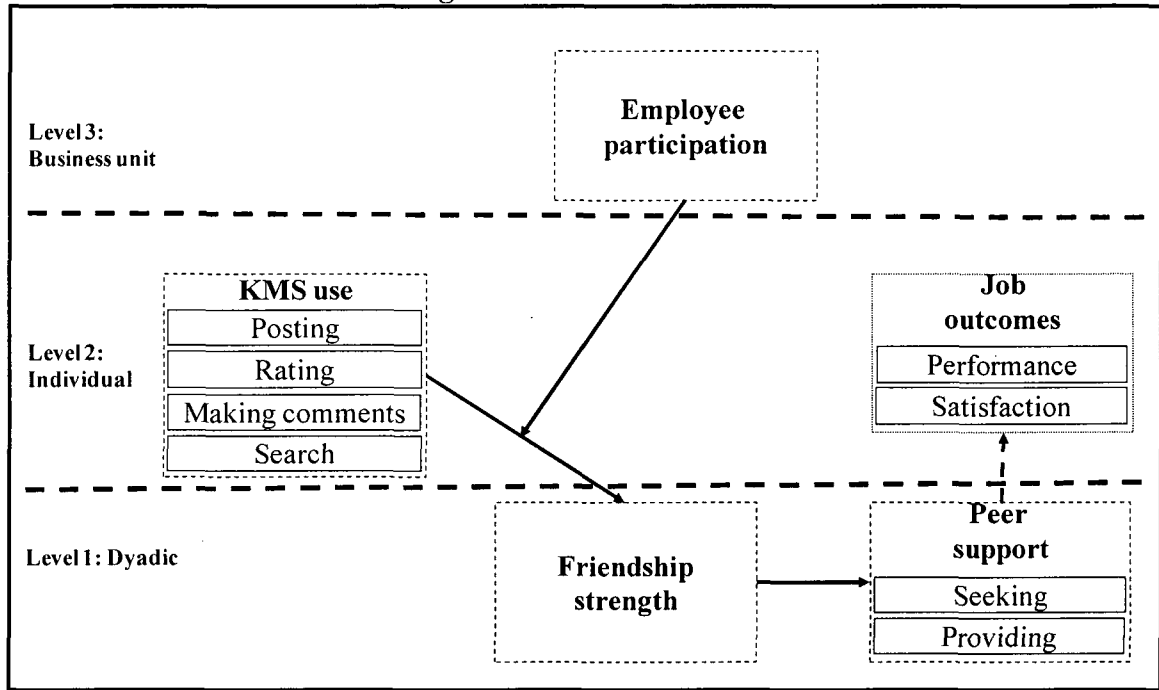
useful ideas or feedback that can be incorporated into the system, thus increasing the chance of success.

Thus, it is important to grant users the right to provide input for decision making during the KMS implementation. When employees use a KMS to resolve work-related problems, their feedback becomes valuable regarding how to improve the technological capability of the KMS. *Employee participation* refers to an IT governance structure that supports users' rights to provide feedback about their use of the KMS (Hunton and Price 1997; Ravichandran and Rai 2000). Particularly, employees are allowed to express their concerns about the capability of the system and make suggestions to improve the system. The fundamental argument that supports this structure of IT governance is that system users are the primary source of input for system improvement (He and King 2008). The main idea is to synchronize the efforts and input of various members (Sambamurthy and Zmud 1999; Weill and Ross 2004).

MODEL DEVELOPMENT

Figure 1 presents a three-level model that incorporates technology, i.e., KMS use, environmental, i.e., IT governance in the form of employee participation, and social, i.e., friendship network, factors to understand peer support and job outcomes. Specifically, I seek to understand how the use of certain KMS features (individual level) affects friendship strength in the friendship network (dyadic level), and how IT governance in the form of employee participation (business unit level) moderates the relationship between friendship strength and peer support (dyadic level) that in turn affects job performance (individual level).

Figure 1: Research Model

Level 3: Business unit		**Employee participation**	
Level 2: Individual	**KMS use** — Posting / Rating / Making comments / Search		**Job outcomes** — Performance / Satisfaction
Level 1: Dyadic		**Friendship strength**	**Peer support** — Seeking / Providing

Posting

The major purpose of posting is to express ideas or thoughts on a certain topic so as to initiate dialog with other employees on the topic (e.g., Alavi et al. 2005; Kankanhalli et al. 2005). When employees post thoughts and ideas, such postings are likely to be read by other employees. By reading postings, employees can learn about those who post. The content of the postings contains information about the posters' areas of interest, knowledge level in certain domain, or even personalities (e.g., Goldman et al. 2008). By reading the content of the postings, employees are likely to develop perceptions about those who post, even though they may have never met the posters. Postings can act like images of the posters and provide a channel for others to know more about the posters. For example, other employees may find that they share common interest with the posters or like the personalities of the posters, such as the posters' styles of expressing ideas and thoughts. Such common interests and favorable perceptions are

48

likely to create more opportunities for interaction and hence relationship building (Balkundi and Harrison 2006). The more employees post, the more likely they are known to others and the higher the chance of building their friendship network. Thus, I hypothesize:

Hypothesis 1a (H1a): Posting will be positively related to friendship strength.

I further argue the positive effect of posting on friendship strength will be strengthened with IT governance in the form of employee participation. Such an IT governance structure encourages employees to provide feedback on how to enhance the capabilities of the KMS. When using the KMS, employees will find deficiencies in the system that make them think the KMS is not reliable or inadequate to support their jobs (e.g., Prendinger et al. 2005). Consequently, employees are less motivated to use the KMS and when they actually use it, they may not be able to use the system effectively, such as use the right feature or fully the leverage benefits of a feature, because they do not have faith in the system. However, if employees are allowed to participate in improving the quality of the system, such as participating in a routine test of the system, reporting errors/bugs and requesting new functions, their motivation to use the system increases. More importantly, when they actually use the system, they pay more attention to the functionalities, exploring their pros and cons such that they can leverage the system more effectively. With respect to the posting feature, they are likely to make the best use of it. For example, they can use different presentation techniques, such as tables, graphics or animation, to make it easier for readers to understand their postings. They can also reveal their personalities by using words or electronic expressions (emotions) that clearly identify their characteristics such that their readers will develop strong impression about

them. All these increase the chance of interactions and relationship building. Thus, I hypothesize:

Hypothesis 1b (H1b): Employee participation will positively moderate the relationship between posting and friendship strength.

Making Comments

Making comments is a way to respond others' ideas and thoughts. I argue that making comments will be positively related to friendship strength. The fact that employees want to make comments on certain postings indicates their interest in certain topics. When employees share common interests, in this case, certain topics discussed in the postings, they are likely to interact more with each other, hence facilitating relationship building. Prior research has indicated people who have common interests are more likely to develop friendships (e.g., Lange 2007). In addition, when employees are interested in the postings, they are motivated to work harder (Locke 1997; Malone 1981; Mitchell 1997), such as exploring the knowledge domain related to the postings or finding out more information about the sources of the posting, including the credibility or reputation of the posters, before making comments. Consequently, they are likely to know better the people who post. Such knowledge will ease communication with the posters because the communication partners can talk about something they have in common. When people communicate freely and easily, they are more likely to be friends. Thus, I hypothesize:

Hypothesis 2a (H2a): Making comments will be positively related to friendship strength.

I further argue the positive relationship between making comments and friendship strength will be strengthened by employee participation. Employees could generate useful insights given that employees have direct experience with using the KMS

(Ravichandran and Rai 2000). Providing recommendations to improve the quality of the KMS and observing positive outcomes as a result of the recommendations strengthen employees' faith that the KMS can be configured or modified to support their jobs (Gefen and Ridings 2002). This motivates employees to learn more about the KMS and engage more in using the KMS to resolve work-related problems (Mory 2003; Scott 2002). Consequently, employees can better leverage various features of the KMS. When making comments, employees are likely to make a better use of this feature to communicate with the posters, such as using colorful or special fonts or other symbols to show their passion or interest in the postings, thus creating more opportunities for relationship building. Thus, I hypothesize:

Hypothesis 2b (H2b): Employee participation will positively moderate the relationship between making comments and friendship strength.

Rating

The rating feature provides employees an opportunity to judge the quality of others' ideas and thoughts (Poston and Speier 2005). In order to give an accurate assessment of the quality of others' ideas and thoughts, employees will spend some time perusing relevant domain knowledge or finding out more information about others. Consequently, they get to know more about the people for whom they would provide ratings. The more employees know about others, the better they can communicate with others. For example, if employees know the people for whom they provide ratings are domain experts in certain areas, the employees may approach these people by consulting advice or discussing relevant topics, thus making these people more comfortable and easier to engage in the conversation. As a result, they are more likely to develop friendships with others. Thus, I hypothesize:

Hypothesis 3a (H3a): Rating will be positively related to friendship strength.

I further argue the positive relationship between rating and friendship strength will be strengthened by employee participation. When employees are allowed to provide input to improve the quality of a KMS, they would think their knowledge and expertise are respected or positively evaluated (Kankanhalli et al. 2005). In addition, such participation could facilitate employees' identification and commitment to the organization (Meyer et al. 2006), resulting in the development of a higher level of morality manifested as an internalization of the organization's moral values and orientation of collectivistic values that transcend self-interest for the sake of the team or organization (Bass 1985; Dvir et al. 2002; Shamir 1991; Wagner 1995). Employees holding such values are more likely to think it is immoral to give inaccurate ratings while giving accurate ratings is an organizational citizenship behavior that contributes positively to individual- and organizational-level outcomes (Podsakoff et al. 2009). In order to provide accurate ratings, these employees are likely to spend more time understanding others' ideas and thoughts, resulting in knowing others better. Such knowing eases communication and facilitates relationship building. Consequently, the effect of rating on friendship strength will be stronger when the level of employee participation is high. Thus, I hypothesize:

Hypothesis 3b (H3b): Employee participation will positively moderate the relationship between rating and friendship strength.

Search

Search is a feature that helps employees find information or knowledge entered into the KMS by other employees to resolve work-related problems. When employees search for information or knowledge, they get to know better the people who contribute

the knowledge. As noted earlier, knowing others better would ease the communication with others that positively affects friendship building. When employees find the information or knowledge they are looking for and such information or knowledge helps to get their job done, they would not only value the information or knowledge but also develop respect for the people who provide the information and knowledge (Kankanhalli et al. 2005; Wasko and Faraj 2005). They are likely to develop favorable perceptions about the people who contribute the information and knowledge. Consequently, when employees interact or communicate with these knowledge contributors, they are likely to show respect or agreeableness. This will make the knowledge contributors feel comfortable and pleased. As a result, the knowledge contributors are more willing to interact with such employees, creating more opportunities for relationship building. Thus, I hypothesize:

Hypothesis 4a (H4a): Search will be positively related to friendship strength.

I further argue the positive relationship between search and friendship strength will be strengthened by employee participation. When employees are encouraged to provide input to enhance the quality of a KMS, they will be motivated to learn more about the KMS. As a result, they can better leverage the KMS to develop their friendship network. When they use the search feature, they are likely to know different aspects of the feature including various tips and tricks, e.g., how to group all the postings of similar topics. Not only are they more capable of finding the correct information or knowledge, but also they retrieve the information and knowledge easier and faster. Consequently, they are likely to know more about the knowledge contributors as well as know them

better, thus facilitating relationship building. This strengthens the positive effect of search on friendship strength. Thus, I hypothesize:

Hypothesis 4b (H4b): Employee participation will positively moderate the relationship between search and friendship strength.

Friendship Network and Peer Support

Giving help to others would cost time and effort. If such a behavior will not result in any benefit, e.g., reciprocity or the people who receive help return the favor in the future, people will be less motivated to engage in such risky behavior. A strong relationship indicates a higher level of trust between two people (Levin and Cross 2004; Tsai and Ghoshal 1998) and trust leads to willingness to accept vulnerability or engage in risky behaviors (Kim et al. 2009; Mayer et al. 1995). If person A has high trust in person B, person A is more likely to help person B because person A believes he or she can depend on person B for a favor in return in the future (Wasko and Faraj 2005). Prior research has found the desire for reciprocity positively affects knowledge providing (Bock et al. 2005). In addition, one's trust in another is likely to shape the extent to which help seekers will be forthcoming about their lack of competence (Borgatti and Cross 2003; Levin and Cross 2004), thus minimizing the negative effect of interpersonal risks, such as admitting ignorance (Borgatti and Cross 2003; Lee 1997; Tynan 2005) and fear of loss of power and status (Gray 2001; Kankanhalli et al. 2005), that create barriers for people to seek help. Further, help seekers who trust help providers' competence are more likely to seek help from the help providers. Prior research has indicated trust facilitates knowledge seeking and transfer (e.g., Cross and Sproull 2004; Levin and Cross 2004). Thus, I hypothesize:

Hypothesis 5 (H5): Friendship strength will be positively related to peer support.

Peer Support and Job Performance

An important hurdle to KMS implementations is that employees need to overcome the knowledge barrier that prevents them from leveraging the KMS efficiently and effectively. In addition to the formal support, such as training and IT help desk, employees rely heavily on their peers to learn a KMS. Even though organizations provide training to employees before the implementation of the KMS, the training period is usually too short to cover all the knowledge that employees need to know and the training is less likely to be customized to fulfill different needs of the trainees. Due to work schedule conflicts, not all employees can attend the available training. Compared to training, it could be easier to learn from coworkers. Coworkers are likely to have similar work experience and business knowledge. When coworkers help one another, they may explain things better by referring to similar terminologies or work scenarios, thus facilitating knowledge transfer (Reagans and McEvily 2003). Coworkers may have come across similar problems and may have fixed the problems such that these coworkers can use their own experience to help others. While employees may request assistance from the IT help desk, they may not be able to receive help in a timely manner due to the large workload of the help desk. In this case, help from coworkers could be obtained quickly. For instance, employees can talk to coworkers in the same office, chat with those they meet in the hallway or pick up a phone to find out answers quickly. Thus, peer support becomes an important source for employees to overcome the challenges they face during a KMS implementation, such as the knowledge barrier to learn the new system. When employees gain more help from their coworkers to resolve work-related problems, they are likely to perform better. Thus, I hypothesize:

Hypothesis 6 (H6): Peer support will be positively related to job performance.

Peer Support and Job Satisfaction

As noted in H5, peer support could enhance job performance. Enhanced job performance may result in promotion and pay increases that contribute positively to job satisfaction (Stamper and Masterson 2002). In addition, peer support is likely to make employees develop favorable perceptions about the organizational climate where employees are helpful to each other (Bock et al. 2005). Such a working climate is likely to make employees more satisfied with their jobs. Moreover, helping coworkers is likely to be positively evaluated by supervisors and coworkers because such behavior is deemed to make a positive contribution to the workplace (e.g., Piccolo and Colquitt 2006; Podsakoff et al. 1990). Such a positive evaluation creates more opportunities for career advancement, e.g., promotion, thus making employees feel more satisfied with their jobs (Stamper and Masterson 2002). Thus, I hypothesize:

Hypothesis 7 (H7): Peer support will be positively related to job satisfaction.

METHOD

This section provides information about the participants, measurement and data collection procedure.

Participants and Data Collection

I collected data in a large financial company that implemented a new KMS. Data were collected from seven business units, i.e., finance and budgeting, accounting, personnel, customer management, sales, advertising and public relations and government liaison with a sampling frame of 1,757 workers. 1,441 of them provided usable responses, resulting in a response rate of 82%, which is above the 80% response rate

threshold required for network analysis (Wasserman and Faust 1994). 1,051 of the respondents were men, with age ranging from 21 to 64 ($M = 38.55$ years, $SD = 7.76$ years). To assess non-response bias, the demographic differences between respondents and non-respondents were checked and no significant differences were found.

The timetable for data collection is shown in Figure 2. I collected individuals' demographic variables, e.g., age and gender, and other control variables, e.g., computer experience, computer self-efficacy and conscientiousness, two weeks before the implementation of the KMS. Use of design features, IT governance, friendship network and peer support were collected at about 9 months after the implementation of the KMS. I collected these data at about 9 months after the implementation of the KMS to follow the recommendation of prior literature (e.g., Markus and Tanis 2000). Prior literature indicates organizations are likely to go through a shakedown phase after implementing large information systems, such as enterprise resource planning system or KMS. During the shakedown phase, employees will be struggling with how to use the system, and there will be a steep learning curve that prevents them from leveraging the system effectively and efficiently. About 6 or 9 months later, employees will get more familiar with the system, they feel more comfortable of using the system and use of the system becomes stable. This is a good time to collect use data and network data.

To collect friendship network data, I created a roster for each business unit by asking the manager of each business unit to give me names of all the employees in the business unit. I asked employees to answer questions about other employees in the same business unit (Wasserman and Faust 1994). Participants were allowed to fill out the survey during normal business hours and then they were required to return the completed

survey within two weeks. The average time to fill out a social network survey was about

2 hours.

Figure 2: Data Collection Schedule

O	**X**	**X**	**O**	**X**	**O**
Demographics	KMS	KMS	Employee Participation	KMS	Job Performance
Control Variables	Implementation	Use	Use of Design Features	Use	Job Satisfaction
			Friendship Network		
			Peer Support		

Measurement	Measurement	Measurement
2 week	9 months	11 months

Two months later, I collected employees' job performance and job satisfaction

data to match the time when the company conducted their annual performance

evaluations. The 360-degree methodology was used to collect job performance data. This

methodology is commonly used in today's organizations to prevent bias and gain a more

accurate assessment of employee performance. Specifically, employees' job performance

was evaluated by their supervisors, coworkers, subordinates and employees themselves.

When employees evaluated their own performance, they also filled out a satisfaction

survey. I acquired the data from the external agency. Once I matched the performance

and satisfaction data with my survey data, I removed the employees' names to respect

confidentiality.

Measures

KMS Use

I obtained use data of each KMS feature from the system log. The counts of the

number of postings, comments, ratings and searches were generated. Such frequency

counts as a measure of use is commonly used in the IS literature (Straub et al. 1995;

Venkatesh et al. 2008).

58

Peer Support

For each pair of employees *(i, j), peer support in terms of help seeking* is assessed on a 5-point scale as the extent to which employee *i* turned to employee *j* for help using the item "Please indicate the employees below that you typically turn to for help during the implementation of the KMS" (Borgatti and Cross 2003; Cross and Cummings 2004). *Peer support in terms of help providing* is assessed as the extent to which employee *j* indicated that employee *i* turned to him/her for help using the item "Please indicate the employees below that typically turn to you for help during the implementation of the KMS" (Cross and Cummings 2004).

Friendship Network

Using the same scale as peer support, friendship strength was measured by asking employees to indicate their personal and/or social relationships with others in the network. The question used was "How would you rate your social relationship with..." This is consistent with the measurement approach of prior research (e.g., Baldwin et al. 1997; Mehra et al. 2001).

Employee Participation

Employee participation was measured using a 5-item, 7-point scale adapted from Ravichandran and Rai (2000) to fit the context of current study. Employees in a business unit were asked to rate the extent to which their unit supported employee participation during the implementation of the KMS. The measures of agreement among individuals' ratings produced a median r_{wg} of .75, an ICC(1) of .16 and an ICC(2) of .73. All these aggregation statistics were within the acceptable range of values summarized in the literature (Bliese 2000; James 1982).

Job Performance

Job performance was obtained using a 5-item scale that was used in the organization. The scale is adapted from prior research (e.g., Kraimer et al. 2005; Welbourne et al. 1998) to focus on overall job effectiveness. The data were gathered from the supervisor, peer coworkers, subordinates and the employees themselves. The multiple evaluators' ratings on these five items were aggregated and reported as a final rating ranging from excellent (7), very good (6), good (5), acceptable (4), needs improvement (3) to varying levels of probation (2, 1).

Job Satisfaction

Job satisfaction was measured using a 3-item scale (Morris and Venkatesh 2010).

Control Variables

The control variables included gender (coded as men=0), organizational tenure, rank and conscientiousness. Gender, organizational tenure and rank have been included in prior research that examines individual performance (Cross and Cummings 2004; Mehra et al. 2001). Conscientiousness is included because this personality trait is a consistent predictor of individual performance (Tett and Burnett 2003). It was measured using a short, 5-item version on a 7-point scale of the conscientiousness developed by Gosling et al. (2003).

RESULTS

Preliminary Analysis

Results of factor analysis confirmed the convergent and discriminant validity of the different scales. Reliabilities, descriptive statistics and correlations of different scales are presented in Table 1. Cronbach alpha of all scales was greater than .70, indicating

Table 1: Descriptive Statistics and Correlations

	Mean	S Dev	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	38.55	7.76	NA																
2. Gender (0: men)	.27	.44	.02	NA															
3. Tenure	4.45	1.20	.24***	-.15*	NA														
4. Rank (grades 1 to 16)	7.78	4.40	.23***	-.17**	.24***	NA													
5. Computer experience	12.40	6.80	.07	-.13*	.05	-.10	NA												
6. Computer self-efficacy	3.95	2.12	-.15*	-.24***	-.16*	-.13*	.23***	.70											
7. Conscientiousness	5.10	0.87	.13*	.08	.14*	.08	.07	.04	.74										
8. Friendship strength	16.80	7.60	.21***	.03	.20***	.02	.03	.02	.02	NA									
9. Peer support help seeking	4.10	1.81	.17**	.05	.19**	.05	.04	.04	.16**	.13*	.75								
10. Peer support help providing	4.23	1.55	.17**	.10	.20***	.02	.07	.10	-.13*	.17***	.17**	.73							
11. Posting	21.08	10.50	-.13*	-.15*	-.12*	-.10	.13*	.15*	.12*	.05	.15*	.17**	NA						
12. Rating	15.50	9.41	-.15*	-.23***	-.14*	-.13*	.12*	.10	.13*	.03	.18**	.20***	.17**	NA					
13. Making comments	17.10	6.31	-.16**	-.15*	-.14*	-.07	.15*	.16**	.15*	.02	.20***	.14*	.23***	.20***	NA				
14. Search	33.50	13.67	.05	.08	.03	-.02	.17**	.19**	.14*	.04	.14*	.12*	.20***	.21***	.17**	NA			
15. Employee participation	4.40	1.30	.18**	.08	.13*	.14*	.02	.02	.09	.02	.07	.08	.06	.04	.15*	.02	.78		
16. Job performance	4.89	1.71	.14*	-.10	.16**	.15*	.03	.08	.17**	.13*	.23***	.25***	.17**	.15*	.16**	.12*	.14*	.80	
17. Job satisfaction	4.13	1.53	.17**	.11*	.17**	.13*	.01	.03	.15*	.14*	.21***	.24***	.19**	.21***	.19***	.14*	.18**	.28***	.84

Notes:
1. n = 1,441.
2. Cronbach's alpha coefficients appear on the diagonal.
3. * p < .05; ** p < .01; *** p < .001.

61

internal consistency. As expected, each design feature was positively correlated to friendship strength but the relationships were not significant. Friendship strength was positively and significantly correlated to peer support. Peer support was positively and significantly correlated to job performance and job satisfaction. Employee participation was positively and significantly correlated to job performance and job satisfaction.

Hierarchical Linear Modeling

I used hierarchical linear modeling (HLM) to analyze the data because variables were measured at different levels, i.e., friendship strength and peer support at the dyadic level, design features, job outcomes and control variables at the individual level, and employee participation at the business unit level. HLM takes into account the nonindependence of observations, and adjusts the degrees of freedom to account for relationships (dyads) nested within individuals, and individuals nested within business units (Bryk and Raudenbush 1992; Singer and Willett 2003). Another assumption of using HLM is that there needs to be significant higher level unit variance in the outcome variable (Hofmann 1997; Hofmann et al. 2000). In this paper, this means it is necessary to examine if there is significant between-individual variance and between-business unit variance in friendship strength. Therefore, I tested the 3-level null model without predictors of friendship strength. Result indicated significance variance in friendship strength was explained by factors at both the business unit and individual levels, thus justifying our conceptualization of a 3-level model and use of HLM.

Model Testing

Table 2 presents the results of the model testing. 5% of the variance in friendship strength was explained by the control variables. None of the design features were

Table 2: Results

Dependent variables →	Tie strength			Peer support help seeking		Peer support help providing		Job performance		Job satisfaction	
R²	.05	.07	.20	.14	.27	.15	.29	.12	.28	.08	.26
ΔR²	.05**	.02	.12***	.14**	.13**	.15**	.14**	.12**	.16**	.08**	.18**
Control variables											
Age	.14*	.03	.03	.12*	.06	.09	.07	.07	.03	.13*	.08
Gender (0: men)	.02	.02	.01	.12*	.09	.14*	.13*	-.12*	-.07	.06	-.04
Tenure	.12*	.14*	.05	.03	.04	.07	.04	.13*	.04	.04	.03
Rank	.02	.01	.01	.04	.03	.06	.03	.04	.07	.05	.01
Computer experience				.06	.05	.15*	.10	.03	.01	.01	.00
Computer self-efficacy				.07	.04	.05	.03	.02	.02	.02	.00
Conscientiousness	.14*			.13*	.13*	-.20***	-.14*	.17**	.13*	.12*	.03
Main effects											
Posting		.02	.01								
Comments		.04	.01								
Rating		.04	.01								
Search		.03	.00								
Tie strength					.21***		.19**				
Peer support help seeking									.20***		.13*
Peer support help providing									.14*		.18**
Interaction effects											
Employee participation			.17**								
Posting x Employee participation			.15*								
Comments x Employee participation			.13*								
Rating x Employee participation			.20**								
Search x Employee participation			.23***								

Note:
1. If the area is in grey, variables are not included in the model test.
2. *p < .05; ** p < .01; *** p < .001.

significantly related to friendship strength. Adding the design features explained 7% of the variance in friendship strength. Thus hypotheses H1a, H2a, H3a and H4a were not supported. Adding employee participation as a cross-level moderator explained an additional 12% of variance in friendship strength over and above the model with only control variables and design features. Employee participation significantly moderated the effect of posting ($\gamma_{posting \times employee\ participation} = .17$, $p < .01$), making comments ($\gamma_{making\ comments \times employee\ participation} = .15$, $p < .05$), rating ($\gamma_{rating \times employee\ participation} = .20$, $p < .01$) and search ($\gamma_{search \times employee\ participation} = .23$, $p < .001$) on friendship strength, thus supporting hypotheses H1b, H2b, H3b and H4b.

I plotted the significant interactions (Figure 3) by following Aiken and West's (1991) guidelines to better understand the pattern of the interaction between use of these KMS features and employee participation. As we can see, the positive effect of KMS use on friendship strength is stronger for high levels of employee participation than it is for low levels of employee participation, thus suggesting employee participation amplifies the effect of KMS use on friendship strength. Although the direct effects of KMS use on friendship strength was not significant, the interactions were positive and significant, indicating when employees are allowed to make contributions to the decision-making on how to improve the quality of a KMS, it can greatly increase the effect of KMS use on friendship strength. Following Aiken and West (1991), I also tested the slopes of the lines representing employee participation at one standard deviation below and above the mean. Based on a t-test, I found the slopes of the lines representing high level of employee participation were significantly different from zero, indicating the significant effect of KMS use on friendship strength, but the slopes of the lines representing low level of

Figure 3: Interaction Plots

Figure 3(a). Effects of posting and employee participation on friendship strength
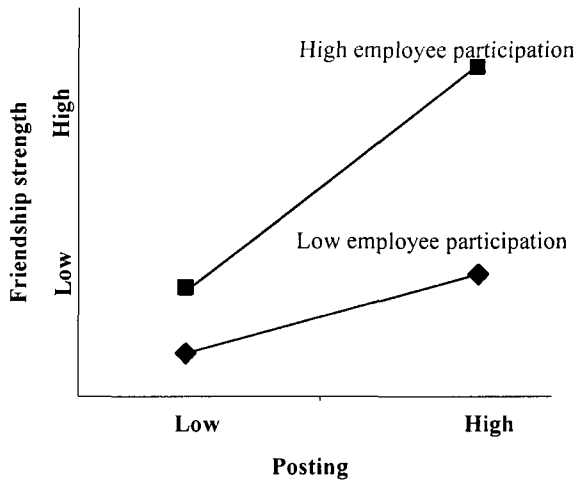

Figure 3(b). Effects of making comments and employee participation on friendship strength
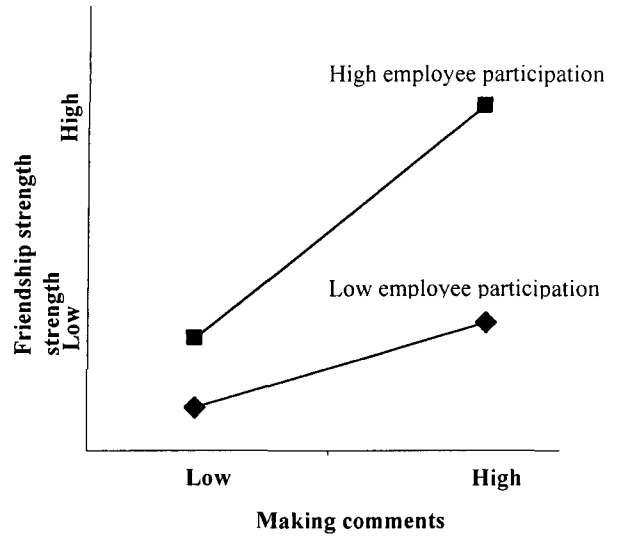

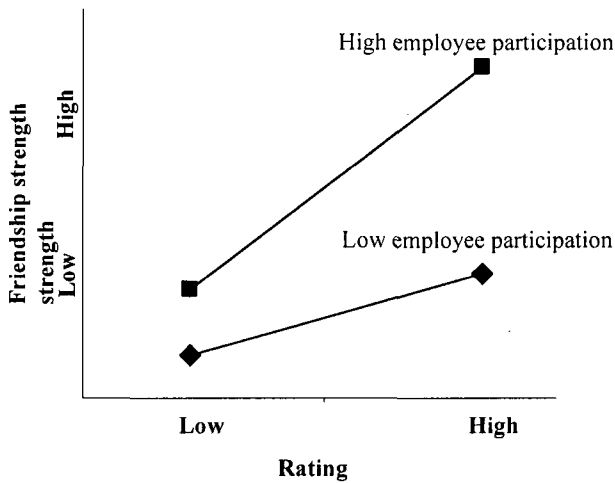### Figure 3(c). Effects of rating and employee participation on friendship strength
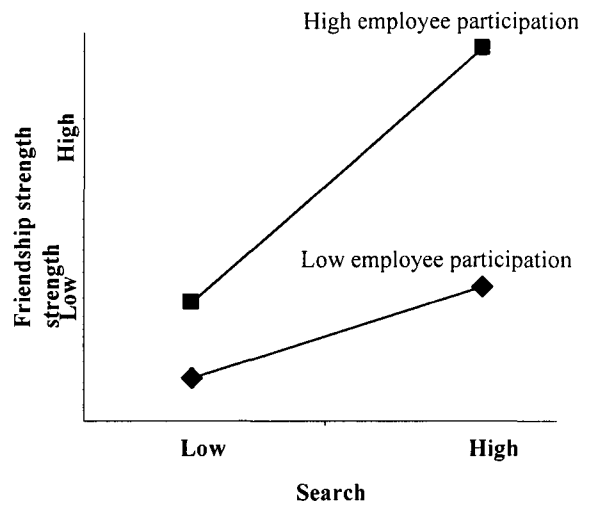

Figure 3(d). Effects of search and employee participation on friendship strength

employee participation were not significantly different from zero, indicating the effect of KMS use on friendship strength is not significant. Following Dawson and Richter (2006), I tested the slope differences between each two lines, one representing high level of employee participation and the other representing low level employee participation. Results indicated each of the two slopes were significantly different from each other, indicating tie strength varied across employees with different levels of employee participation.

With regard to the effect of friendship network on peer support, I found friendship strength was positively related to peer support in term of help seeking (β= .21, p < .001) and help providing (β= .19, p < .01) and the relationships were significant, thus supporting hypothesis 5. Peer support was positively related to job outcomes and the relationship was significant after controlling for individual differences. Specifically, peer support in terms of help seeking (β= .20, p < .001) and help providing (β= .14, p < .05) were positively and significantly related to job performance, thus supporting hypothesis 6. Similarly, peer support in terms of help seeking (β= .13, p < .05) and help providing (β= .18, p < .01) were positively related to job satisfaction, thus supporting hypothesis 7.

DISCUSSION

A big challenge of KMS implementations is the knowledge hurdle employees need to overcome during the implementation of a KMS. This research aimed to understand an important factor, i.e., peer support, that would help employees overcome this hurdle. It seeks to understand the antecedents of peer support in the context of a KMS implementation by incorporating technology, i.e., use of specific KMS features, environmental, i.e., IT governance structure in the form of employee participation, and

social, i.e., friendship network, factors, conceptualized at different levels, to gain a better understanding of their interdependent roles. Results indicate use of different KMS features would have significant and positive impact on relationship building when there is an IT governance structure that supports employee participation. In addition, the effect of peer support on job outcomes was examined and results indicated peer support positively affected job performance and job satisfaction.

Theoretical Implications

A few theoretical implications emerge from the empirical findings of this work. First, this work extends research related to KMS implementations. This study indicates the importance of integrating technology, environmental and social factors to understand their interdependent role in affecting KMS implementations. One insight gained from such an integrated view is that technology alone does not affect relationship building, an important antecedent of peer support that plays a critical role in affecting KMS success. To reap the benefits of a KMS implementation, an effective IT governance structure must be in place to encourage employees share their ideas and thoughts about how to improve the quality of the KMS. Under such an IT governance structure, employees are likely to use the KMS more effectively and efficiently to strengthen their friendship ties that in turn would lead to more peer support and hence positive job outcomes.

Related yet distinct from the first contribution is the second contribution of this work—i.e., gaining a better understanding of an important factor, namely peer support, in KMS implementation. This study identifies one important antecedent of peer support, i.e., friendship network, and examines the facilitators of a friendship network, i.e., KMS use and IT governance structure in the form of employee participation. In addition, this work

empirically tested the impact of peer support on job outcomes. Thus, this paper demonstrates the importance of peer support during KMS implementation and advances our understanding of this important factor by examining its nomological network. Given that peer support plays a critical role in affecting KMS implementations, it is important to further examine this factor so as to extend our understanding of this factor, such as finding out what the other antecedents are and how it would affect other outcomes related to KMS implementations.

The third contribution of this research is that it expands the nomological network related to job outcomes by linking it to technology. During KMS implementations, it is important to have a positive climate of peer support. But little or limited research has examined the role of technology in shaping such a climate. Understanding the role of technology becomes more relevant and critical in the context of KMS implementation because prior research has indicated technology implementations can change social structures, e.g., friendship network, that play an important role in affecting peer support (Baldwin et al. 1997; DeSanctis and Poole 1994; Fulk and DeSanctis 1995; Jones and Karsten 2008; Mehra et al. 2001). In addition, this paper identifies one important environmental factor, i.e., IT governance structure in the form of employee participation, and understands how it would interact with the technology factor, i.e., KMS use, in affecting the social structure, i.e., friendship network. The interdependent role of KMS use and IT governance structure in facilitating the development of friendship network provides us with further evidence that we would gain insights about job outcomes by incorporating technology, social and environmental factors.

Fourth, this research extends our understanding of the role of one important environmental factor, i.e., IT governance structure, in affecting KMS implementations. While prior research has mainly focused on understanding the direct effect of IT governance structure on technology improvement (He and King 2008; Ravichandran and Rai 2000), this study complements prior research by examining IT governance structure as a moderating variable. Particularly, I seek to understand the moderating role of IT governance structure in strengthening the effect of KMS use on friendship strength, an important facilitator of peer support that contributes positively to job outcomes. This study found that when organizations enforce an IT governance structure in the form of employee participation, employees are likely to leverage the KMS more effectively in strengthening their friendship ties.

Finally, this paper takes a multi-level approach to gain a better understanding of the phenomenon being investigated (Aubert et al. 2008; Hitt et al. 2007). A fundamental assumption of multi-level theorizing is that variance in the dependent variable can be attributed to factors at the same level and those at higher levels (Hofman 1997; Klein and Kozlowski 2000). The number of levels needed is dependent on the theoretical context but prior research mostly stops at two-levels in developing theory—e.g., individual and team levels or individual and organizational levels. This work spans to three levels for theory development. By integrating IS and management research related to KMS use, social network, peer support and IT governance structure, I develop a three-level model to understand KMS implementation. At the lowest level (i.e., dyadic), I sought to understand how friendship strength affects peer support. At the higher level (i.e., individual), I sought to understand how KMS use affects friendship strength. At the

highest level (i.e., business unit), I sought to understand how IT governance structure affects the relationship between KMS use and friendship strength. Therefore, the three-level model helps us develop a holistic understanding of how different environmental, social and technology factors independently and interdependently affect KMS implementation.

Limitations and Future Research

First, this research indicates that peer support plays a critical role in affecting the success of KMS implementation. This raises an important question of what facilitates peer support. Drawing from social network theory, the current research proposes friendship network as a potential facilitator. Future research should explore other potential facilitators by drawing from different literatures, e.g., procedural or distributive justice, task interdependence or organizational climate (e.g., Bock et al. 2005). Second, this research argues that use of certain features of a KMS would enhance friendship strength. The argument was supported only when organizations employ an IT governance structure in the form of employee participation. Future research should explore other KMS features and find out whether there is a direct relationship between the use of these features and friendship strength. In addition, it would be better to examine such a relationship in a longitudinal study to verify the causal relationship. Third, this research identifies IT governance structure as an important environmental factor that affects KMS implementations. Future research should examine how other environmental factors, such as an incentive system, would shape the effect of KMS use on friendship strength.

Practical Implications

The large investment in KMSs requires organizations to reap the benefits of implementing such systems, e.g., enhance employees' job outcomes (e.g., Sambamurthy and Subramani 2005; Shannak 2009). A big challenge for employees is to overcome the tremendous knowledge barriers in learning complex systems. Thus, it is important that employees can help each other during the implementation of a KMS. Current research found peer support positively enhanced job outcomes in the context of a KMS implementation. This has significant implications for organizations. When implementing new KMSs, organizations largely rely on formal training or IT help desks to help employees learn the new systems. This research suggests organizations should leverage not only the above formal mechanisms, but also the informal mechanisms, such as peer support, to facilitate learning of the new systems. Therefore, organizations should encourage peer support. For example, managers can allocate some time in regular business meetings for employees to help each other. Organizations can also think about how to use different incentives, e.g., monetary reward and recognition, to motivate peer support.

This research indicates employees are more likely to engage in peer support if they are friends. While there are many factors that could contribute to the development of friendship, organizations should pay more attention to those factors, i.e., KMS use and IT governance strurcure, that are more relevant in the context of KMS implementation. Although this study did not find a significant relationship between KMS use and friendship strength, I found that IT governance structure in the form of employee participation is an important contingency factor of such relationships. At high levels of

employee participation, the impact of KMS use on friendship ties was positive and significant. This suggests organizations should enforce such IT governance structure. In order to do so, organizations should think about creating opportunities for employees to contribute ideas and thoughts about how to improve the quality of the KMS. For example, organizations can hold face-to-face meetings or set up online discussion forums for employees to share ideas and discuss solutions.

A broader implication for managers is that the success of KMS implementation is not simply dependent on technology factors, such as KMS use or functional capabilities of the KMS. Social factors, such as friendship network and peer support, and environmental factors, such as IT governance structure in the form of employee participation, also play a critical role in affecting KMS success. Ignoring these factors is likely to result in failure. KMS implementation is complicated and requires management's attention to various aspects of different issues. Particularly, managers need to understand the complex relationships between various technology, social and environmental factors such that they can leverage these factors effectively and efficiently.

CONCLUSIONS

This work adds to the body of research on KMS implementations by developing a better understanding of the antecedents and consequences of peer support that plays a critical role in facilitating KMS success. It integrates different theoretical perspectives related to KMS use, social network and IT governance to understand the technology, social and environmental factors that affect peer support and job outcomes. It conceptualizes these factors at three different levels—i.e., dyadic, individual and business unit—to understand their interdependent role in affecting KMS implementation. Such an

integrated view not only helps us gain a more holistic view of the phenomenon but also fosters the development of an in-depth understanding of the relationships among various technology, social and environmental factors.

CHAPTER 4

ESSAY3

A SOCIO-TECHNICAL PERSPECTIVE TO UNDERSTAND THE IMPACT OF KNOWLEDGE MANAGEMENT SYSTEM USE ON JOB PERFORMANCE

ABSTRACT

This paper seeks to examine the under-researched relationship between knowledge management system (KMS) use and employees' job performance. Drawing from knowledge management literature, this paper identifies the mediational mechanisms, i.e., capability to leverage explicit knowledge and capability to leverage tacit knowledge, that link KMS use to job performance. It extends the traditional unitary conceptualization of KMS use to include not only frequency of use, but also cognitive absorption and breadth of use. It also draws from social network theory to identify an important contingency factor, advice network centrality, to understand the use-performance link. Specifically, this paper argues different types of KMS use are positively related to employees' capability to leverage explicit and tacit knowledge and such capability is positively related to job performance. In addition, this paper argues network centrality positively moderates the relationships between breadth of use and capability to leverage explicit and tacit knowledge. The theory was tested in a field study of 184 knowledge workers in one business unit of a large finance corporation. Results provide support for the theory that incorporates the mediational and contingency factors to understand the use-performance link. I discuss the scientific and practical implications, and outline directions for future research.

INTRODUCTION

The implementation of knowledge management systems (KMSs)—"a class of information systems applied to managing organizational knowledge" (Alavi and Leidner 2001, p. 114) is expected to bring in numerous benefits, such as improving strategic planning, reducing cost of employee training and increasing versatility of the workforce (Levinson 2007). At the individual level, a potential positive outcome is enhanced job performance (e.g., Sambamurthy and Subramani 2005; Shannak 2009). For example, Cisco built a KMS to allow its 250 newly hired service support managers to access and share critical information, significantly reducing their learning curve and time-to-efficiency. However, studies indicated over 70% of KMS failed and one important indicator of failure is that the use of KMS did not result in enhanced job performance (Akhavan et al. 2005; Butler and Murphy 2007).

The IS success model (DeLone and McLean 1992, 2003), a holistic nomological network that related system characteristics all the way to IS success conceptualized as downstream impacts of technologies on individuals and organizations, has been used as a theoretical lens to understand KMS success (e.g., Kulkarni et al. 2006; Wu and Wang 2006). The IS success model indicates the importance of examining the downstream impacts of technology use, such as employee job performance. One study that examined the relationship between KMS use and perceived performance enhancement did not find it to be significant (Wu and Wang 2006). This indicates there could be mediational mechanisms that could have been omitted. Therefore, identifying the meditational mechanisms could help us gain a better understanding of how KMS use affects job performance.

To perform better, employees need to utilize their skills or knowledge to accomplish their jobs. If employees can make the best use of their skills or knowledge, they are likely to perform better. To understand the impact of KMS use on job performance, we need to know whether and how KMS use will improve employees' capabilities to leverage their knowledge. Consistent with the knowledge management literature that distinguishes between explicit knowledge and tacit knowledge (Alavi and Leidner 2001; Nonaka 1994; Polanyi 1962, 1967), I conceptualize employees' capabilities to leverage knowledge into two dimensions: (1) capability to leverage explicit knowledge, defined as an employee's ability to exploit explicit knowledge; and (2) capability to leverage tacit knowledge, defined as an employee's ability to exploit tacit knowledge. These capabilities are examined as the mediational mechanisms between use and performance.

A KMS is more likely to enhance employees' capabilities to leverage explicit and tacit knowledge when employees use various features of the system (i.e., breadth of use). Prior research indicates breadth of use facilitates learning and enhances task performance (Burton-Jones and Straub 2006; Wan et al. 2008). But when employees use more features of the system, they could encounter more problems or questions about how to better leverage different features of the system, e.g., the pros and cons between different features (e.g., Kanter 2000). It is very challenging to resolve all the problems and questions without any help from coworkers (e.g., Sykes et al. 2009). The connections people have and how they interact with each other related to obtaining resources, such as advice (Nahapiet and Ghoshal 1998). The extent to which employees are connected, i.e., network centrality, affects how well they can access coworkers' advice (Ahuja et al.

2003; Sparrowe et al. 2004). The more advice they can get, the more likely they use such advice to resolve problems and questions associated with using various features of the system. Thus, I identify network centrality as an important contingency factor in affecting the relationship between breadth of use of the system and employees' capabilities to leverage knowledge.

The main objective of this paper is to understand how KMS use affects employees' job performance. Drawing from literature related to knowledge management (Alavi and Leidner; Argote and Ingram 2000; Becerra-Fernandez and Sabherwal 2001; Nonaka 1994) and social network theory (Borgatti 1995, 2005; Freeman 1999), this paper identifies the mediational processes and contingency factors that link KMS use to job performance. It takes a socio-technical perspective to understand this link. KMS use represents the technology factor and network centrality represents the social factor. By incorporating both social and technology factors in one study, we gain a better understanding of their interdependent role in affecting job performance.

This paper is expected to make important theoretical contributions. First, this work will add to the body of IS research related to KMS implementation by developing a better understanding of how to leverage a KMS to enhance job performance. Second, this paper extends the nomological network related to the IS success model by identifying the meditational and contingency factors that link technology use to job performance. Third, this paper contributes to knowledge management literature by developing a better understanding of the interdependent role of technology and social factors in affecting employees' capabilities to leverage knowledge.

THEORETICAL BACKGROUND

77

The section presents an overview of the theoretical background pertaining to KMS use, advice network and knowledge capability.

Rich Conceptualization of KMS Use

A KMS is an integrated set of IT tools used to support knowledge management (Damodaran and Olphert 2000). Knowledge repositories, such as a database system, data warehouse and digital library, are used to stock up knowledge, group support systems and Intranet are used as channels for knowledge sharing, data mining techniques and competitive intelligence systems are used for knowledge creation, and GUI with animation and multimedia technologies are used for knowledge application (Lee and Hong 2002). Although KMS use is expected to enhance job performance (e.g., Sambamurthy and Subramani 2005; Shannak 2009), there is little empirical evidence to support this relationship. To better understand the use-performance link, recent research suggests that it is imperative to look beyond the traditional lean conceptualizations of technology use that captures only the extent of the use behavior, such as use/nonuse, duration, frequency or extent of use (see Burton-Jones and Straub 2006). Rich conceptualization of use indicates the extent to which users employ different technology features and enjoy about using them (Agarwal and Karahanna 2000; Burton-Jones and Straub 2006; Saga and Zmud 1994). Rich conceptualization of use emphasizes user's level of involvement with the system—i.e., *cognitive absorption*—and the extent to which a system is used—i.e., *breadth of use* (Saga and Zmud 1994). Cognitive absorption is a situational intrinsic motivator (Agarwal and Karahanna 2000) and intrinsic motivation is generally thought to have a strong effect on behavioral outcomes (Vallerand 1997). Hence, cognitive absorption could have significant impact on use. A KMS might

78

have many features such that using the right features for the core aspects of the task is critical for task success. Breadth of use exposes employees to various features such that employees are likely to get familiar with different features and leverage the features more effectively. Therefore, KMS use is conceptualized to include *frequency of use*, *cognitive absorption* and *breadth of use*.

Advice Network Centrality

By definition, a social network refers to "a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the persons involved" (Mitchell 1969, p. 2). A social network approach describes pattern of interactions among people as a graph of connections (Newman 2002), with persons within a network being called nodes and relationships between actors being called ties. Nodes and ties form the structure of a social network and social network theory describes the network structure as resources for social action (Baker 1990; Bourdieu 1986; Burt 1992; Coleman 1988, 1990; Jacobs 1965; Loury 1987). A wealth of research has examined different types of networks (e.g., advice network) to understand how network structure affects interactions and behaviors (e.g., Baldwin et al. 1997; Borgatti and Cross 2003; Cho et al. 2007; Obstfeld 2005; Reagans and McEvily 2003; Yang and Tang 2003).

The core thesis of social networks research is that an individual's network position is a critical predictor of their behaviors (e.g., Burt 1992; Cross and Cummings 2004; Mehra et al. 2001; Sparrowe et al. 2001). In understanding the impact of social networks on individual behaviors, prior research has mainly focused on examining network centrality, a structural property that contributes to the acquisition of valuable

resources, such as advice and knowledge. Network centrality describes how individuals are connected and thus how they would interact with each other (Borgatti 2005; Freeman 1979). When people have high degree of network centrality, they have contacts with many others, increasing the opportunity of reaching useful resources, such as advice and knowledge (Ahuja 2003). In contrast, when people have low degree of centrality, they occupy peripheral positions in the network, resulting in being isolated from direct involvement with most others and having limited opportunity to access useful resources, such as advice and knowledge (Freeman 1979).

Knowledge Capability

Knowledge capability refers to an employee's ability to harness knowledge that has been mostly categorized into two dimensions, i.e., tacit and explicit (Alavi and Leidner 2001; Nonaka 1994; Polanyi 1962, 1967). Tacit knowledge is rooted in actions, experiences and involvement in specific context and explicit knowledge is articulated and generalized knowledge (Alavi and Leidner 2001; Zander and Kogut 1995). Explicit knowledge can be transmitted in formal, systematic language and tacit knowledge is hard to formalize and communicate (Nonaka 1994). The two dimensions of knowledge are not dichotomous states of knowledge, but mutually dependent and reinforcing qualities of knowledge in that tacit knowledge can serve as the basis of developing and understanding explicit knowledge (Alavi and Leidner 2001; Polyani 1975).

Understanding the taxonomy of knowledge is important for the conceptualization of capability to leverage knowledge. Consistent with the explicit-tacit knowledge taxonomy, capability to leverage knowledge is classified into two dimensions, i.e., capability to leverage explicit knowledge and capability to leverage tacit knowledge. Two

people may have same knowledge level, but their capabilities to apply the knowledge to generate desired outcomes could be substantially different. For example, two software programmers can have the same level of programming knowledge, but this does not mean they both can develop high quality software applications. When using their programming knowledge to develop software applications, one programmer may be more capable of leveraging such knowledge than the other programmer can, such as being more effective in time management or being more resilient in face of challenges, thus resulting in one programmer producing higher quality of outputs. Therefore, it is important to incorporate the concepts of capability to leverage explicit knowledge and capability to leverage tacit knowledge to understand how they mediate the use-performance link.

MODEL DEVELOPMENT

Figure 1 presents the research model that incorporates capability to leverage explicit knowledge and capability to leverage tacit knowledge as the mediational factors and advice network centrality as the contingency factor that explain the relationship between KMS use and job performance. Specifically, this model explains how different types of KMS use, i.e., frequency of use, cognitive absorption and breadth of use, affect employees' capabilities to leverage explicit and tacit knowledge, and how employees' advice network centralities would change the effect of breadth of use on employees' capabilities to leverage explicit and tacit knowledge. Finally, the paper examines how employees' capabilities to leverage explicit and tacit knowledge affect their job performance.

Figure 1: Research Model
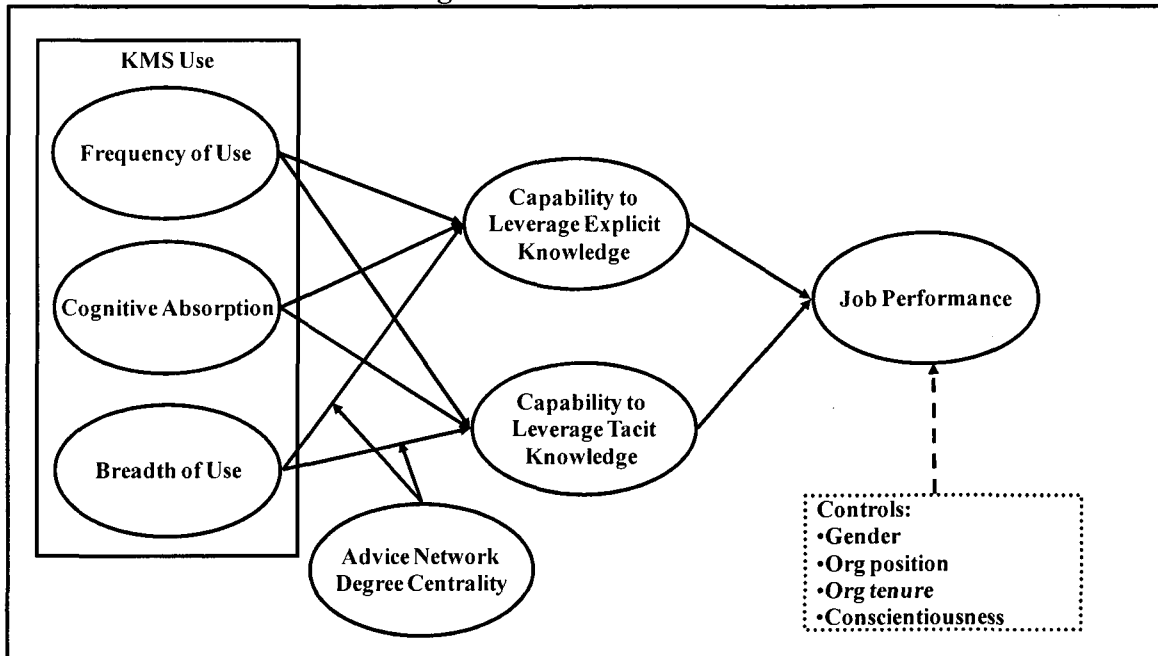
KMS Use and Knowledge Capability

Frequency of use. When employees find knowledge in the KMS that is relevant to their work, they would spend time on understanding the knowledge and attempt to apply that knowledge to improve their work. For example, after an employee reads a posting in a KMS about how to change the configuration of a software application to make it run more efficiently, the employee may try to apply the knowledge and figure out all the problems that he or she may encounter in the knowledge application process. Such a process will enhance the employee's capability to leverage the knowledge (e.g., Wan et al. 2008). The more instances an employee goes through such a process, the more likely the employee will improve his or her capabilities to leverage the knowledge. A KMS is mainly a repository of knowledge that has been codified, i.e., explicit knowledge (Alavi and Leidner 2001; Coff et al. 2006). When employees use a KMS frequently, they are

likely to explore more explicit knowledge and their capabilities to leverage such explicit knowledge are likely to be strengthened. Thus, I hypothesize:

Hypothesis 1a (1a): Frequency of use will be positively related to capability to leverage explicit knowledge.

I further argue that the more frequent employees use a KMS, the more capable they are to leverage tacit knowledge. Using a KMS not only makes employees get to know about the knowledge in the system, but also helps them get to know the people who post the knowledge. For example, when an employee reads a posting of how to fix a programming bug, the employee will not only seek to understand the content of the posting, but also find out more information about the person who posts the knowledge, such as the poster's domain of expertise and reputation, in order to validate the credibility of the source of the knowledge. The more frequent an employee uses the system, the more likely the employee will develop a knowledge map of who knows what (Austin 2003; Faraj and Sproull 2000; Lewis 2003, 2004; Moreland and Myaskovsky 2000). Such awareness of others' areas of expertise would facilitate interpersonal interaction between the employee and domain experts (Borgatti and Cross 2003; Cross and Cummings 2004). A domain expert can help the employee resolve challenges in leveraging tacit knowledge that is likely to be transferred via interpersonal interactions (Faraj and Sproull 2000; Maruping et al. 2009). Consequently, the employee's capability to leverage tacit knowledge is likely to be strengthened. Thus, I hypothesize:

Hypothesis 1b (H1b): Frequency of use will be positively related to capability to leverage tacit knowledge.

Cognitive absorption. Cognitive absorption describes the interaction between a user and technology (Agarwal and Karahanna 2000; Burton-Jones and Straub 2006). In this case, the technology refers to a KMS. It indicates a user's level of involvement with a

83

KMS—"a state of deep attention and engagement—i.e., the individual is perceptually engrossed with the experience" (Agarwal and Karahanna 2000, p. 667). Cognitive absorption has five dimensions: *temporal dissociation, focused immersion, heightened enjoyment, control* and *curiosity* (Agarwal and Karahanna 2000). According to Agarwal and Karahanna (2000), when users interact with a KMS: (1) they feel that they can manage the interaction (control); (2) they have a strong sense of inquisitiveness (curiosity); (3) they feel great pleasure in using it (heightened enjoyment); (4) they occupy themselves totally with it (focused immersion); and (5) they may not even realize how much time they have spent on it (temporal dissociation). When users really enjoy using a technology, they are less likely to feel bored or tired and they are more likely to work harder and longer (e.g., Locke 1997; Mitchell 1997). In addition, when users occupy themselves totally with a technology, they are less likely to be distracted (Naveh-Benjamin et al. 2007). Consequently, employees are likely to spend more time and engross themselves in exploring the knowledge in the system and figuring out how to better leverage the knowledge, thus strengthening their capabilities to leverage the knowledge. Given that a KMS mainly stores explicit knowledge (Alavi and Leidner 2001; Coff et al. 2006), cognitive absorption would improve employees' capabilities to leverage explicit knowledge. Thus, I hypothesize:

Hypothesis 2a (H2a): Cognitive absorption will be positively related to capability to leverage explicit knowledge.

I further argue there is a positive relationship between cognitive absorption and capability to leverage tacit knowledge. One dimension of cognitive absorption, i.e., curiosity, indicates that when employees use a KMS, their sensory and cognitive organisms are aroused (Malone 1981). In such a state, they become very inquisitive about

the knowledge and the people who contribute the knowledge. Prior studies indicated curiosity is a situational intrinsic motivator (Malone 1981) that could have significant impact on cognitive (concentration or attention, memory or conceptual learning), affective (interest, positive emotion, satisfaction, anxiety) and behavioral outcomes (persistence at task, intensity, complexity, performance) (Vallerand 1997). Driven by curiosity, employees would like to find out more information about people who contribute the knowledge, thus increasing their awareness of others' areas of expertise. As noted earlier, such awareness of others' areas of expertise contributes positively to the development of the capability to leverage tacit knowledge. Thus, I hypothesize:

Hypothesis 2b (H2b): Cognitive absorption will be positively related to capability to leverage tacit knowledge.

Breadth of use. Breadth of use, i.e., the number of features that is used, indicates the extent to which a KMS is used (Burton-Jones and Straub 2006; Saga and Zmud 1994). When employees use various features of a KMS, they are likely to benefit from the complementarities of these features that would facilitate their understanding and leveraging of the knowledge. For example, a KMS may have two features that store knowledge. One is similar to a traditional knowledge store where different types of knowledge, e.g., computer knowledge and business knowledge, are well categorized and structured. A knowledge store mainly keeps a concise description of all sorts of knowledge (Kulkarni et al. 2006). Another one is the electronic bulletin board or online discussion forum where employees post their thoughts and ideas. Knowledge stored in an electronic bulletin board or online discussion forum is less organized and structured because it is embedded in the content of the discussion and it is more informal. An employee may learn from the knowledge store that "MyDoom" is a computer virus

spread by email to install some form of backdoor component on a target machine. If the employee also uses online discussion forum, he or she may find out more information about "MyDoom" posted by other employees who may have been affected by the virus. These employees are able to provide more information about the virus, e.g., what backdoor components "MyDoom" will install, what functions of the computer will not operate properly when infected, how to remove the virus. In this case, the online discussion forum complements the knowledge store by helping employees better understand and leverage the knowledge. When employees use more features of a KMS to access explicit knowledge, they are more likely to take advantage of the complementary effect of these features in understanding and leveraging such knowledge. Consequently, their capabilities to leverage explicit knowledge will be strengthened. Thus, I hypothesize:

Hypothesis 3a (H3a): Breadth of use will be positively related to capability to leverage explicit knowledge.

I further argue there is a positive relationship between breadth of use and capability to leverage tacit knowledge. When employees use various features of a KMS, they are likely to be aware of the differences between these features, know the pros and cons of these features and become more proficient in using these features. For example, they are likely to know better which features should be used to support a specific task (Burton-Jones and Straub 2006; Goodhue and Thompson 1995). This indicates employees' skills in applying tacit knowledge, such as distinguishing between different contexts and appropriately applying the knowledge (Leonardi and Bailey 2008; Sole and Edmondson 2002), in this case, use the right feature to resolve the relevant problems, would grow as they use more features of a KMS. Thus, I hypothesize:

Hypothesis 3b (H3b): Breadth of use will be positively related to capability to leverage tacit knowledge.

Advice network centrality. When employees use more features of a KMS, they are likely to encounter more technical challenges in using the system (Kanter 2000; Sykes et al. 2009). If employees cannot overcome these challenges, they may not be able to achieve the positive outcomes resulting from breadth of use. For example, when employees are not familiar with the different search techniques used to locate the needed knowledge in different knowledge repositories, such as knowledge store or discussion forum, they are less likely to enjoy the complementary benefits of using these knowledge repositories. One potential benefit mentioned above is better understanding and leveraging explicit knowledge. When employees have a large number of contacts in their advice network, they have more people to whom they can turn for advice and the chance of resolving a problem, such as overcoming the technical challenges of using different features of a KMS, is higher. Consequently, these employees are more likely to achieve the positive outcome of breadth of use, i.e., enhanced capability to leverage explicit knowledge. In contrast, when employees have fewer contacts in their advice network, they will have less opportunity to resolve the technical challenges in using different features of a KMS. Consequently, these employees are less likely to enhance capabilities to leverage explicit knowledge. Thus, I hypothesize:

Hypothesis 4a (H4a): Advice network centrality will positively moderate the relationship between breadth of use and capability to leverage explicit knowledge.

Likewise, I argue advice network centrality will positively moderate the relationship between breadth of use and capability to leverage tacit knowledge. As noted in H3b, breadth of use can strengthen employees' capability to leverage tacit knowledge. The presumption is that employees need to know how to use different features

87

effectively. As noted in H4a, this presumption is more likely to be satisfied when employees have a large number of contacts in their advice network because these employees are more likely to gain help in resolving various challenges of using different features of a KMS. Thus, I hypothesize:

Hypothesis 4b (H4b): Advice network centrality will positively moderate the relationship between breadth of use and capability to leverage tacit knowledge.

Knowledge Capability and Job Performance

Capability to leverage explicit knowledge. Possessing certain explicit knowledge may not necessarily lead to enhanced job performance. To perform well, employees need to develop their capabilities to apply such knowledge in resolving work-related problems. For example, employees can learn how to make PowerPoint slides by attending training courses or reading user manuals, but this does not ensure that they can make high quality PowerPoint slides. In order to do so, they need to develop skills that help them better leverage their PowerPoint knowledge. For example, they need to know the font size, color and animation style that will be effective in presenting different content. Employees who have higher capabilities to leverage explicit knowledge have more experience and skills in applying such knowledge to accomplish their jobs (Dokko et al. 2008). They are likely to be more effective in transferring their knowledge into high quality outputs. Consequently, employees with higher capabilities to leverage explicit knowledge are likely to perform better. Thus, I hypothesize:

Hypothesis 5a (H5a): Capability to leverage explicit knowledge will be positively related to job performance.

Capability to leverage tacit knowledge. Likewise, knowing certain tacit knowledge may not necessarily lead to enhanced job performance. The key to perform well is to effectively apply the tacit knowledge in resolving work-related problems. For

example, junior sales people may learn a lot of tacit knowledge, such as different sales tactics (Alavi and Leidner 2001), from senior sales people, but this does not guarantee that the junior sales people will become good salespeople. Whether or not the junior sales people will become good salespeople is largely dependent on their capabilities to leverage the tacit sales knowledge. For example, good sales people may consider using different sales tactics on people with different personalities. Employees who have higher capabilities to leverage tacit knowledge have more experience and skills in applying such knowledge to complete their jobs (Dokko et al. 2008). They are likely to incorporate different contextual factors in developing work plans, adhering to work schedules, and monitoring and controlling the work progress so as to make changes whenever necessary (Shulkin 2009). Consequently, employees with higher capabilities to leverage tacit knowledge are likely to perform better. Thus, I hypothesize:

Hypothesis 5b (H5b): Capability to leverage tacit knowledge will be positively related to job performance.

METHOD

This section presents information about the participants, measurement and data collection procedure.
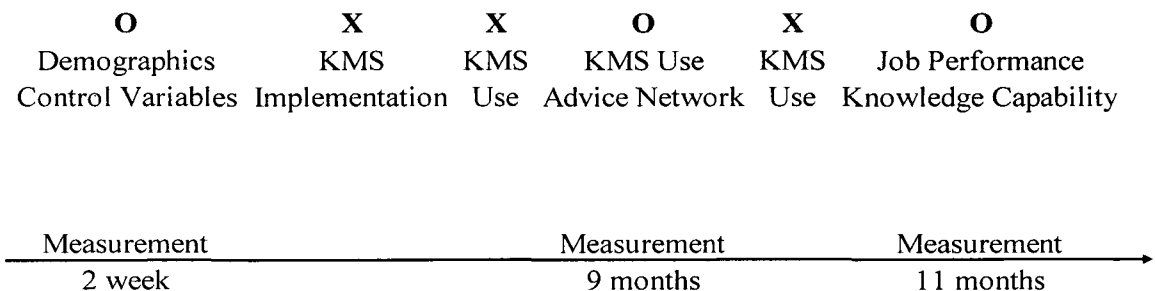
Participants and Data Collection

Data were collected from one business unit of a large finance company that implemented a KMS. Participants were knowledge workers, including software engineers, analysts and technical leads. Of the 220 participants, 184 (65 women) provided usable responses, resulting in a response rate of 83.6%, which is above the 80% response rate threshold required for social network analysis (Wasserman and Faust 1994). The age of the respondents ranged from 22 to 68 ($M = 44.61$ years, $SD = 13.29$ years).

No significant differences were found in demographics between respondents and non-respondents.

Figure 2 shows how the data were collected at different times. Two weeks before the implementation of the KMS, individual demographics and other control variables were collected, including age, gender, organizational position, organizational tenure and conscientiousness. About 9 months after the implementation of the KMS, data about different types of KMS use and advice network were collected. The timing of 9 months was chosen because prior literature indicates after the implementation of large information systems, such as enterprise resource planning system or KMS, organizations would go through a shakedown phase during which employees have lots of challenges in using the system and the use of the system is not stable (e.g., Markus and Tanis 2000; Morris and Venkatesh 2010). It will take about 6 or 9 months before employees get more familiar with the system and use of the system becomes more stable. This was a better time to collect use data and network data. I obtained the names of all the employees in the business unit to create a roster that was then used to collect data about the advice network in the business unit. The company allowed participants to fill out the survey during normal business hours and asked them to return the completed survey within two weeks. The average time to fill out the network survey was about an hours.

Figure 2: Data Collection Schedule.

O	**X**	**X**	**O**	**X**	**O**
Demographics	KMS	KMS	KMS Use	KMS	Job Performance
Control Variables	Implementation	Use	Advice Network	Use	Knowledge Capability

Measurement	Measurement	Measurement
2 week	9 months	11 months

About 2 months later, I collected knowledge capability (i.e., capability to leverage explicit knowledge and capability to leverage tacit knowledge) and employees' job performance data. The 2 months' time interval gives the time window to examine the impact of different types of KMS use on capability to leverage explicit knowledge and capability to leverage tacit knowledge. This was also the time when the company conducted their annual performance evaluations using the 360-degree methodology. This methodology is commonly used in today's organizations to prevent biases and gain a more accurate and complete assessment of individuals' performance. When the 360-degree methodology is used, employees' job performance is evaluated by their supervisors, peer coworkers, subordinates and employees themselves. The company sent the performance data to an external agency from whom I obtained the data. Once I matched the performance data with my survey data, employees' names were deleted to respect confidentiality.

Scale Development

To the best of my knowledge, there are no existing measures for capability to leverage explicit knowledge and capability to leverage tacit knowledge. I developed new scales for these constructs by following DeVellis' (2003) guidelines. Items for the constructs were derived from their conceptual definitions, descriptions and narratives of explicit and tacit knowledge and their applications found in prior literature (Alavi and Leidner 2001; Becerra-Fernandez and Sabherwal 2001; Bock et al. 2005; Coff et al. 2006; Nonaka 1994; Polanyi 1962, 1967; Regans and McEvily 2003; Subramaniam and Venkatraman 2001; Zander and Kogut 1995). I first generated the item pools and then asked domain experts to examine them and provide feedback based on which additions,

deletions or modifications were made to improve the content validity of these scales (Straub 1989). I recruited doctoral students to conduct a card sorting exercise to ensure that the newly developed scales and other scales were independent of each other. Following the card sorting exercise, I conducted a pilot test using 55 students and the pilot test showed the scales exhibited adequate convergent and discriminant validity.

Measures

KMS Use

I obtained *frequency of use* from the system log. Such frequency counts as a measure of use is commonly used in the IS literature (Straub et al. 1995; Venkatesh et al. 2008). *Cognitive absorption* was adapted from Agarwal and Karahanna (2000) and Burton-Jones and Straub (2006). *Breadth of use* was adapted from Burton-Jones and Straub (2006) and Saga and Zmud (1994).

Capability to Leverage Explicit Knowledge and Capability to Leverage Tacit Knowledge

I used two 4-item scales to measure capability to leverage explicit knowledge and capability to leverage tacit knowledge respectively. A 7-point Likert scale was used with "strongly disagree" and "strongly agree" as anchors. The scale of capability to leverage explicit knowledge had a reliability of .79 and the scale of capability to leverage tacit knowledge had a reliability of .80.

Advice Network Centrality

Advice network data were collected by asking employees the extent to which they seek advice or being sought out for advice from other employees on topics related to the KMS. For each pair in the advice network *(i, j)*, I assessed (1, "strongly disagree," to 5, "strongly agree") the extent to which person *i* claimed to turn to person *j* for advice

("Please indicate the people below that *you typically turn to* for advice on system-related topics") as well as whether person *j* indicated that person *i* turned to him/her for advice ("Please indicate the people below that *typically turn to you* for advice on system-related topics"). Among the different centrality measures, degree centrality was chosen because it indicates the number of direct contacts an employee has in the network (Borgatti 1995, 2005; Freeman 1979), thus well representing the underlying theoretical mechanisms discussed in this paper, i.e., the more direct ties, the more access to advice an employee has from these ties and the more likely the employee can resolve problems of using the KMS (e.g., Ahuja et al. 2003).

Job Performance

Job performance was adapted from prior research (e.g., Kraimer et al. 2005; Welbourne et al. 1998) to focus on overall job effectiveness. The data were gathered from the supervisor, peer coworkers, subordinates and the employees themselves. The multiple evaluators' ratings on these five items were then aggregated and reported as a final rating ranging from excellent (7), very good (6), good (5), acceptable (4), needs improvement (3) to probation (2, 1).

Control Variables

I included gender (coded as men=0), organizational tenure, organizational rank and conscientiousness as control variables that have been included in prior research to predict individual performance (Cross and Cummings 2004; Mehra et al. 2001). Conscientiousness is included because this personality trait is a consistent predictor of individual performance (Tett and Burnett 2003). It was measured using a short, 5-item version on a 7-point scale of the scale developed by Gosling et al. (2003).

RESULTS

Partial least squares (PLS), a structural equation modeling technique using a component-based approach designed to maximize the variance explained (Chin 1998b), was used for model estimation. This approach is less constrained by sample size and residual distributions (Chin 1998a, 1998b; Fornell and Bookstein 1982; Lohmoller 1989). The specific software package used in this study was Smart PLS. I first analyzed the measurement properties of the constructs by using confirmatory factor analysis (CFA). This included the estimation of internal consistency (reliability), and an assessment of the discriminant validity of the constructs. After identifying the measurement model, I tested the structural models.

Measurement Model

Results of confirmatory analysis (CFA) indicated adequate convergent and discriminant validity of the different scales. Item loadings of multi-item scales with reflective indicators were greater than .70 and cross-loadings were less than .30, suggesting internal consistency and discriminant validity (Fornell and Larcker 1981; Nunnally 1978). Internal consistency reliabilities (ICRs), descriptive statistics and correlations of different scales are shown in Table 1. All ICRs were greater than .70, thus indicating internal consistency. As expected, the relationships between different types of use and capability to leverage knowledge were positive and significant, except the relationship between breadth of use and capability to leverage explicit knowledge. Capability to leverage explicit knowledge ($r = .33$, $p < .001$) and capability to leverage tacit knowledge ($r = .40$, $p < .001$) were both positively related to job performance and the relationships were significant.

Table 1: Descriptive Statistics and Correlations

	Mean	S Dev	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	44.61	13.29	NA											
2. Gender (0 men)	.65	.48	-.04	NA										
3. Organizational position	4.24	2.06	-.01	-.13*	NA									
4. Organizational tenure	4.58	2.09	.04	-.08	.11	NA								
5. Conscientiousness	3.96	1.72	-.01	-.11	.01	.02	.76							
6. Frequency of use	11.99	6.63	.04	.03	-.04	.02	.09	NA						
7. Cognitive absorption	4.25	1.89	-.10	-.01	-.05	-.01	.01	.02	.71					
8. Breadth of use	4.38	1.94	.01	.04	.09	-.04	-.04	.03	-.11	.73				
9. Degree centrality	14.83	8.98	.09	.13*	.18***	.17**	.04	.17**	.09	.22***	NA			
10. Capability to leverage explicit knowledge	4.34	1.87	.02	.02	.01	.09	.19*	.25***	.31***	-.02	.18**	.79		
11. Capability to leverage tacit knowledge	4.40	2.02	.06	-.03	-.02	-.01	.18*	.39***	.34***	.34***	.17**	.35***	.80	
12. Job performance	5.09	1.86	-.01	-.04	.06	-.02	.17**	.23***	.22***	.30***	.23***	.33***	.40***	.71

Notes:
1. n = 184.
2. Internal consistency reliabilities (ICRs) appear on the diagonal.
3. * p < .05; ** p < .01; *** p < .001.

Structural Model

The path coefficients in a PLS model are interpreted as standardized beta weights in a regression analysis. Table 2 presents the results of the model testing. As shown in Table 2, KMS use (i.e., frequency of use, cognitive absorption and breadth of use) explained 20% of the variance in capability to leverage explicit knowledge. Frequency of use (β = .15, p < .05) and breadth of use (β = .22, p < .001) were both positively related to capability to leverage explicit knowledge, thus supporting H1a and H3a. Cognitive absorption (β = .04, p > .05) was not statistically significantly related to capability to leverage explicit knowledge. H2a was, therefore, not supported. KMS use explained 22% of the variance in capability to leverage tacit knowledge. Frequency of use (β = .13, p < .05), cognitive absorption (β = .15, p < .01) and breadth of use (β = .14, p < .05) were positively related to capability to leverage tacit knowledge, supporting H1b, H2b and H3b. Both capability to leverage explicit knowledge (β = .17, p < .01) and capability to leverage tacit knowledge (β = .23, p < .001) were positively related to job performance, thus supporting H5a and H5b.

To test the hypothesized interactions, breadth of use and advice network centrality were standardized prior to creating the interaction terms to reduce collinearity between the main effects and interaction terms (Chin et al. 2003; Goodhue et al. 2007). Results indicated advice network centrality positively moderated the relationship between breadth of use and capability to leverage explicit knowledge (β = .13, p < .05), thus supporting H4a. Adding advice network centrality as a moderator explained 25% of variance in capability to leverage explicit knowledge, a significant increase of 5% over and above the main effect model with control variables and three types of KMS use.

Table 2: Results

	Capability to leverage explicit knowledge			Capability to leverage tacit knowledge			Job performance			
	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b	Model 1c	Model 2c	Model 3c	Model 4c
R^2	.05	.20	.25	.05	.22	.30	.13	.21	.28	.30
ΔR^2		.15**	.05*		.17**	.08*		.08*	.15**	.17**
Control variables										
Age	.01	.02	.01	.06	.06	.04	-.01	-.02	-.01	-.03
Gender	-.01	-.01	-.01	-.04	-.03	-.02	-.01	-.01	-.01	-.02
Organizational position	.00	.00	.00	-.03	-.03	-.03	.05	.03	.05	.04
Organizational tenure	.11	.11	.11	-.03	-.04	-.02	-.04	-.05	-.04	-.06
Conscientiousness	.18*	.19*	.19*	.19*	.18*	.19*	.17**	.04	.06	.04
Main effects										
Frequency of use		.15*	.15*		.13*	.14*		.12*		.05
Cognitive absorption		.04	.05		.15**	.12*		.13*		.06
Breadth of use		.22***	.19**		.14*	-.02		.17**		.09
Advice network degree centrality			-.07			.13				
Capability to leverage explicit knowledge									.17**	.19**
Capability to leverage tacit knowledge									.23***	.25***
Interaction effects										
Breadth of use x advice network centrality			.13*			.19*				

Note:
1. If the area is in grey, variables are not included in the model test.
2. *p < .05; ** p < .01; *** p < .001.

97

Similarly, advice network centrality positively moderated the relationship between breadth of use and capability to leverage tacit knowledge (β = .19, p < .05), thus supporting H4b. Adding advice network centrality as a moderator explained 30% of variance in capability to leverage tacit knowledge, a significant increase of 8% over and above the main effects model with control variables and the three types of KMS use.

To better understand the pattern of the moderating effect of network centrality, I plotted the interactions by following Aiken and West's (1991) guidelines (Figure 3). Figure 3 indicates the positive effect of breadth of use on capability to leverage explicit and tacit knowledge is stronger for high degree of network centrality than it is for low degree of network centrality, thus suggesting network centrality strengthens the effect of breadth of use on capability to leverage explicit knowledge as well as tacit knowledge. Following Aiken and West (1991), I also tested the slopes of the lines representing network centrality at one standard deviation below and above the mean. A t-test indicates the slopes of the lines representing high degree of network centrality were significantly different from zero, indicating the significant effect of breadth of use on capability to leverage explicit knowledge and capability to leverage tacit knowledge, but the slopes of the lines representing low level of network centrality were not significantly different from zero, indicating the effects of breadth of use on capability to leverage explicit knowledge and capability to leverage tacit knowledge were not significant. The slope differences between each of the two lines in each interaction plot were tested following Dawson and Richter (2006), one representing high degree of network centrality and the other representing low degree of network centrality. I found that each of the two slopes were significantly different from each other, suggesting capability to leverage explicit

knowledge and capability to leverage tacit knowledge varied across employees with

different levels of network centrality.

Figure 3: Interaction Plots

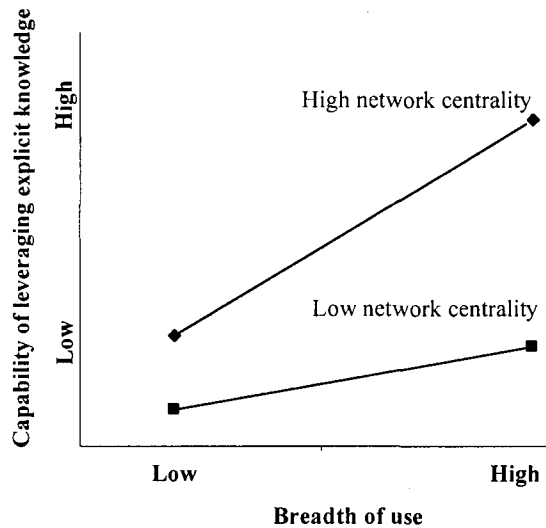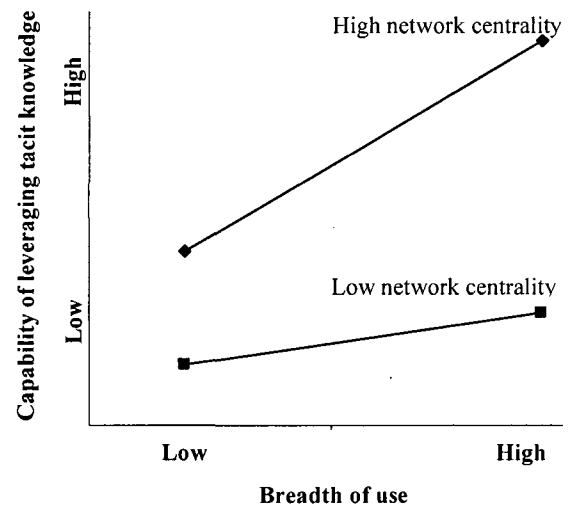| **Figure 3(a). Effects of breadth of use and network centrality on capability to leverage explicit knowledge** | **Figure 3(b). Effects of breadth of use and network centrality on capability to leverage tacit knowledge** |

Following Baron and Kenny (1986)'s guidelines, I tested the mediating role of

capability to leverage explicit knowledge and capability to leverage tacit knowledge by

examining the relationships between: (1) different types of use and capability to leverage

explicit knowledge and capability to leverage tacit knowledge (per the results of models

2a and 2b); (2) different types of use and job performance in the absence of capability to

leverage explicit/tacit knowledge (per the results of model 2c); and (3) different types of

use and job performance in the presence of capability to leverage explicit knowledge and

capability to leverage tacit knowledge. In step 2 (model 2c), we found mean frequency of

use (β = .12, p < .05), cognitive absorption (β = .13, p < .05), and breadth of use (β = .17,

p < .01) to be positively associated with job performance. However, once capability to

leverage explicit knowledge and capability to leverage tacit knowledge were entered into the model, the relationship between different types of use and job performance became non-significant (model 4c). Although this approach is conservative, the results suggest possible full mediation by capability to leverage explicit knowledge and capability to leverage tacit knowledge. To determine the extent to which the effects of the different use on job performance are carried through capability to leverage explicit knowledge and capability to leverage tacit knowledge, I conducted the more powerful Sobel test (MacKinnon et al. 2002). The results of the Sobel test indicate that capability to leverage explicit knowledge ($z = 2.21$, $p < .05$) and capability to leverage tacit knowledge ($z = 2.18$, $p < .05$) indeed fully mediated the relationships between different types of use and job performance.

DISCUSSION

This study seeks to understand the mediational processes that relate KMS use to job performance. The major finding of this study is that capability to leverage explicit knowledge and capability to leverage tacit knowledge mediated the effect of different types of KMS use (i.e., frequency of use, cognitive absorption and breadth of use) on job performance. In addition, I found that employees' network positions, i.e., advice network centralities, played an important role in strengthening the relationship between breadth of use of KMS and capability to leverage explicit knowledge and capability to leverage tacit knowledge. Particularly, when employees are widely connected, breadth of use enhanced employees' capabilities to leverage explicit knowledge and capabilities to leverage tacit knowledge.

Theoretical Implications

This study contributes to research in several ways. First, this work adds to the body of IS literature related to KMS implementations. One of the main objectives of implementing a KMS is to enhance job performance (e.g., Sambamurthy and Subramani 2005; Shannak 2009). But the impact of KMS use on job performance has not been adequately understood. This paper opens the black box that links KMS use to job performance by integrating different theoretical perspectives. Drawing from knowledge management literature, it identifies capability to leverage explicit knowledge and capability to leverage tacit knowledge as the important mediational mechanisms that link KMS use to job performance. It further identifies advice network centrality as an important contingency factor by drawing from social network theory. Thus, current research helps us gain a better understanding of the relationship between KMS use and job performance. This has significant implications for organizations that strive to enhance employees' job performance by making huge investments in KMSs.

Related to the first point, current research improves our understanding of the relationship between KMS use and job performance by extending the unitary conceptualization of KMS use to include three different types of KMS use, i.e., frequency of use, cognitive absorption and breadth of use. Such a rich conceptualization of KMS use helps us better understand the use-performance link. Specifically, we gain a better understanding of how different types of KMS use affect employees' capabilities to leverage different types of knowledge and how such capabilities influence job performance.

Third, this work extends the nomological network related to the IS success model (DeLone and McLean 1992, 2003). An important part of the IS success model is to relate

technology use to individual benefits, such as job performance. This work draws from knowledge management literature and social network theory to enrich our understanding of this phenomenon. Specifically, it underscores the mediating role of capability to leverage explicit knowledge and capability to leverage tacit knowledge in relating KMS use to job performance. In addition, it identifies employees' network positions, i.e., network centralities, as an important contingency factor that changes the effect of KMS use on capability to leverage explicit knowledge and capability to leverage tacit knowledge. This work is consistent with prior research that seeks to extend IS theory by integrating factors drawn from other theoretical perspectives, e.g., social network theory (e.g., Sykes et al. 2009).

Finally, current study helps us develops a better understanding of the interdependent role of technology and social factors in affecting knowledge management. This responds to the call for research on integrating technology and social factors in understanding knowledge management (Sambamurthy and Subramani 2005). In this paper, different types of KMS use represent the technology factors and network centrality represents the social factor. The interdependent role of technology and social factors in affecting knowledge management is investigated by examining the how the impact of breath of use on capability to leverage different types of knowledge would vary across employees with different degree of network centralities.

Limitations and Future Research

First, this research identifies capability to leverage explicit knowledge and capability to leverage tacit knowledge as important mediators of the relationship between KMS use and job performance. Prior literature has theorized how the two types of

102

knowledge are related to each other, such as how explicit knowledge is converted into tacit knowledge or vice versa (Alavi and Leidner 2001; Becerra-Fernandez and Sabherwal 2001; Nonaka 1994). Such a relationship between explicit and tacit knowledge has not been examined in the current research. Future research should incorporate such a relationship to better understand the use-performance link. Second, this paper identifies one important contingency factor, i.e., advice network centrality, and integrates it with KMS use to understand knowledge management. Future research should examine other potential social factors, e.g., fairness, affiliation (Bock et al. 2005), to enrich our understanding of the interdependent role of technology and social factors in affecting knowledge management. Third, the measure of breadth of use is a subjective measure and future research should also use objective measure, such as capturing the various features an employee uses from the system log. In addition, future research should extend the concept of breadth of use to capture not only number of features, but also the tasks that are supported by specific features (Burton-Jones and Straub 2006).

Practical Implications

Our study seeks to help organizations reap the benefits of a KMS implementation, an important one of which is to enhance employees' job performance. One important implication of this study is that organizations should facilitate breadth of use. Given that using a variety of features of a KMS can improve employees' capability to leverage explicit and tacit knowledge that contributes positively to their job performance, organizations should provide adequate training to their employees such that their employees know how to leverage more features of a KMS. For example, when training employees how to find a piece of knowledge, employees should not only be taught how

to use the knowledge store where knowledge is better categorized and structured, but also be taught how to search relevant information on an online discussion forum where knowledge is less organized and structured. Organizations should also motivate their employees to use various features of a KMS by using different approaches. One approach is to make their employees realize the benefits of using more features, e.g., the complementary effect of using a number of features. Another approach is to provide incentives, e.g., bonus, recognition, to facilitate breadth of use.

This study also indicates employees who have a large number of contacts in their advice network are more likely to obtain the benefits of breadth of use because these employees are more capable of accessing useful resources, e.g., advice, from coworkers to resolve challenges associated with using various features of a KMS. An important implication for organizations is that they should attend to employees who do not have a large number of contacts in their advice network. These employees are less likely to obtain advice from their coworkers on how to resolve challenges associated with using various features of a KMS. Organizations should consider allocating additional resources, such as more training, to these employees.

Because advice networks can help employees develop capabilities to leverage explicit and tacit knowledge that contributes positively to job performance, organizations should help employees expand their advice networks. Organizations should encourage employees to create more network connections so as to leverage the benefits of these connections. Organizations should promote the creation and sustenance of these networks by encouraging employees with no or small number of connections to interact with other employees through socialization activities. This is consistent with prior social networks

research that has made useful suggestions for organizations on nurturing value-creating interactions or engaging employees through community efforts (e.g., Cross et al. 2006).

CONCLUSIONS

The main purpose of this paper is to develop a better understanding of how to leverage a KMS to enhance job performance. It integrates different theoretical perspectives related to technology use, knowledge management and social networks to understand job performance. It underscores the importance of understanding the interdependent role of technology and social factors in affecting knowledge management and subsequent job performance. Such an integrative view enriches our understanding of the core underlying phenomenon.

CHAPTER 5

CONCLUSIONS

Theoretical Contributions

The major contribution of this research is to develop an integrated view of the social and technology factors in understanding KMS implementations. The social factors focus on understanding the interpersonal interactions among employees around knowledge sharing and peer support, and the role of management support and decision structure in explaining behavioral outcomes. The technology factors focus on examining the role of technology in facilitating knowledge management and enhancing job outcomes. By theorizing the interactive effect of these two sets of factors, this dissertation develops a rich understanding of the factors that affect KMS implementation. Next, I describe various specific contributions of this dissertation.

First, this dissertation adds to the body of IS literature related to KMS implementation (e.g., Kankanhalli et al. 2005; Wasko and Faraj 2005). Each essay draws from different theoretical perspectives to tackle different challenges of KMS implementations. It not only underscores the critical factors, e.g., knowledge sharing, peer support, in affecting KMS success, but also identifies facilitators of those critical factors, e.g., KMS use, social networks. Specifically, essay 1 incorporated literature related to KMS use, leadership and awareness network to understanding knowledge sharing and job outcomes. Essay 2 drew from literature related to KMS use, IT governance and friendship network to understand peer support and job outcomes. Essay 3 integrated literatures related to knowledge management and advice networks to understand the mediational processes and contingency factors that link KMS use to job

performance.

Second, this dissertation expands the nomological network related to job outcomes by linking it to technology (DeLone and McLean 1992, 2003). We develop a better understanding of employees' job outcomes by incorporating management research into IS research. By incorporating different social factors drawn from management literature, i.e., social networks, leadership and IT governance structure, we gain a better understanding of the relationship between technology and job outcomes, i.e., the effect of technology on job outcomes is dependent on different social factors.

Third, this dissertation extends knowledge management literature by developing a better understanding of the role of technology in affecting knowledge management. The main focus is to understand the impact of KMS use on knowledge sharing and application. In order to do so, I draw from different theoretical perspectives to understand KMS use. Essays 1 and 2 anchor on the design literature to understand how the use of different KMS features that support employees' interaction would affect knowledge sharing. Essay 3 draws from rich use literature to understand how different types of use would affect employees' capability to leverage explicit and tacit knowledge. The various conceptualizations of use provide us with different angles to examine the role of technology and thus help us develop a better understanding of its role in knowledge management.

Fourth, this dissertation contributes to management literature by enriching our understanding of the role of leadership and IT governance structure in affecting KMS implementation. Management literature has mainly focused on understanding the direct impact of leadership and IT governance structure in affecting employees' behavioral

outcomes. This dissertation complements this stream of research by examining the moderating roles of leadership and IT governance structure. Particularly, I examine the interactive effect of leadership and KMS use and the interactive effect of IT governance structure and KMS use in affecting employees' behavioral outcomes, thus extending our understanding of leadership and IT governance structure as important contingency factors affecting KMS implementation.

Finally, this dissertation incorporates various theoretical perspectives theorized at different levels to develop a holistic understanding of KMS implementation. It responds to research that calls for multi-level theorizing to gain a better understanding of the phenomena being investigated (Aubert et al. 2008; Hitt et al. 2007). While prior research primarily takes a two-level approach in developing theory—e.g., individual and team levels or individual and organizational levels, this paper extends this type of work to a three-level approach for theory development. By integrating IS and management research related to KMS use, leadership, IT governance structure, social network, knowledge sharing and peer support, essays 1 and 2 develop a three-level model to understand KMS implementation, thus helping us develop a holistic understanding of how different social and technology factors independently and interdependently affect KMS implementation.

Practical Implications

The main objective of this dissertation is to help organizations facilitate KMS implementation success. Based on the findings of this dissertation, I propose a few managerial interventions to support KMS implementation. First, I suggest that organizations should facilitate effective use of a KMS that would develop employees' skills to utilize knowledge and their social relationships. To strengthen employees'

capability to leverage explicit and tacit knowledge in enhancing job performance, organizations need to encourage employees to use various features of the system, i.e., breadth of use. To develop employees' awareness networks and friendship networks, organizations should facilitate use of the KMS features that support employees' interactions. Organizations can apply different approaches to facilitate effective use, such as providing adequate training to familiarize employees with various features of the KMS and underscoring the complementary effect of different features in facilitating knowledge transfer.

Second, this dissertation indicates the important role of social networks in helping employees deal with different challenges during KMS implementations. Different types of social networks bring in different benefits. Organizations should help employees develop their awareness network so that employees are more likely to engage in knowledge sharing behaviors that contribute positively to job performance. Organizations should also help employees develop their friendship networks so that employees are more likely to gain peer support to overcome the knowledge barriers of learning a new system. Moreover, organizations should help employees develop their advice networks so that employees are more likely to reap the benefits of breadth of use. Organizations can promote the creation and sustenance of different types of networks by encouraging employees to interact with others through socialization activities.

Third, organizations should provide effective management support during the implementation of a KMS. Essay 1 indicates transformational leaders play an important role in affecting KMS implementation by motivating employees to use the technology to develop their awareness network. Organizations should provide training to leaders to

develop their transformational leadership skills. Such training could use a case study methodology, e.g., comparing the managerial effectiveness resulting from performing transformational leadership and other types of leadership. Organizations should also consider constructing effective management teams comprising transformational leaders during the implementation of a KMS.

Finally, organizations should enforce an IT governance structure that supports employees' participation in improving the quality of the system. Employees' experience with the system is valuable input to improve the system. In order to do so, organizations can schedule regular meetings to allow employees to share their thoughts and feedback. For example, such meetings can bring up the discussion of the major challenges in using the system such that employees can share their thoughts and ideas of overcoming the challenges. To motivate employees to participate in improving the system, organizations can also use different incentives, e.g., bonus, promotion.

REFERENCES

Agarwal, R., and Karahanna, E. 2000. "Time Files When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," *MIS Quarterly* (24:4), pp. 665-694.

Ahuja, M. K., Galletta, D. F., and Carley, K. M. 2003. "Individual Centrality and Performance in Virtual R&D Groups: An Empirical Study," *Management Science* (49:1), pp. 21-38.

Aiken, L. S., and West, S. G. 1991. *Multiple Regression: Testing and Interpreting Interactions*, Thousand Oaks, CA: Sage.

Akhavan, P., Jafari, M., and Fathian, M. 2005. "Exploring Failure-Factors of Implementing Knowledge Management Systems in Organizations," *Journal of Knowledge Management Practice* (6), pp. 1-9.

Alavi, M., Kayworth T. R., and Leidner, D. E. 2005. "An Empirical Examination of the Influence of Organizational Culture on Knowledge Management Practices" *Journal of Management Information Systems* (22:3), pp. 191–224.

Alavi, M., and Leidner, D.E. 2001. "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues" *MIS Quarterly* (25:1), pp. 107-136.

Argote, L., and Ingram, P. 2000. "Knowledge Transfer. A Basis for Competitive Advantage in Firms," *Organizational Behavior and Human Decision Processes* (82:1), pp. 150-169.

Aubert, B., Barki, H., Patry, M., and Roy, V. 2008. "A Multi-Level, Multi-Theory Perspective of Information Technology Implementation," *Information Systems Journal* (18:1), pp. 45-72.

Austin, J. R. 2003. "Transactive Memory in Organizational Groups: The Effect of Content, Consensus, Specialization, and Accuracy on Group Performance," *Journal of Applied Psychology* (88:5), pp. 866-878.

Avolio, B., and Gibbons, T. C. 1988. "Developing Transformational Leaders: A Life Span Approach". In *Charismatic Leadership: The Elusive Factor in Organizational Effectiveness*, Gonger, J. A., and Kanungo, R. N. (Eds.), San Francisco: Jossey-Bass, pp. 276-308.

Baker, W. "Market Networks and Corporate Behavior," *American Journal of Sociology* (96:3), 1990, pp. 589-625.

Baldwin, T. T., Bedell, M. D., and Johnson, J. L. 1997. "The Social Fabric of a Team-Based M.B.A. Program: Network Effects on Student Satisfaction and Performance," *Academy of Management Journal* (40:6), pp. 1369-1397.

Balkundi, P., and Harrison, D. A. 2006. "Ties, Leaders, and Time in Teams: Strong Inference and Network Structure's Effects on Team Viability and Performance," *Academy of Management Journal* (49:1), pp. 49-68.

Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall.

Baron, R., and Kenny, D. A. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6), pp. 1173-1182.

Bass, B. M. 1985. *Leadership and Performance Beyond Expectations.* New York: Free Press.

Bass, B. M., and Avolio, B. J. 1995. *MLQ Multifactor Leadership Questionnaire for Research.* Redwood City, CA: Mind Garden.

Bass, B. M., and Avolio, B. J. 1990. "The Implications of Transactional and Transformational Leadership for Individual, Team, and Organizational Development". In *Research in Organizational Change and Development*, Woodman, R. W., and Pasmore, W. A. (Eds.). Greenwich, GT: JAI Press, pp. 231-272.

Becerra-Fernandez, I., and Sabherwal, R. 2001. "Organizational Knowledge Management: A Contingency Perspective," *Journal of Management Information Systems* (18:1), pp. 23-55.

Blau, P. 1964. *Exchange and Power in Social Life.* New York: Wiley.

Bliese, P. D. 2000. "Within-group Agreement, Non-independence, and Reliability: Implications for Data Aggregation and Analysis". In *Multi-level Theory, Research, and Methods in Organizations*, Klein, K. J., and Kozlowski, S. W. J. (Eds.) San Francisco: Jossey-Bass, pp. 349–381.

Bock, G. W., Zmud, R. W., Kim, Y. G., and Lee, J. N. 2005. "Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate," *MIS Quarterly* (29:1), pp. 87-111.

Bono, J. E., and Judge, T. A. 2003. "Self-concordance at Work: Toward Understanding the Motivational Effects of Transformational Leaders," *Academy of Management Journal*, (46:5), pp. 554–571.

Bordia, P., Irmer, B. E., and Abusah, D. 2006. "Differences in Sharing Knowledge Interpersonally and via Database: The Role of Evaluation Apprehension and Perceived Benefits," *European Journal of Work and Organizational Psychology,* (15:3), pp. 262-280.

Borgatti, S. P. "Centrality and AIDS," *Connections,* (18:1), 1995, pp. 112-124.

Borgatti, S. P. "Centrality and Network Flow," *Social Networks,* (27:1), 2005, pp. 55-71.

Borgatti, S. P., and Cross, R. 2003. "A Relational View of Information Seeking and Learning in Social Networks," *Management Science* (49:4), pp. 432-445.

Bourdieu, P. 1986. "The Forms of Capital," in *Handbook of Theory and Research for the Sociology of Education,* J. G. Richardson (ed.), Greenwood, New York, pp. 241-258.

Bowler, W. M., and Brass, D. J. 2006. "Relational Correlates of Interpersonal Citizenship Behavior: A Social Network Perspective," *Journal of Applied Psychology* (91:1), pp. 70-82.

Brass, D. J, Galaskiewicz, J., Greve, H. R., and Tsai, W. 2004. "Taking Stock of Networks and Organizations: A Multilevel Perspective," *Academy of Management Journal* (47:6), pp. 795-817.

Bryk, A., and Raudenbush, S. 1992. *Hierarchical Linear Models.* Newbury Park, CA: Sage Publications.

Burns, J. M. 1978. *Leadership.* New York: Harper & Row.

Burt, R. S. 1992. *Structural Holes: The Social Structure of Competition,* Cambridge, MA: Harvard University Press.

Burton-Jones, A., and Straub, D. W. 2006. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3), pp. 228-246.

Butler, B. S. 2001. "Membership Size, Communication Activity, and Sustainability: The Internal Dynamics of Networked Social Structures," *Information Systems Research* (12:4), pp. 346-362.

Butler, T. and Murphy, C. 2007. "Understanding the Design of Information Technologies for Knowledge Management in Organizations: A Pragmatic Perspective," *Information Systems Journal* (17:2), pp. 143-163.

Cabrera, A., Collins, W. C., and Salgado, J. F. 2006. "Determinants of Individual Engagement in Knowledge Sharing," *International Journal of Human Resource Management,* (17:2), pp. 245-264.

Chia, H., Foo, M., and Fang, R. 2006. "Workplaces as Communities: The Role of Social Networks in Who Seeks, Gives, and Accepts Information on Justice Issues," *Journal of Community Psychology* (34:3), pp. 363-377.

Chin, W. 1998a. "Issues and Opinion on Structural Equation Modeling," *MIS Quarterly* (22:1), March, pp. 7-16.

Chin, W. 1998b. "The Partial Least Squares Approach to Structural Equation Modeling," in *Modern Methods for Business Research,* G. A. Mar-coulides (ed.), Mahwah, NJ: Lawrence Erlbaum Associates.

Chin, W. W., Marcolin, B., and Newstead, P. R. 2003. "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study," *Information Systems Research* (14:2), pp. 189-217.

Cho, H., Gay, G., Davidson, B., and Ingraffea, A. "Social Networks, Communication Styles, and Learning Performance in a CSCL Community," *Computers & Education* (49:2), 2007, pp. 309-329.

Coff, R., Coff, D., and Eastvold, R. 2006. "The Knowledge Leveraging Paradox: How to Achieve Scale without Making Knowledge Imitable," *Academy of Management Review* (31:2), pp. 452–465.

Colbert, A. E., Kristof-Broiatn, A. L., and Bradley, B. H. 2008. "CEO Transformational Leadership: The Role of Goal Importance Congruence in Top Management Teams," *Academy of Management Journal* (51:1), pp. 81-96.

Coleman, J. S. 1990. *Foundations of Social Theory,* Cambridge, MA: Belknap Press of Harvard University Press.

Coleman, J. S. 1988. "Social Capital in the Creation of Human Capital," *American Journal of Sociology* (94), pp. 95-120.

Cross, R., and Cummings, J. N. 2004. "Tie and Network Correlates of Individual Performance in Knowledge-Intensive Work," *Academy of Management Journal* (47:6), pp. 928-937.

Cross, R., Laseter, T., Parker, A., and Velasquez, G. 2006. "Using Social Network Analysis to Improve Communities of Practice," *California Management Review* (49:1), pp. 32-60.

Cross, R., and Sproull, L. 2004. "More than An Answer: Information Relationships for Actionable Knowledge," *Organization Science* (15:4), pp. 446-462.

Damodaran, L., and Olphert, W. 2004. "Barriers and Facilitators to the Use of Knowledge Management Systems," *Behaviour & Information Technology* (19:6), 2004, pp. 405-413.

Davis, F. D., and Venkatesh, V. 2004. "Toward Preprototype User Acceptance Testing of New Information Systems: Implications for Software Project Management," *IEEE Transactions on Engineering Management* (51:1), pp. 31-46.

Dawson J. F, Richter, A. W. 2006. "Probing Three-way Interactions in Moderated Multiple Regression: Development and Application of a Slope Difference Test," *Journal of Applied Psychology* (91:4), pp. 917–926.

DeLone, W. H., and McLean, E. R. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-year Update," *Journal of Management Information Systems* (19:4), pp. 9-30.

DeLone, W. H., and McLean, E. R. 1992. "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research* (3:1), pp. 60-95.

DePaulo, B. M., and Fisher, J. D. 1980. "The Costs of Asking for Help," *Basic and Applied Social Psychology*, (1:1), pp. 23-35.

DeSanctis, G., and Poole, M. S. 1994. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science* (5:2), pp. 121-147.

De Vries, R. E., Van Den Hooff, B., and De Ridder, J. A. 2006. "Explaining Knowledge Sharing: The Role of Team Communication Styles, Job Satisfaction, and Performance Beliefs," *Communication Research* (33:2), pp. 115-135.

Dirks, K. T., and Ferrin, D. L. 2002. "Trust in Leadership: Meta-analytic Findings and Implications for Research and Practice," *Journal of Applied Psychology* (87:4), pp. 611-628.

Dokko, G., Wilk, S. L. and Rothbard, N. P. 2008. "Unpacking Prior Experience: How Career History Affects Job Perfomance," *Organization Science* (20:1), pp. 51-68.

Dvir, T., Eden, D., and Avolio, B. J. 2002. "Impact of Transformational Leadership on Follower Development and Performance: A Field Experiment," *Academy of Management Journal* (45:4), pp. 735-744.

Faraj, S. and Sproull, L. 2000. "Coordinating Expertise in Software Development Teams" *Management Science* (46:12), pp. 1554-1568.

Fehr, B. 1996. *Friendship Processes*. Thousand Oaks, California: Sage.

Fornell, C., and Bookstein, F. 1982. "Two Structural Equation Models: LISREL and PLS Applied to Consumer Exit-Voice Theory," *Journal of Marketing Research* (19:4), pp. 440-452.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39-50.

Freeman, L. 1979. "Centrality in Social Network: Conceptual Clarification," *Social Networks* (1:3), pp. 215-239.

Fulk, J. and DeSanctis, G. 1995. "Electronic Communication and Changing Organizational Form," *Organization Science* (6:4), pp. 337-349.

Fuller, J. B., Patterson, C. E. P., Hester, K., and Stringer, D. Y. 1996. "A Quantitative Review of Research on Charismatic Leadership," *Psychological Reports* (78:1), pp. 271–287.

Gefen, D., and Ridings, C. M. 2002. "Implementation Team Responsiveness and User Evaluation of Customer Relationship Management: A Quasi-experiment Design Study of Social Exchange Theory," *Journal of Management Information Systems* (19:1), pp. 47-69.

Goodhue, D., Lewis, W., and Thompson, R. 2007. "Statistical Power in Analyzing Interaction Effects: Questioning the Advantage of PLS with Product Indicators," *Information Systems Research* (18:2), pp. 211-227.

Goodhue, D. L., and Thompson, R. L. 1995. "Task-Technology Fit and Individual Performance," *MIS Quarterly* (19:2), pp. 213-236.

Gray, P. H. 2001. "The Impact of Knowledge Repositories on Power and Control in the Workplace," *Information Technology and People* (14:4) pp. 368-384.

Goldman. D. 2009. "Obama's Big Idea: Digital Health Records," *CNNMoney.com* (January 12). http://money.cnn.com/2009/01/12/technology/stimulus_health_care/.

Goldman, R. H., Cohen, A. P., and Sheahan, F. 2008. "Using Seminar Blogs to Enhance Student Participation and Learning in Public Health School Classes," *American Journal of Public Health* (98:9), pp. 1658-1663.

Goldstein, D. E. 2000. *E-Healthcare: Harness the Power of Internet E-Commerce & E-Care.*, Gaithersburg, MD: Aspen Publishers.

Gonzalez-Reinhart, J. 2005. "Wiki and the Wiki Way: Beyond a Knowledge Management Solution," *Information Systems Research Center*, February. pp. 1-22.

Gosling, S. D., Rentfrow, P. J., and Swann, W. B., Jr. 2003. "A Very Brief Measure of the Big Five Personality Domains," *Journal of Research in Personality* (37:6), pp. 504-528.

Greguras, G. J., and Diefendorff, J. M. 2009. "Different Fits Satisfy Different Needs: Linking Person-Environment Fit to Employee Commitment and Performance Using Self-Determination Theory," *Journal of Applied Psychology* (94:2), pp. 465-477.

Griffin, R. W., Bateman, T. S., Wayne, S. J., and Head, T. C. 1987. "Objective and Social Factors as Determinants of Task Perceptions and Responses: An Integrated Perspective and Empirical Investigation," *Academy of Management Journal* (30:3), pp. 501-523.

Grudin, J. 2006. "Enterprise Knowledge Management and Emerging Technologies," in Proceedings of the 39th Hawaii International Conference on System Science (HICSS-39).

Hansen, M. T., Mors, M. L., and Løvås, B. 2005. "Knowledge Sharing in Organizations: Multiple Networks, Multiple Phases," *Academy of Management Journal* (48:5), pp. 776–793.

He, W., Fang, Y., and Wei, K. 2008. "The role of Trust in Promoting Organizational Knowledge Seeking using Knowledge Management Systems: An Empirical Investigation," *Journal of the American Society for Information Science and Technology* (60:3), pp. 526-537.

He, J., and King, W. R. 2008. "The Role of User Participation in Information Systems Development: Implications from a Meta-analysis," *Journal of Management Information Systems* (25:1), pp. 301–331.

Hitt, M. A, Beamish, P. W, Jackson S. E., and Mathieu J. E. 2007. "Building Theoretical and Empirical Bridges across Level: Multilevel Research in Management," *Academy of Management Journal* (50:6), pp. 1385–1399.

Hofmann, D. A. 1997. "An Overview of the Logic and Rationale of Hierarchical Linear Models," *Journal of Management* (23:6), pp. 723-744.

Hofmann, D. A., Griffin, M. A., and Gavin, M. B. 2000. "The Application of Hierarchical Linear Modeling to Organizational Research," In *Multilevel Theory, Research, and Methods in Organizations: Foundations, Extensions, and New directions,* Klein, K. and Kozlowski, S. (Eds.) San Francisco: Jossey-Bass. pp. 467–511.

Hollingshead, A. 1998. "Retrieval processes in Transactive Memory Systems," *Journal of Personality and Social Psychology* (74:3), pp. 659-671.

Hunter, L. W., and Thatcher, S. M. B. 2007. "Feeling the heat: Effects of Stress, Commitment, and Job Experience on Job Performance," *Academy of Management Journal* (50:4), pp. 953-968.

Hunton, J. E., and Price, K. H. 1997. "Effects of the User Participation Process and Task Meaningfulness on Key Information System Outcomes," *Management Science* (43:6), pp. 797-812.

Ibarra, H. 1992. "Homophily and Differential Returns: Sex Differences in Netowrk Structure and Access in an Advertising Firm," *Administrative Science Quarterly* (37:3), pp. 422-447.

Jacobs, J. 1965. *The Death and Life of Great American Cities,* London: Penguin Books.
James, L. R. 1982. "Aggregation Bias in Estimates of Perceptual Agreement," *Journal of Applied Psychology* (67:2), pp. 219-229.

Jasperson, J., Carter, P. E., and Zmud, R. W. 2005. "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems," *MIS Quarterly* (29:3), pp. 525-557.

Jones, M., and Karsten, H. 2008. "Giddens's Structuration Theory and Information Systems Research," *MIS Quarterly* (32:1), pp. 127-157.

Judge, T. A., and Piccolo, R. F. 2004. "Transformational and Transactional Leadership: A Meta-Analytic Test of their Relative Validity," *Journal of Applied Psychology,* (89:5), pp. 755-768.

Kane, G. C., and Alavi, M. 2008. "Casting the Net: A Multimodal Network Perspective on User-System Interactions," *Information Systems Research* (19:3), pp. 253-272.

Kane, G. C., and Fichman, R. G. 2009. "The Shoemaker's Children: Using Wikis for Information Systems Teaching, Research, and Publication," *MIS Quarterly* (33:1), pp. 1-17.

Kankanhalli, A., Tan, B. C. Y., and Wei, K. 2005. "Contributing Knowledge to Electronic Knowledge Repositories: An empirical investigation," *MIS Quarterly* (29:1), pp. 113-143.

Kanter, J. 2000. "Have We Forgotten the Fundamental IT Enabler: Ease of Use?" *Information Systems Management* (17:3), pp. 70-77.

Kim, D. J., Ferrin, D. L., and Rao, H. R. 2009. "Trust and Satisfaction, Two Stepping Stones for Successful E-Commerce Relationships: A Longitudinal Exploration," *Information Systems Research* (20:2), pp. 237-257.

Kim, S., and Lee, H. 2006. "The Impact of Organizational Context and Information Technology on Employee Knowledge-sharing Capabilities," *Public Administration Review* (66:3), pp. 370-385.

Klein, K. J., and Kozlowski, S. W. J. 2000. "From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multi-level Research," *Organizational Research Methods* (3), pp. 211-236.

Krackhardt, D. 1992. "The Strength of Strong Ties: The importance of Philos in Organizations," in *Networks and Organizations,* N. Nohria and R. Eccles (eds.), Harvard Business School Press, Boston, pp. 216-239.

Kraimer, M. L., Wayne, S. J., Liden, R. C., and Sparrowe, R. T. 2005. "The Role of Job Security in Understanding the Relationship between Employees' Perceptions of Temporary Workers and Employees' Performance," *Journal of Applied Psychology* (90:2), pp. 389-398.

Kulkarni, U. R., Ravindran, S., and Freeze, R. 2006. "A Knowledge Management Success Model: Theoretical Development and Empirical Validation," *Journal of Management Information Systems* (23:3), pp. 309-347.

Lange, P. 2007. "Publicly Private and Privately Public: Social Networking on YouTube," *Journal of Computer-Mediated Communication* (13:1), pp. 361-380.

Lee, F. 2002. "The Social Costs of Seeking Help," *Journal of Applied Behavioral Science* (38:1), pp. 17-35.

Lee, S. M., and Hong, S. 2002. "An Enterprise-Wide Knowledge Management System Infrastructure," *Industrial Management & Data Systems,* (102:1/2), pp. 17-25.

Lee, F. 1997. "When the going gets tough, do the tough ask for help? Help Seeking and Power Motivation in Organizations," *Organizational Behavior and Human Decision Processes* (72:3), pp. 336-363.

Leonardi, P. M., and Bailey, D. E. 2008. "Transformational Technologies and Creation of New Work Practices: Making Implicit Knowledge Explicit in Task-based Offshoring," *MIS Quarterly* (32:2), pp. 411-436.

Levin, D. Z., and Cross, R. "The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer," *Management Science* (50:11), 2004, pp. 1477-1490.

Levinson, M. 2007. "ABC: An Introduction to Knowledge Management (KM)," *http://www.cio.com/article/40343/ABC_An_Introduction_to_Knowledge_Managemen t_KM_/1.* Accessed 2010.

Lewis, K. 2004. "Knowledge and Performance in Knowledge-worker Teams: A Longitudinal Study of Transactive Memory Systems," *Management Science* (50:11), pp. 1519-1533.

Lewis, K. 2003. "Measuring Transactive Memory Systems in the Field: Scale Development and Validation," *Journal of Applied Psychology* (88:4), pp. 587-604.

Locke, E. A. 1997. "The Motivation to Work: What We Know," in *Advances in Motivation and Achievement (Vol. 10)*, Maehr, M. L., and Pintrich, P. R. (Eds.), Greenwich, CT: JAI Press, pp. 375-412.

Lohmoller, J. 1989. *Latent Variable Path Modeling with Partial Least Squares*, Heidelberg: Physica-Verlag.

Loury, G. 1987. "Why Should We Care About Group Inequality," *Social Philosophy & Policy* (5:1), pp. 249-271.

MacKinnon, D. P., Lockwood, C., Hoffman, J., West, S. G., and Sheets, V. 2002. "A Comparison of Methods to Test Mediation and Other Intervening Variable Effects," *Psychological Methods* (7:1), pp. 83–104. Lowe, K. B., Kroeck, K. G., and Sivasubramaniam, N. 1996. "Effectiveness Correlates of Transformational Leadership and Transactional Leadership: A Meta-analytic Review of the MLQ Literature," *Leadership Quarterly* (7:3), pp. 385-425.

Malone, T. W. 1981. "Toward A Theory of Intrinsically Motivating Instruction," *Cognitive Sciences* (5:4), pp. 333-369.

Markus, M. L. 2001. "Towards a Theory of Knowledge Reuse: Types of Knowledge Reuse Situations and Factors in Reuse Success," *Journal of Management Information Systems* (18:1), pp. 57-94.

Markus, M. L., Majchrzak, A., and Gasser, L. 2002. "A Design Theory for Systems that Support Emergent Knowledge Processes," *MIS Quarterly* (26:3), pp. 179-212.

Markus, M. L. and Tanis, C. 2000. "The Enterprise Systems Experience-From Adoption to Success," In *Framing the Domains of IT Management: Projecting the Future through the Past*, R. W. Zmud. (Ed.), Cincinnati: Pinnaflex Publishing, pp. 173-207.

Marsden, P. V. 1990. "Network Data and Measurement," in *Annual Review of Sociology* (16), Scott, W. R., and Blake, J. (eds.), Palo Alto, CA: Annual Reviews, pp. 435-463.

Maruping, L. M., Zhang, X., and Venkatesh, V. 2009. "Role of Collective Ownership and Coding Standards in Coordinating Expertise in Software Project Teams," *European Journal of Information Systems* (18:4), 355-371.

Massey, A. P., and Montoya-Weiss, M. M. 2006. "Unraveling the Temporal Fabric of Knowledge Conversion: A Model of Media Selection and Use," *MIS Quarterly* (30:1), pp. 99-114.

Mayer, R. C., Davis, J. H., and Schoorman, F. D. 1995. "An Integrative Model of Organizational Trust,". *Academy of Management Review* (20:3), pp. 709–734.

McAfee, A. P. 2006. "Enterprise 2.0: The Dawn of Emergent Collaboration," *MIT Sloan Management Review* (47:3), pp. 21–28.

McPherson, M., Smith-lovin, L., and Cook, J. M. 2001. "Birds of a Feather: Homophily in Social Networks," *Annual Review of Sociology* (27), pp. 415-444.

Mehra, A., Kilduff, M., and Brass, D. 2001. "The Social Networks of High and Low-Self Monitors: Implications for Workplace Performance," *Administrative Science Quarterly* (46:1), pp. 121-146.

Meindl, J. R. 1990. "On Leadership: An Alternative to the Conventional Wisdom." In B. M. Staw and L. L. Cummings, eds., *Research in Organizational Behavior*, vol. 12. Greenwich, CT: JAI Press.

Messick, D. M. 2005. "On the Psychological Exchange between Leaders and Followers" in *The Psychology of Leadership: New Perspectives and Research,* D. M. Messick, and R. M. Kramer (Eds.) Mahwah, NJ: Erlbaum, pp. 81-96.

Meyer, J. P., Becker, T. E., and van Dick, R. 2006. "Social Identities and Commitments at Work: Toward an Integrative Model," *Journal of Organizational Behavior* (27), pp. 665-683.

Mitchell, T. R. 1997. "Matching Motivational Strategies with Organizational Contexts," *Research in Organizational Behavior* (19), pp. 57-149.

Moon, H. K., and Park, M. S. 2002. "Effective Reward Systems for Knowledge Sharing," *Knowledge Management Review* (4), pp. 22-25.

Moreland, R., Argote, L, and Krishnan, R. 1996. "Socially Shared Cognition at Work: Transactive memory and Group Performance," in *What's Social About Social Cognition.* J. Nye, A. Brower, (Eds.). Thousand Oaks, CA: Sage Publications, pp. 57-85.

Moreland, R. L., and Myaskovsky, L. 2000. "Exploring the Performance Benefits of Group Training: Transactive Memory or Improved Communication," *Journal of Applied Psychology* (82:1), pp. 117-133.

Morrison, E. W. 2002. "Information Seeking within Organizations," *Human Communication Research* (28:2), pp. 229-242.

Morris, M.G. and Venkatesh, V. 2010. "Enterprise Resource Planning Systems Implementation and Organizational Change: Impacts on Job Characteristics and Job Satisfaction," *MIS Quarterly* (34:1), pp. 143-161.

Mory, E. H. 2003. "Feedback Research Revisited," in *Handbook of Research for Educational Communications and Technology* (2nd ed.), D. H. Jonassen (ed.), Lawrence Erlbaum, Mahwah, NJ, pp. 745-783.

Nahapiet, J., and Ghoshal, S. 1998. "Social Capital, Intellectual Capital, and the Organizational Advantage," *Academy of Management Review,* (23:2), pp. 242-266.

Naveh-Benjamin, M., Guez, J. and Sorek, S. 2007. "The Effects of Divided Attention on Encoding Processes in Memory: Mapping the Locus of Interference," *Canadian Journal of Experimental Psychology* (61:1), pp. 1-12.

Newman, M. E. J. 2002. "The Structure and Function of Networks," *Computer Physics Communications* (147:1), pp. 40-45.

Nonaka, I. 1994. "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science* (5:1), pp. 14-37.

Nunnally, J. 1978. *Psychometric Theory,* New York: McGraw-Hill.

Obstfeld, D. 2005. "Social Networks, the Tertius Lungens Orientation, and Involvement in Innovation," *Administrative Science Quarterly* (50:1), pp. 100-130.

Oritz, M. R., Hoyos, J. C. and Lopez, M. G. 2004. "The Social Networks of Academic Performance in a Student Context of Poverty in Mexico," *Social Networks* (26:2), pp. 175-188.

Orlikowski, W. J. 2000. "Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations," *Organization Science* (11:4), pp 404-428.

Pettersson, U. 2009. "Success and Failure Factors for KM: The Utilization of Knowledge in the Swedish Armed Forces," *Journal of Universal Computer Science* (15:8), pp. 1735-1743.

Piccolo, R. F., and Colquitt J. A. 2006. "Transformational Leadership and Job Behaviors: The Mediating Role of Core Job Characteristics," Academy of Management Journal (49:2) pp. 327-340.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., and Fetter, R. 1990. "Transformational Leader Behaviors and their Effects on Followers' Trust in Leader,

Satisfaction, and Organizational Citizenship Behaviors," *Leadership Quarterly* (1:2), pp. 107–142.

Podsakoff, N. P., Whiting, S. W., Podsakoff, P. M., and Blume, B. D. 2009. "Individual- and Organizational-Level Consequences of Organizational Citizenship Behaviors: A Meta-Analysis," *Journal of Applied Psychology*, (94:1), pp. 122-141.

Polanyi, M. 1975. "Personal Knowledge," in *Meaning*, M. Polanyi and H. Prosch (eds.), Chicago: University of Chicago Press, pp. 22-45.

Polanyi, M. 1962. *Personal Knowledge: Toward a Post-Critical Philosophy*, New York: Harper Torchbooks.

Polanyi, M. 1967. *The Tacit Dimension,* London: Routledge and Keoan Paul.

Poston, R. S., and Speier, C. 2005. "Effective Use of Knowledge Management Systems: A Process Model of Content Ratings and Credibility Indicators," *MIS Quarterly* (29:2). Pp. 221-244.

Prendinger, H., Mori, J., and Ishizuka, M. 2005. "Using Human Physiology to Evaluate Subtle Expressivity of a Virtual Quizmaster in a Mathematical Game," *International Journal of Human-Computer Studies* (62:2) pp. 231-245.

Quigley, N. R., Tesluk, P. E., Locke, E. A., and Bartol, K. M. 2007. "A Multilevel Investigation of the Motivational Mechanisms Underlying Knowledge Sharing and Performance," *Organizational Science* (18:1), pp. 71-88.

Ravichandran, T., and Rai, A. 2000. "Quality Management in Systems Development: An Organizational System Perspective," *MIS Quarterly* (24:3), pp. 381-415.

Reagans, R., and McEvily, B. 2003. "Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. *Administrative Science Quarterly* (48:2), pp. 240-267.

Revere, D., Turner, A. M., Madhavan, A., Rambo, N., Bugni, P.F., Kimball, A., and Fuller, S.S. 2007. "Understanding the Information Needs of Public Health Practitioners: A Literature Review to Inform Design of an Interactive Digital Knowledge Management System," *Journal of Biomedical Informatics* (40:4), pp.410-421.

Rubin, R. S., Munz, D. C., and Bommer, W. H. 2005. "Leading from within: The Effects of Emotion Recognition and Personality on Transformational Leadership Behavior," *Academy of Management Journal* (48:5), pp. 845-858.

Rulke, D. L., and Galaskiewicz, J. 2000. "Distribution of Knowledge, Group Network Structure, and Group Performances," *Management Science* (46:5), pp.612-626.

Saga, V. L., and Zmud, R. W. 1994. "The Nature & Determinants of Information Technology Infusion at an Organizational Level of Analysis," *Academy Management, Distinguished Poster Session, Technology & Innovation Management*, Dallas, TX (August).

Salancik, G. R., and Pfeffer, J. 1978. "A Social Information Processing Approach to Job Attitudes and Job Design," *Administrative Science Quarterly* (23:2), pp. 224-254.

Sambamurthy, V., and Subramani, M. 2005. "Special Issue on Information Technologies and Knowledge Management," *MIS Quarterly*, (29:1), pp. 1-7.

Sambamurthy, V., and Zmud, R. 1999. "Arrangements for Information Technology Governance: A Theory of Multiple Contingencies," *MIS Quarterly* (23:2), pp. 261-290.

Schmidt, F. L., and Hunter, J. E. 2004. "General mental ability in the world of work: Occupational attainment and job performance," *Journal of Personality and Social Psychology* (86:1), pp. 162-173.

Scott, J. L. 2002. "Stimulating Awareness of Actual Learning Processes," *Journal of the Operational Research Society* (53:1), pp. 2-10.

Scott, J. 2000. *Social Network Analysis: A Handbook,* London: Sage.

Seddon, P.B. 1997. "A Respecification and Extension of the DeLone and McLean Model of IS Success," *Information Systems Research* (8:3), pp. 240-253.

Settoon, R. P., and Mossholder, K. W. 2002. "Relationship Quality and Relationship Context as Antecedents of Person- and Task-focused Interpersonal Citizenship Behavior," *Journal of Applied Psychology* (87:2), pp. 255–267.

Shamir, B. 1991. "The charismatic relationship: Alternative Explanations and Predictions," *Leadership Quarterly* (2:2) pp. 81-104.

Shamir, B., House, R. J., and Arthur, M. A. 1993. "The Motivational Effects of Charismatic Leadership: A Self-concept Based Theory," *Organization Science* (4:4), pp. 577-594.

Shannak, R. O. 2007. "Measuring Knowledge Management Performance," *European Journal of Scientific Research* (35:2), pp. 242-253.

Shapiro, G. E. 1983. "Embarrassment and Help-seeking" in *New Directions in Helping* B. M. DePaulo, A. Nadler, & J. D. Fisher (Eds.) Toronto: Academic Press. pp. 143-163.

Sharma, R., Yetton, P. 2007. "The Contingent Effects of Training, Technical Complexity, and Task Interdependence on Successful Implementation Systems Implementation," *MIS Quarterly* (31:2), pp. 219-238.

Shulkin, D. J. 2009. "Assessing Hospital Safety on Nights and Weekends: The SWAN Tool," *Journal of Patient Safety,* (5:2), pp. 75-78.

Singer, J., J. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence.* New York: Oxford University Press.

Sole, D., and Edmondson, A. 2002. "Situated Knowledge and Learning in Dispersed Teams," *British Journal of Management* (13), pp. 17-34.

Sparrowe, R. T., Liden, R. C., and Kraimer, M. L. 2001. "Social Networks and the Performance of Individuals and Groups," *Academy of Management Journal* (44:2), pp. 316-325.

Srivastava, A., Bartol, K. M., and Locke, E. A. 2006. "Empowering Leadership in Management Teams: Effects on Knowledge Sharing, Efficacy, and Performance," *Academy of Management Journal* (49:6), pp. 1239-1251.

Stamper, C. L., and Masterson, S. S. 2002. "Insider or Outsider? How Employee Perceptions of Insider Status Affect Their Work Behavior," *Journal of Organizational Behavior* (23:8), pp. 875-894.

Staples, D. S., and Webster, J. 2008. "Exploring the Effects of Trust, Task Interdependence and Virtualness on Knowledge Sharing in Teams," *Information Systems Journal* (18:6), pp. 617-640.

Straub, D. W. 1989. "Validating Instruments in MIS Research," *MIS Quarterly* (13:2), pp. 147-169.

Straub, D., Limayem, M., and Karahanna, E. 1995. "Measuring System Usage: Implications for IS Theory Testing," *Management Science* (41:8), pp. 1328-1342.

Sturdy, A, Brocklehurst, M, Winstanley, D and Littlejohns, M. 2006. "Management as a (Self) Confidence Trick: Management Ideas, Education and Identity Work," *Organization* (13:6), pp. 841-860.

Subramaniam, M., and Venkatraman, N. 2001. "Determinants of Transnational New Product Development Capability: Testing the Influence of Transferring and Deploying Tacit Overseas Knowledge," *Strategic Management Journal* (22:1), pp. 359-378.

Sykes, T. A., Venkatesh, V., and Gosain, S. 2009. "Model of Acceptance with Peer Support: A Social Network Perspective to Understand Employees' System Use," *MIS Quarterly* (33:2), pp. 371-393.

Tett, R. P., and Burnett, D. D. 2003. "A Personality Trait-Based Interactionist Model of Job Performance," *Journal of Applied Psychology* (88:3), pp. 500-517.

Tiwana, A. 2009. "Governance-knowledge Fit in Systems Development Projects," *Information Systems Research* (20:2), pp. 180-197.

Tsai, W., and Ghoshal, S. 1998. "Social Capital and Value creation: The Role of Intrafirm Networks," *Academy of Management Journal* (41:4), pp. 464-478.

Tynan, R. 2005. "The Effects of Threat Sensitivity and Face Giving on Dyadic Psychological Safety and upward Communication," *Journal of Applied Social Psychology* (35:2), pp. 223-247.

Vallerand, R. J. 1997. "Toward a Hierarchical Model of Intrinsic and Extrinsic Motivation," *Advances in Experimental Social Psychology* (29), pp. 271-360.

Venkataramani, V., and Dalal, R. S. 2007. "Who Helps and Harms Whom? Relational Antecedents of Interpersonal Helping and Harming in Organizations," *Journal of Applied Psychology* (92:4), pp. 952-966.

Venkatesh, V., Brown, S.A., Maruping, L.M., and Bala, H. 2008. "Predicting Different Conceptualizations of System Use: The Competing Roles of Behavioral Intention, Facilitating Conditions, and Behavioral Expectation," *MIS Quarterly* (32:3), pp. 483-502.

Wagner, C. 2004. "Wiki: A Technology for Conversational Knowledge Management and Group Collaboration" *Communications of the Association for Information Systems* (13), pp. 265-289.

Wagner, J. A. 1995. "Studies of Individualism-Collectivism: Effects on Cooperation in Groups," *Academy of Management Journal* (38:1), pp. 152-172.

Wan, Z., Wang, Y., and Haggerty, N. 2008. "Why People Benefit from E-learning Differently: The Effects of Psychological Processes on E-learning Outcomes," *Information & Management* (45:8), pp. 513-521.

Wasko, M. M., Faraj, S. 2005. "Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice," *MIS Quarterly* (29:1), pp. 35-57.

Wasserman, S., and Faust, K. 1994. *Social Network Analysis: Methods and Applications,* Cambridge, England: Cambridge University Press.

Watson, S. and Hewitt, K. 2006. "A Multi-Theoretical Model of Knowledge Transfer in Organizations: Determinants of Knowledge Contributions and Knowledge Reuse," *Journal of Management Studies*, (43:2), pp. 141-73.

Wegner, D. M. 1986. "Transactive memory: A Contemporary Analysis of the Group Mind," in *Theories of Group Behavior* B. Mullen and G. R. Goethals (Eds.) New York: Springer-Verlag. pp. 185-205.

Weick, K., and Roberts, K. 1993. "Collective Mind in Organizations: Heedful Interrelating on Flight Decks," *Administrative Science Quarterly* (38:3), pp. 357-381.

Weill, P., and Ross, J. W. 2004. *IT Governance*. Boston, MA: Harvard Business School Press.

Welbourne,T. M, Johnson, D. E., and Erez, A. 1998. "The Role-Based Performance Scale: Validity Analysis of a Theory-Based Measure," *Academy of Management Journal* (41:5), pp. 540-555.

Wu, J., and Wang, Y. 2006. "Measuring KMS Success: A Respecification of the Delone and Mclean's Model," *Information & Management* (43:6), pp. 728-739.

Yang, H. L., and Tang, J. H. 2003. "Effects of Social Network on Student Performance: A Web-Based Forum Study in Taiwan," *Journal of Asynchronous Learning Networks* (7:3), pp. 93-107.

Yukl, G., and Van Fleet, D. D. 1992. "Theory and Research on Leadership in Organizations," in *Handbook of Industrial & Organizational Psychology* M. D. Dunnette & L. M. Hough (Eds.) (2 ed., Vol. 3). Palo Alto, CA: Consulting Psychologists Press. pp. 147-197.

Zander, U., and Kogut, B. 1995. "Knowledge and the Speed of Transfer and Imitation of Organizational Abilities: An Empirical Test," *Organization Science* (6:1), pp. 76-92.

Zhang, P. 2008. "Motivational Affordances: Fundamental Reasons for ICT Design and Use," *Communications of the ACM* (51:11), pp. 145-147.

Zhang, P. 2008. "Toward a Positive Design Theory: Principles for Designing Motivating Information and Communication Technology," in *Designing Information and Organizations with a Positive Lens*, M. Avital, R. Bolland, and D. Cooperrider (eds.), a volume of the Advances in Appreciative Inquiry series, Elsevier.