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Please read the attached article and answer the following questions based on your own judgments.

Article: KNOWLEDGE MANAGEMENT SYSTEM USE AND JOB PERFORMANCE: A MULTILEVEL CONTINGENCY MODEL

Part I. (50% points)

(1) Please do a detailed summary of their research objectives and explain what research methodologies they have implemented? (10%)

(2) Conduct a deep analysis of their research design with methodologies. How do they apply these techniques to solve the research questions? Why do you think it is appropriate? (20%)

(3) Based on your own knowledge, please explain the advantages and disadvantages of their research methodologies. How do you increase the rigor of this study? (20%)

Part II. (Please choose any 3 of the following questions to answer. 50% points)

(4) Base on the case of this study, comment on the appropriateness of conducting both quantitative and qualitative research; suggest situations suitable for each approach.

(5) Describe the process of a qualitative research.

(6) Compare mediation and moderation; explain ways to conduct mediator analysis.

(7) Distinguish between reflective and formative measurement models; explain the criteria used for the assessment of formative measurement models.

(8) Discuss the collinearity issues of a structural model; explain ways to assess and avoid it.

MIS Quarterly

RESEARCH ARTICLE

KNOWLEDGE MANAGEMENT SYSTEM USE AND JOB PERFORMANCE: A MULTILEVEL CONTINGENCY MODEL[1]

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This paper seeks to develop a better understanding of job performance in the context of a knowledge management system (KMS) implementation. This work adopts the context theorizing approach that informs the conceptualization of KMS use and identification of contingency factors. Specifically, the literature on rich system use is adapted to develop the construct in the context of a KMS. The literature related to task, system, user, and leadership is also drawn upon to identify four contingency factors—task nonroutineness, perceived support for contextualization, absorptive capacity, and transformational leadership—that affect the KMS use and job performance relationship. The paper argues that rich use of a KMS positively affects job performance and the four contingency factors moderate this relationship. A mixed methods approach that includes a quantitative study (n = 1,441) among knowledge workers in seven business units of a large organization in the finance industry was used to validate the theoretical model. A follow-up qualitative study (n = 48) was conducted in one business unit to cross-validate the findings and explain unsupported findings. Data were collected from multiple sources (i.e., surveys, interviews, and system archives). The results largely supported the model. Theoretical and practical implications of the results are discussed.

Keywords: KMS implementation, context theorizing, rich use of KMS, job performance, contingency factors, mixed methods

Introduction

Social technologies that facilitate collaborative work among employees are regarded as a key driver of organizational productivity gains (*CIO Magazine* 2011). Given that a knowledge management system (KMS), that is, "a class of information systems applied to managing organizational knowledge" (Alavi and Leidner 2001, p. 114), facilitates knowledge sharing and transfer among employees, a KMS represents a type of social technology. KMS implementations are expected to bring in numerous benefits such as driving economic growth, facilitating social development, reducing cost of employee training, and enhancing job performance (Gallivan et al. 2003; He and Wei 2006). For example, Cisco built a KMS to allow its 250 newly hired service support managers to access and share critical information, thus significantly reducing their learning curve and time-to-efficiency (VisionCor 2010). However, KMSs often fail to deliver expected benefits and it is notoriously difficult to ever achieve the initially set goals of KMSs (Mann 2010). Therefore, the question of how to reap the benefits of KMSs is of great interest both to research and practice.

In pursuit of answers to such a question, prior IS research on KMS implementations has underscored the importance of KMS use, a proxy for KMS success, and examined various social (e.g., He and Wei 2006; Kankanhalli et al. 2005) and technological (e.g., Kulkarni et al. 2006; Taylor 2004) drivers of KMS use. However, it is important to go beyond technology use as the ultimate dependent variable (see Venkatesh,

[1]Suprateek Sarker was the accepting senior editor for this paper. Atreyi Kankanhalli served as the associate editor.

The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

Thong, and Xu 2016; for examples, see Sykes 2015; Sykes et al. 2014, Sykes et al. 2011). A review of the KMS literature (see Appendix A) revealed mixed evidence for the effect of KMS use on job performance, with studies indicating no effect (e.g., Gallivan et al. 2003; Handzic 2009), only short-term performance gains (e.g., McCall et al. 2008) and a positive effect on individual performance (e.g., Kankanhalli et al. 2011; Ko and Dennis 2011). These inconclusive findings are the primary motivation for the current research: to develop a better understanding of the relationship between KMS use and job performance. An important approach to understand why a relationship is not significant or is inconsistent across studies is to improve construct conceptualization based on the context of the study and go beyond the simple bivariate relations between a predictor and a criterion by examining the boundary conditions or how contextual factors mediate and/or moderate the original relationships (Fairchild and MacKinnon 2009). Against this backdrop, the *context theorizing* approach, which emphasizes the investigation of the potential situational and temporal boundary conditions as a way to explain paradoxical findings (Johns 2006; Rousseau and Fried 2001; for an example, see Venkatesh et al. 2010) is adopted. The main benefit of context theorizing is to make the model more accurate and the interpretation of results more robust (Rousseau and Fried 2001). By adopting the context theorizing approach to understand the relationship between KMS use and job performance, we can conceptualize use based on the context of a KMS implementation. In addition, we can specify the nature and form of the possible situational or boundary conditions and how they are likely to influence the phenomenon under investigation (Whetten 1989; for an example, see Venkatesh et al. 2010).

In the context of a KMS implementation, this work adopts a rich use perspective to conceptualize KMS use that examines *cognitive absorption* (i.e., the extent to which employees are in a state of deep attention and engagement with the system; e.g., Agarwal and Karahanna 2000), and *deep structure use* (i.e., the extent to which the right features of the system are used to support relevant tasks; e.g., Burton-Jones and Straub 2006). As discussed in greater detail in the next section, this work adopts a rich use perspective because it better represents the interaction between users and a KMS by capturing important factors related to a KMS implementation, such as the key purpose of a KMS implementation and some important characteristics of a KMS. In such a case, the use–performance link can be better understood. In addition, although Burton-Jones and Straub (2006) examined the relationship between rich use and task performance, the question of whether rich use affects job performance in the context of a KMS implementation remains unanswered.

To understand why a relationship is not significant or is inconsistent across studies, context theorizing calls for the investigation of the unique organizational, worker, temporal, and extraorganizational conditions potentially influencing the results (Fairchild and MacKinnon 2009; Whetten 2008). According to context theorizing, inclusion of mediators and/or boundary conditions via moderators in theory development and validating the new theory in the right setting have been noted as an important way to move research forward and make substantial theoretical contributions (e.g., Bamberger 2008; Whetten 2008; for an example, see Venkatesh et al. 2010). Given that prior literature indicates performance gains in the context of technology implementations are contingent on the fit among task, system, and user (e.g., Burton-Jones and Straub 2006; Fuller and Dennis 2009), *task nonroutineness*, *perceived support for contextualization,* and *absorptive capacity* are incorporated as contingency factors that correspond to task, system, and user to shed light on our understanding of the relationship between KMS use and job performance. Another important contingency factor is related to top management. In the context of technology implementations, leaders can play an important role in affecting success of the implementations (e.g., Enns et al. 2003; Kettinger et al. 2011). Thus, leadership, *transformational leadership* in particular, is incorporated into the model. Leadership has been mainly conceptualized at the individual and the business unit levels (e.g., Hofmann et al. 2000; Piccolo and Colquitt 2006). Conceptualizing it at the business unit level will help us understand whether and how leadership will affect KMS implementation success. As an example, one study found that transformational leadership, conceptualized at the business unit level, was positively related to employees' commitment to a change initiative, such as an implementation of a new technology (Herold et al. 2008).

The paper thus has two objectives:

1. To develop a model to understand rich use of a KMS and its impact on employee job performance.

2. To understand the contingency effects related to task, system, user, and leadership.

This work adopts a mixed methods approach that combines quantitative and qualitative studies to test the model given that such an approach provides a holistic understanding of a phenomenon when extant research is inconclusive and equivocal (Venkatesh et al. 2013; Venkatesh, Brown, and Sullivan 2016), and will help us identify the circumstances under which KMS use has a positive, negative, significant, or nonsignificant effect on job performance. Given that a KMS is a large-scale and sophisticated system, using such a system to complete various tasks, especially for unstructured tasks, is not likely to be simple. Whereas a quantitative study may provide evidence to support the theory, a qualitative study

offers us more information about the complicated and intricate process of using a KMS for the completion of job tasks. Specifically, three waves of quantitative data using surveys and system logs and one wave of qualitative data using interviews were collected in a large organization. By interviewing employees who used the KMS, the process of using the KMS, such as the cognitive mechanisms, the interdependencies among task, user, and system, and the role of management, was better understood. With such additional information and evidence, this work better explains, refutes, or provides complementary knowledge to existing theories.

This paper is expected to make several contributions. First, this work will add to the body of IS research related to KMS implementations by adopting the context theorizing approach to develop a better understanding of employee job performance in the context of KMS use. Second, this paper will extend research related to rich use of technology by adapting it to the context of KMS implementations and developing a better understanding of how rich use of a KMS affects job performance.[2] Third, this work will contribute to the management literature on job performance by incorporating context into theory development to understand performance gains resulting from technology use. Fourth, from a methodological perspective, by using a mixed methods approach, a key empirical contribution is that this paper will achieve greater robustness in model validation. Finally, this work will provide guidance to organizations on how to enhance employees' job performance in the context of KMS implementations. Specifically, this work will provide organizations with suggestions on guiding their employees to effectively use a KMS by accounting for the contingency factors related to task, system, user, and leadership.

Theory

Based on the context theorizing approach (Rousseau and Fried 2001), the conceptualization of system use should be based on the nature of the system and the identification of contingency factors should be tied to the context in which the system is implemented. In this section, a brief overview of the conceptualization of rich use of KMS is presented. Then, the four contingency factors related to task, system, user, and leadership are discussed. In particular, an explanation of why these factors are relevant and important in the context of KMS implementations is given. Finally, the model and the justification for the relationships in the model are presented.

[2]This paper is different from Sykes and Venkatesh (forthcoming) in that it focuses on identifying the contingencies of the rich use and job performance relationship, whereas Sykes and Venkatesh use a social network lens to understand the effect of rich use on job performance.

Conceptualization of Rich Use of KMS

There are different conceptualizations of technology use that can be categorized into two types: lean use and rich use (e.g., Burton-Jones and Straub 2006; Venkatesh et al. 2008). Lean use considers the technology being investigated as a whole and captures technology use in terms of duration, frequency, or intensity (e.g., Venkatesh 2000; Venkatesh et al. 2008). The conceptualization of rich use refers to cognitive absorption and deep structure use. Cognitive absorption describes the interaction between a user and a technology, here a KMS (see Agarwal and Karahanna 2000; Burton-Jones and Straub 2006). It has five dimensions: *temporal dissociation, focused immersion, heightened enjoyment, control,* and *curiosity* (Agarwal and Karahanna 2000). Based on Agarwal and Karahanna (2000), when users interact with a system (here, 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 realize how much time they have spent on it (temporal dissociation). The concept of cognitive absorption is rooted in the theory of flow that aims to understand *optimal experience*, a state when people feel in control of their actions, as a master of their own fate, a sense of exhilaration and a deep sense of enjoyment (Csikszentmihalyi 1990). The control of actions is achieved by control of consciousness (i.e., the ability to focus attention at will and to be oblivious to distractions; Csikszentmihalyi 1990). When people enter a state of cognitive absorption, they also become more sensitive to and more curious about things on which they focus (Trevino and Webster 1992). Such sensitivity and curiosity will drive them to seek answers to various issues in which they are interested or about which they are uncertain, such as getting to know the pros and cons of different features of a system. In a state of optimal experience, people voluntarily stretch their bodies and minds to their limits to accomplish something challenging (Csikszentmihalyi 1990).

Deep structure use is the extent to which system features pertinent to the task have been deployed with respect to the *breadth of use* (i.e., number of features used) and *depth of use* (i.e., use the right features for the core aspects of the tasks). Although employees may not need to learn all the features, it is important to develop proficiency in using certain features that are relevant and critical to get their jobs done. Such features should capture the core aspects of the job tasks, defined as the critical components of the job tasks or the critical paths that determine whether the job tasks can be successfully completed (e.g., Davis and Heidorn 1971). The core aspects of job tasks are likely to vary depending on the nature of task and job. Deep structure use describes use of the system at the

feature level (Burton-Jones and Straub 2006). When employees engage in deep structure use, they are likely to get familiar with different features and leverage the features more effectively (Jasperson et al. 2005).

A KMS is a class of information system coupled with knowledge sharing practices that support and enhance organizational knowledge management effort (Alavi and Leidner 2001). The IS literature has mainly categorized KMS into two types: codification-based systems that emphasize knowledge reuse through access to codified expertise and personalization-based systems that emphasize knowledge exchange among employees (Kankanhalli et al. 2005; Ko and Dennis 2011). Although the prior KMS literature has mainly taken a lean use perspective to understand the relationship between use and performance, in this study it is argued that a rich use perspective is more appropriate in the context of a KMS implementation for two reasons. First, a key purpose of a KMS is to facilitate the processes of knowledge storage, retrieval, sharing, and application, and such processes require users to learn a large and complex system (Alavi and Leidner 2001). If users pay more attention when using a system, they are likely to develop a better understanding of the system that may help them better leverage the system to complete job tasks. Therefore, it is important to capture users' level of involvement with a KMS when conceptualizing KMS use. Given that cognitive absorption captures not only frequency of use, but also degree of attention, it adequately represents users' level of involvement with a KMS. Second, lean use considers the technology as a whole and we do not know which features or functions of the technology will contribute positively to job performance. Most of the large-scale systems, such as a KMS, come with numerous functions and features. Given that the conceptualization of breadth of use and depth of use underscores the specific features of the system that are closely related to job task completion, the use–performance link will be better explained by a rich conceptualization of use than by a lean conceptualization of use (see Burton-Jones and Straub 2006).

Contingency Factors

In this section, the contingency factors related to task (i.e., task nonroutineness), system (i.e., perceived support for contextualization), user (i.e., absorptive capacity), and leadership (i.e., transformational leadership) are discussed.

Task nonroutineness is defined as the extent to which an employee perceives a task to have many exceptions or unexpected events (Haerem and Rau 2007; Keller 2012; Maruping et al. 2009). Numerous features of a KMS increase the difficulty of identifying the right features for the completion of various job tasks, especially for tasks that are uncertain, less structured, or without predefined solutions (Keller 2012). It is generally difficult to accomplish a nonroutine task using preset procedures (Maruping et al. 2009). Due to the lack of predefined solutions, employees may need to explore various potential solutions when tackling nonroutine tasks. Given that employees who engage in deep structure use will explore various features of the system, they will be more likely to find the right features that facilitate the completion of nonroutine tasks. In addition, tackling nonroutine tasks requires substantial information processing (Faraj and Yan 2009). In a state of cognitive absorption, employees get focused and will be likely to process more information. Moreover, tackling nonroutine tasks requires employees to spend a significant amount of time and effort interacting with the system. If they enjoy using the system, they will be more likely to work persistently without weariness until they find solutions. On the contrary, a routine task is likely to be accomplished by following explicit guidelines and rules. It may not require employees to enter a state of cognitive absorption and deep structure use to solve some simple problems. Therefore, the effectiveness of rich use will likely be more salient for nonroutine tasks. Hence, the incorporation of task nonroutineness as a contingency factor will shed light on our understanding of the relationship between use and performance.

Perceived support for contextualization is defined as the extent to which an employee perceives the capability of a KMS to provide context information in facilitating the assimilation of knowledge (Majchrzak et al. 2005). The intricacies of various tools and devices of a KMS increase the difficulty of utilizing it for the completion of job tasks. If a KMS can be designed to reduce the cognitive effort in learning the system and facilitate knowledge assimilation, it will be likely to increase the effect of use on performance. The support for contextualization will likely be more important for employees who engage in rich use of a KMS because these employees will be likely to process a large amount of information—some of which may be ambiguous or difficult to understand. Under such circumstances, providing relevant context information may help employees understand the linkage between different pieces of information, thus facilitating their comprehension of the information. Also, prior work has indicated context information leads to more efficient and effective information processing because it prioritizes information and provides alternative views on cause–effect links (Majchrzak et al. 2005; Setia et al. 2013). A KMS can convey context information to help employees better understand the knowledge in the system. Prior research has indicated four dimensions of support for contextualization: transparency of authorship, easy access to knowledge, comparison of multiple perspectives, and handling of emergent knowledge (Majchrzak et al. 2005). Given the importance of context information in

realizing the benefits of rich use of a KMS, perceived support for contextualization is incorporated as a contingency factor to understand the relationship between KMS use and job performance.

Absorptive capacity is defined as an employee's ability to learn new knowledge and harness the knowledge (e.g., Brown 2005; Zhang et al. 2011). Absorptive capacity was originally used to describe a firm's ability to recognize the value of external knowledge, convert it to its own context, and then apply such knowledge to gain competitive advantage (Cohen and Levinthal 1990). Given that a firm's absorptive capacity depends on the absorptive capacity of its individual members (Roberts et al. 2012), IS research has also examined this construct at the individual level and conceptualized it as prior related knowledge (Ko et al. 2005) or an individual's ability to utilize available knowledge (Griffith et al. 2003). Absorptive capacity is conceptualized here at the individual level because the focus is to understand the effect of KMS use on job performance at the individual level. In addition, absorptive capacity is conceptualized as a capability rather than as prior related knowledge, because there is greater agreement among researchers that such a conceptualization is more appropriate (Roberts et al. 2012). The main components of absorptive capacity are to understand new knowledge and utilize it (Jansen et al. 2005). Prior work theorizes a positive relationship between absorptive capacity and knowledge transfer (e.g., Tsai 2001). When employees engage in rich use of a KMS, they need to explore the system intensively, learn, and apply new knowledge about the system. For example, employees may need to learn how to customize a KMS feature to support their tasks. Without the ability to absorb new knowledge, employees may find it difficult to enhance their job performance through the effective use of the system. The incorporation of absorptive capacity thus sheds light on our understanding of the relationship between rich use of a KMS and job performance.

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 1992, p. 174).

It has received significant attention over the past two decades in order to understand leader effectiveness (e.g., Dvir et al. 2002; Piccolo and Colquitt 2006). 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 (Piccolo and Colquitt 2006) 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).

There are four dimensions of transformational leadership (Piccolo and Colquitt 2006): *idealized influence* (i.e., the degree to which leaders behave in 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 challenge assumptions, take risks, and solicit followers' ideas), and *individual consideration* (i.e., the degree to which leaders attend to followers' needs, act as mentors or coachesm 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; Piccolo and Colquitt 2006). In the context of KMS use, we argue transformational leadership will moderate the relationship between rich use and performance because under high levels of transformational leadership, rich use behaviors will more likely be acknowledged and commended by leaders who may then provide better ratings for their employees. Therefore, transformational leadership is incorporated as a contingency factor to understand the relationship between rich use of a KMS and job performance.

Job Performance

An employee's job performance is defined as his or her overall job effectiveness (e.g., Griffin et al. 2007). It indicates whether an employee performs his or her job well. An employee's job performance can be obtained using either objective performance data (e.g., sales volume) or assessed by the employee's supervisors, peer coworkers or employees themselves (Rothbard and Wilk 2011; Sykes 2015; Sykes et al. 2014; Tepper et al. 2011).[3]

[3]The distinction between task performance and job performance lies in that task performance represents only one aspect of job performance. Task performance focuses on employees' behaviors of executing the organization's technical processes or maintaining the organization's technical requirements (e.g., Dalal et al. 2009; Motowidlo and Van Scotter 1994), whereas job performance comprises the quality of work on broader dimensions, including not only technical processes (i.e., task performance), but also other activities that support the organizational, social, and psychological environment in which the technical core must function (e.g., Griffin et al. 2007; Motowidlo and Van Scotter 1994). The antecedents of task performance may not be the same as those of other aspects of job performance. For example, experience was found to have a stronger correlation with task performance than do other aspects of job performance, whereas personality traits, such as conscientiousness, were found to affect other aspects of job performance more strongly than they do task performance (e.g., Chiaburu et al. 2011).

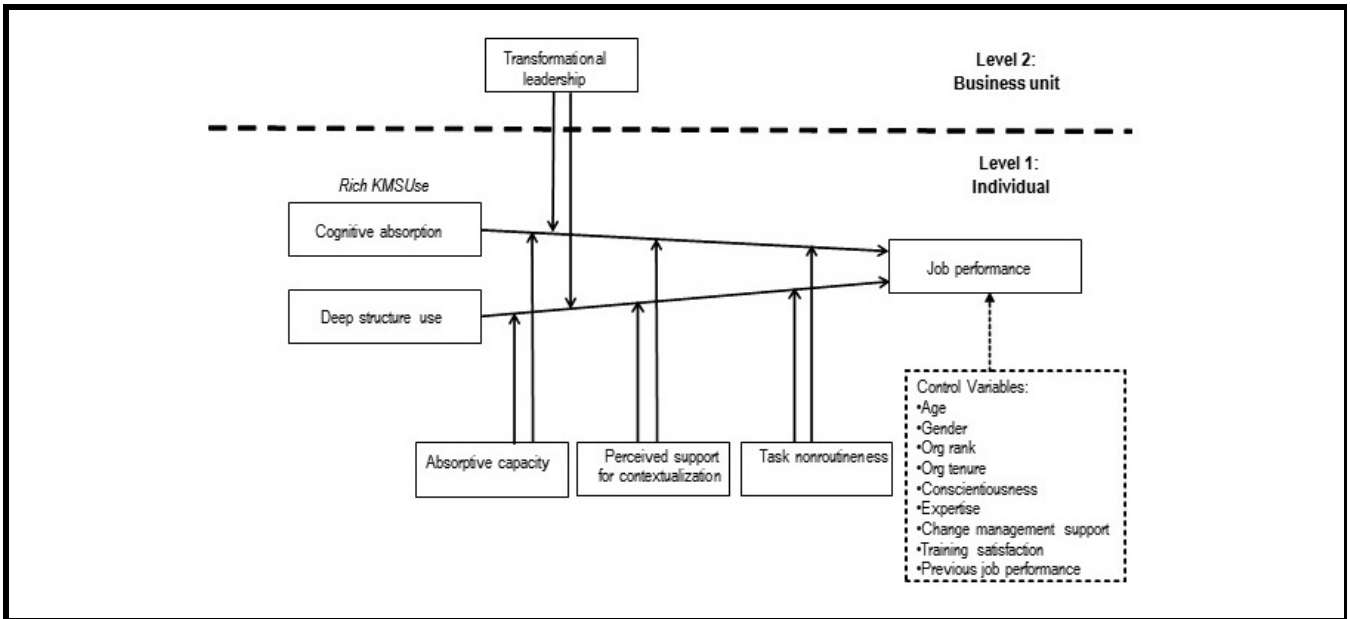

Figure 1. Research Model

Model Development

Figure 1 presents the model. Specifically, the relationship between rich use of KMS and job performance is theorized, as are the effects of task nonroutineness, perceived support for contextualization, absorptive capacity, and transformational leadership in moderating this relationship.[4]

Cognitive Absorption

When users enjoy using a system, they will be less likely to feel bored or tired and they will be more likely to work harder and longer, thus resulting in higher productivity. This argument is supported by prior research that indicates the amount of effort and the degree of persistence, driven by the motivational process of goal setting, have a significant impact on performance outcomes (e.g., Mitchell 1997). In addition, when users occupy themselves totally with a system, they will be less likely to be distracted by other nonwork-related problems that might slow down their progress or cause them to make more mistakes. Prior research has demonstrated the detrimental effects of divided attention on performance (Naveh-Benjamin et al. 2007). Moreover, cognitive absorption is a situational intrinsic motivator (Agarwal and Karahanna 2000), an important driver of performance (Vallerand 1997). Mitchell (1997) found that the strength of motivation was strongly related to performance. To summarize, if users are cognitively absorbed with using a KMS to accomplish their jobs, they will be likely to perform their work more efficiently and effectively, resulting in better job performance. Thus, we hypothesize

H1: Cognitive absorption will have a positive effect on job performance.

Deep Structure Use

A system may have many features to support the underlying structure of a particular task. When employees engage in deep structure use of a KMS, they will likely be aware of the differences between these features, know the pros and cons of using these features, and become more proficient in using these features. They will also be likely to understand the complementarity among these features and leverage these features to get their jobs done. For example, a KMS may have two features that store knowledge. One could be similar to a traditional knowledge store[5] where different types of

[4]Given that transformational leaders inspire and motivate employees to engage in beyond-routine work behaviors, it is possible to theorize the direct effect of transformational leadership on rich use of KMS that represents such behavior as beyond simple and routine use of the system. Consistent with prior research (e.g., Dvir et al. 2002), it is also possible to theorize the direct effect of transformational leadership on job performance. Given that the focus of this work is to understand the use-performance link, these two relationships were excluded from the model.

[5]A knowledge store mainly keeps a concise description of all sorts of knowledge (Kulkarni et al. 2006).

knowledge (e.g., computer knowledge and business knowledge) are well-categorized and well-structured. Another one could be an 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 traditional knowledge store that "MyDoom" is a computer virus spread via e-mail and installs some form of backdoor component on a target machine. If the employee also uses an 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 could 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, and how to remove the virus). In this case, the online discussion forum complements the traditional knowledge store by helping employees better understand and leverage knowledge.

If the features used support the task, employees will be likely to perform better (Burton-Jones and Straub 2006; Goodhue and Thompson 1995). This argument is based on task–technology fit (TTF). The tenets of TTF suggest that when capabilities of a technology (system) match the tasks, it will be more likely to have a positive impact on individual performance (Goodhue and Thompson 1995) because when there is a fit between a task and technology (system), users do not need to spend extra time and effort modifying the system to support the task. Consequently, they can utilize their cognitive resources to concentrate on completing the task. In contrast, when a technology (system) does not support a particular task, users may need to allocate additional mental resources to increase the fit between the task and the technology (system). For instance, prior studies have indicated that decision-making performance was dependent on the fit between the data presentation format and the task (e.g., Benbasat et al. 1986), and a misfit would slow down the decision-making processes (e.g., Vessey 1991). Given that employees who engage in deep structure use will be likely to benefit from the complementarity of various features and use the right features to support their tasks, they will be likely to perform better. Thus, we hypothesize

H2: Deep structure use will have a positive effect on job performance.

Task Nonroutineness

A routine task is generally simple because it can be accomplished using preset procedures, whereas a nonroutine task has many exceptions or unexpected events that are difficult to tackle using predefined methods or procedures (Faraj and Yan 2009; Maruping et al. 2009). Nonroutine tasks require individuals to think differently and creatively, and look for alternative solutions (Keller 2012). When using a KMS to perform a routine task, cognitive absorption may not help much with the completion of job tasks given that a routine task simply requires the individual to follow certain procedures and the need for an immersed focus or a heightened sense of control is less critical. When using a KMS to perform a nonroutine task, cognitive absorption becomes more important in facilitating job task completion. This is because when employees are cognitively absorbed, they will be likely to get more focused and more creative in generating solutions, resulting in better job performance. Thus, we hypothesize

H3a: Task nonroutineness will moderate the relationship between cognitive absorption and job performance such that the effect will be stronger for nonroutine tasks.

If employees engage in deep structure use of a KMS when performing a nonroutine task, they will be likely to have higher performance gains given that a nonroutine task may require employees to explore various features and understand the fit between a feature and a task. When employees understand the pros and cons of different features and the relationships between these features and different tasks, they will be more likely to identify optimal solutions, resulting in better job performance. As noted earlier, solving a routine problem only requires employees to follow prescribed procedures. Spending a lot of time on exploring many features may distract employees, such as diverting their attention and energy from completing their job tasks, resulting in decreased job performance. Thus, we hypothesize

H3b: Task nonroutineness will moderate the relationship between deep structure use and job performance such that the effect will be stronger for nonroutine tasks.

Perceived Support for Contextualization

When a KMS supports contextualization, it provides context information to help a user understand a piece of knowledge with respect to its creator(s), application boundary, and evolution. The context information may also include the presentation of multiple perspectives regarding cause–effect links (Majchrzak et al. 2005). In a state of cognitive absorption, employees get focused and will be likely to process more information. If relevant context information is provided to facilitate information processing and knowledge application,

employees will be likely to perform better. For example, by knowing the evolution and the application boundary of a piece of knowledge, employees can better apply the knowledge for the completion of their job tasks, resulting in better job performance. Thus, we hypothesize

H4a: Perceived support for contextualization will moderate the relationship between cognitive absorption and job performance such that the effect will be stronger at higher levels of perceived support for contextualization.

When employees engage in deep structure use of a KMS, they look for a match between a task and a KMS feature. Context information should help them better understand the pros and cons of various features, increasing the chance of finding the right feature for the completion of their job tasks. For example, when coming across contradicting views about the application of a few KMS features or the perceived utility of certain features varies significantly across employees who have used the features, those who are going to use the features will be likely to make a more appropriate decision about which feature to use if more context information is provided, such as how a particular feature may have been more efficiently used to complete a specific task. Thus, we hypothesize

H4b: Perceived support for contextualization will moderate the relationship between deep structure use and job performance such that the effect will be stronger at higher levels of perceived support for contextualization.

Absorptive Capacity

Cognitive absorption describes the optimal experience of using a KMS. In such a state, employees become curious about the KMS. Such curiosity will drive them to explore the system (Venkatesh 1999). Consequently, they will spend hours using the system to tackle challenging problems, such as searching for information or engaging in extensive discussions with experts in different domains. Prior studies have indicated curiosity is a situational intrinsic motivator (Venkatesh 1999) that could have a significant effect 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). Although cognitive absorption increases employees' opportunities to acquire new or diverse knowledge, whether employees can use such knowledge to achieve better job performance is dependent on employees' capabilities to assimilate and apply such knowledge (i.e., absorptive capacity). Employees who have a higher level of absorptive capacity will be likely to assimilate new knowledge or integrate different knowledge more effectively and efficiently, strengthening the positive effect of cognitive absorption on job performance. Thus, we hypothesize

H5a: Absorptive capacity will moderate the relationship between cognitive absorption and job performance such that the effect will be stronger at higher levels of absorptive capacity.

Likewise, when employees engage in deep structure use, they will be likely to encounter more questions or problems arising from using various features. To resolve various problems, they may need to learn new knowledge, compare it with existing knowledge, or integrate different knowledge. This is easier for employees who are more capable of learning and applying new knowledge, such as the strengths and weaknesses of various features. The more features they explore, the more likely they will learn and apply new knowledge in completing job tasks. Consequently, they can leverage these features to enhance their job performance. For employees who have a low level of absorptive capacity, they may experience challenges in understanding the intricacies and nuances of various features. The more features they explore, the more likely they will come across questions that they may not be able to address. This may prevent them from leveraging the right features to enhance their job performance. Consequently, these employees will be less capable of taking advantage of deep structure use to enhance their job performance, resulting in a weaker effect of deep structure use on job performance. Thus, we hypothesize

H5b: Absorptive capacity will moderate the relationship between deep structure use and job performance such that the effect will be stronger at higher levels of absorptive capacity.

Transformational Leadership

In a state of cognitive absorption, employees will be so immersed with a KMS that they do not pay attention to the passage of time. Consequently, they will spend a lot of time using the system or asking questions about the system. These employees will likely be noticed by transformational leaders who have been trying to motivate employees to leverage the system to its full potential given its benefits in facilitating the completion of job tasks. Employees who concentrate on using a system will be likely to better know the pros and cons of the system, resulting in more effective use of the system. Transformational leaders will be likely to view such em-

ployees more favorably and such favorable views will be likely to result in better performance ratings (e.g., MacKenzie et al. 1993). Thus, we hypothesize

H6a: Transformational leadership will moderate the relationship between cognitive absorption and job performance such that the effect will be stronger at higher levels of transformational leadership.

When employees engage in deep structure use of a KMS, they explore various features to understand their differences in supporting the completion of job tasks. They will be likely to develop a better understanding of how a feature supports a job task (Goodhue and Thompson 1995). Consequently, they will be likely to use the system more effectively and efficiently. Their proficiency in using the system will be likely to be favorably viewed by transformational leaders who have been trying to inspire employees to make best use of the system. Employees who are favorably viewed by their supervisors will be likely to receive better performance ratings (e.g., MacKenzie et al. 1993). Thus, we hypothesize

H6b: Transformational leadership will moderate the relationship between deep structure use and job performance such that the effect will be stronger at higher levels of transformational leadership.

Method

This work used a mixed methods approach that includes both a quantitative study and a qualitative study (Creswell and Clark 2007; Venkatesh et al. 2013; Venkatesh, Brown, and Sullivan 2016). Qualitative and quantitative approaches are mutually supportive given that each method has different assumptions and procedures (Mingers 2001). When applying a mixed methods approach, researchers can use either a concurrent or sequential design. A concurrent design means conducting quantitative and qualitative studies in parallel, whereas a sequential design means conducting the two types of studies one after another, with a quantitative study conducted first followed by a qualitative study or vice versa (Venkatesh et al. 2013). Venkatesh et al. (2013) suggest that when a strong theoretical foundation exists but previous findings are inconclusive—here, there are inconclusive findings regarding the relationship between KMS use and performance—a quantitative study followed by a qualitative study should be used to gain additional insights. Therefore, a sequential approach is used. In addition, the results across studies are compared with a view toward demonstrating the similarity of findings to add to the robustness of the model.

Study 1: Quantitative Study

Participants and Data Collection

Data were collected from seven business units of a large organization in the finance industry that implemented a KMS. The main reasons for implementing the KMS were to improve financial product services, respond quickly to market change, and reduce costs (e.g., employees do not need to "reinvent the wheel" if what they are trying to do has been done by others in the organization). The KMS was a commercial product that incorporates knowledge repositories, such as library, portal, RSS, and interactive systems, to facilitate organizational learning by capturing and disseminating knowledge. The interactive systems use social media technologies, such as forums, blogs, wikis, messaging, and social blogging, to facilitate knowledge exchange among employees in a more free-flowing and unconstrained manner. The KMS had many features that could be used independently for a specific purpose (e.g., knowledge classification and storage, and some of the features could be used together). For example, when employees used the online discussion feature to communicate and collaborate with coworkers, they could use the search or federated search features simultaneously to access relevant information that facilitates understanding and knowledge exchange. Therefore, some features were complementary to each other. Employees mainly used the KMS for knowledge sharing (e.g., using group support systems and Intranets with features of blogs and wiki to share knowledge).

Data were collected from seven business units (i.e., finance and budgeting, accounting, personnel, customer management, sales, advertising and public relations, and government liaison). These business units were targeted to benefit from the KMS implementation. Employees were at different hierarchical levels (e.g., salesperson, sales team leader, sales manager) and, within each level, employees were ranked by seniority. Although employees at different hierarchical levels performed different tasks and might use the KMS differently, they would also use similar features (e.g., sales people, sales team leaders, and sales managers might use features that allow them quickly access information related to specific financial products and compare them with other products).

Of the total 1,757 employees, 1,441 (390 women) provided usable responses, resulting in a response rate of 82%. Such a high response rate was obtained because the top management of the organization strongly supported the data collection. The age of the respondents ranged from 21 to 64 years ($M = 38.55$, $SD = 7.76$). To test for nonresponse bias, a series of t-tests were carried out to compare the means of the respondents with those of the nonrespondents on their demographic characteristics. There were no significant differences between

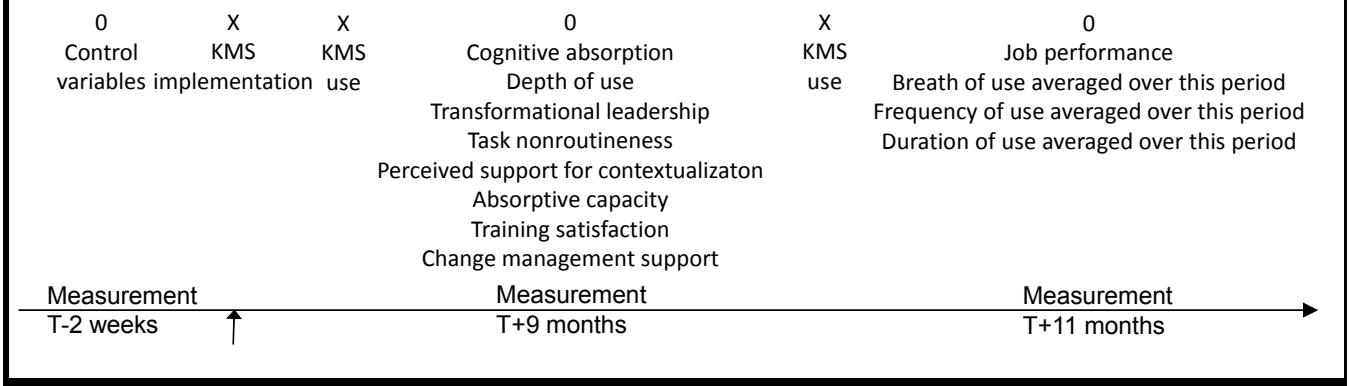

Figure 2. Data Collection Time Line

respondents and nonrespondents (Armstrong and Overton 1977).

Figure 2 shows the data collection time line. Two weeks before the implementation of the KMS, data about control variables, including age, gender, organizational rank, organizational tenure, conscientiousness, expertise, and previous job performance, were collected. Previous job performance was obtained from the organization's archives. The company allowed participants to fill out the survey during normal business hours and asked them to return the completed survey within four weeks. A comparison of early versus late respondents on descriptive statistics of key variables showed no differences. To increase the response rate, a weekly follow-up e-mail was sent for three weeks to those who did not return the survey. The average time to fill out the survey was about 20 minutes.

About 9 months after the KMS implementation, data about cognitive absorption, depth of use, transformational leadership, task nonroutineness, perceived support for contextualization, absorptive capacity, training satisfaction, and change management support were collected. The effects of training and change management support on job performance were controlled (Venkatesh et al. 2011). The timing of 9 months was chosen because prior research indicates that after the implementation of large information systems, such as a KMS, organizations would go through a shakedown phase during which employees face significant challenges in using the system and the use of the system is not stable (e.g., Morris and Venkatesh 2010; Sykes 2015; Sykes et al. 2014). It takes about 6 or 9 months before employees get familiar with the system and use of the system becomes more stable. At that time, employees are likely to use more features of the system and immerse themselves in the system to complete their jobs. The subjective measures of rich use of a KMS (i.e., cognitive absorption and depth of use) were collected two months before job performance given that accounting for the temporal difference between the two variables is likely to help us gain a better idea of how rich use of a KMS affects job performance.

Two months later, breadth of use, lean use (i.e., frequency of use and duration of use), and employees' job performance data were collected. Breadth of use, frequency of use, and duration of use were obtained from system logs and averaged over the entire 11-month period after the implementation. The collection of job performance data coincided with the time when the company conducted their annual job performance reviews. An external firm was hired by the organization to process the job performance data to protect personal information from being revealed. The data were obtained from the external firm. Once the job performance data were obtained and matched with the survey data, the employees' names were removed to protect their privacy and confidentiality. In addition to the annual performance data, employees were asked to assess their job performance gains related to KMS use. This allowed obtaining job performance data with reference to the KMS that complements the annual job performance data without making reference to the KMS.

Measurement

The items used in this study are shown in Table 1. The details are provided below.

Rich Use of KMS. The scales for *cognitive absorption* and *deep structure use* were adapted from Agarwal and Karahanna (2000) and Burton-Jones and Straub (2006). Both scales were adapted to fit the context of the KMS implementation being studied. Given that the five dimensions of cognitive absorption (i.e., temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity) do not

Table 1. Constructs and Measures

Constructs		Items *7-point Likert Scale*: 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = moderately agree, 7 = strongly agree
Cognitive absorption		When I am using the system, I am able to block out all other distractions. (FI1)
		When I am using the system, I feel totally immersed in what I am doing. (FI2)
		When I am using the system, I feel completely absorbed in what I am doing. (FI3)
		When I am using the system, my attention does not get diverted very easily. (FI4)
		Time appears to go by very quickly when I am using the system. (TD1)
		Sometimes I lose track of time when I am using the system. (TD2)
		Time flies when I am using the system. (TD3)
		I often spend more time on using the system than I intend. (TD4)
		I have fun interacting with the system. (HE1)
		Using the system provides me with a lot of enjoyment. (HE2)
		I enjoy using the system. (HE3)
		When using the system I feel in control. (CO1)
		The system allows me to control my computer interaction. (CO2)
		Using the system excites my curiosity. (CU1)
		Interacting with the system makes me curious. (CU2)
		Using the system arouses my imagination. (CU3)
Deep structure use	Breadth of use	number of features used
	Depth of use	*Finance and budgeting:*
		I use features that help me evaluate and compare different financial products. (FB1)
		I use features that help me compare the budget to actual results. (FB2)
		I use features that help me review, analyze and trim every line item. (FB3)
		I use features that help me perform multi-level budgeting. (FB4)
		I use features that help me monitor and revise budgets. (FB5)
		Accounting:
		I use features that help me check whether the financial documents conform to reporting and procedural standards. (ACT1)
		I use features that flag suspicious spending and revenue. (ACT2)
		I use federated search to obtain multiple sources of information when creating tax strategies. (ACT3)
		I use features that help me audit accounting activities. (ACT4)
		Personnel:
		I use features that help me improve the design of the work system. (PNL1)
		I use features that help me evaluate and compare different applicants. (PNL2)
		I use the online discussion forum to answer employees' questions about recruitment, payroll and benefits. (PNL3)
		I use features that provide me information about the current trends in sourcing and recruiting candidates. (PNL4)
		Customer management:
		I use features that help me understand the patterns of customers' purchasing behaviors. (CMG1)
		I use the file sharing feature that keeps important customers' documents and information attached right next to the entities to which they are related. (CMG2)
		I use features that help me import and organize the contact information of customers, track communication history, see social profiles, and manage tasks and events. (CMG3)
		I use features that help me prioritize different projects aiming to improve customer loyalty. (CMG4)
		Sales:
		I use features that convert raw data to useful information that is critical for making sales promotion decisions. (SLE1)
		I use federated search to obtain multiple sources of information when creating a sales forecast. (SLE2)
		I use features that help me quickly obtain knowledge that is critical for developing sales strategies. (SLE3)
		I use features that help me test different assumptions in the sales data to evaluate different sales proposals. (SLE4)

Table 1. Constructs and Measures (Continued)

Constructs		Items *7-point Likert Scale*: 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = moderately agree, 7 = strongly agree
Deep structure use	Depth of use	I use features that help me compare and contrast competitors' data to derive insightful conclusions on market share. (SLE5)
		Advertising and public relations:
		I use features that help me collect and synthesize information from multiple sources to develop advertising strategies. (APR1)
		I use features that help me publicize and promote our organization. (APR2)
		I use features that help me answer stakeholders' questions and/or clarify their misunderstanding. (APR3)
		I use features that help me share information with the customer management division. (APR4)
		Government liaison:
		I use features that direct me to the right sources of information to understand the relevant government rules and regulations. (GL1)
		I use features that facilitate communication with the government. (GL2)
		I use features to track happenings within the government that could affect my organization. (GL3)
		I use features that help me conduct research and monitor legislation. (GL4)
Task nonroutineness		I frequently use the system to deal with ill-defined business problems. (TSK1)
		I frequently use the system to deal with ad hoc, nonroutine business problems. (TSK2)
		Frequently the business problems I use the system to tackle involve answering questions that have never been asked in quite that form before. (TSK3)
Perceived support for contextualization		By using the system, I easily know who contributed a piece of knowledge to the system. (OWN1)
		By using the system, I easily find specific entries in the system that have been contributed by specific individuals. (OWN2)
		By using the system, I can easily link our unit's repository with other knowledge sources and applications. (TRV1)
		By using the system, I can easily identify historical connections between entries. (TRV2)
		The system easily allows different people to find summaries as well as details. (TRV3)
		The system easily interweaves notes, chat, email, and documents. (IND1)
		The system easily knows rationale behind the decision made by employees so that decisions and rationale can be revisited later. (IND2)
		The system easily labels an entry with multiple key words it pertains to. (MUL1)
		The system easily views annotations and comments on knowledge made by others. (MUL2)
		The system informs me when knowledge in the system changes. (EMG1)
		Sharing my knowledge through the system makes me lose my knowledge that no one else has. (EMG2)
		The systems easily changes identifiers on knowledge as employees' ideas evolve over time. (EMG3)
Absorptive capacity		*Capability to understand knowledge:*
		I have the necessary skills to acquire knowledge. (CUN1)
		I have the technical competence to absorb knowledge. (CUN2)
		I know the necessary steps to learn knowledge. (CUN3)
		I have the educational background to acquire knowledge. (CUN4)
		Capability to utilize knowledge:
		I utilize the knowledge in the system effectively. (CUT1)
		I have developed useful approaches to apply the knowledge in the system. (CUT2)
		I know how to make the best use of the knowledge in the system. (CUT3)

Table 1. Constructs and Measures (Continued)

Constructs	Items *7-point Likert Scale*: 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = moderately agree, 7 = strongly agree
Transformational leadership	*Please rate the following questions in terms of how much you agree or disagree with these questions that describe your leader of your business unit.*
	Instill pride in others for being associated with me. (INF1)
	Go beyond self-interest for the good of the group. (INF2)
	Act in ways that build others' respect for me. (INF3)
	Display a sense of power and confidence. (INF4)
	Talk about my most important values and beliefs. (INF5)
	Specify the importance of having a strong sense of purpose. (INF6)
	Consider the moral and ethical consequences of decisions. (INF7)
	Emphasize the importance of having a collective sense of mission. (INF8)
	Talk optimistically about the future. (MOT1)
	Talk enthusiastically about what needs to be accomplished. (MOT2)
	Articulate a compelling vision of the future. (MOT3)
	Express confidence that goals will be achieved. (MOT4)
	Re-examine critical assumptions to question whether they are appropriate. (STM1)
	Seek differing perspectives when solving problems. (STM2)
	Get others to look at problems from many different angles. (STM3)
	Suggest new ways of looking at how to complete assignments just as a member of the group. (STM4)
	Spend time teaching and coaching. (ICN1)
	Treat others as individuals rather than just as a member of the group. (ICN2)
	Consider each individual as having different needs, abilities and aspirations from others. (ICN3)
	Help others to develop their strengths. (ICN4)
Job performance without reference to the KMS	*Please rate your subordinates along the following dimensions…*
	Quality of work. (PE1)
	Quantity of work. (PE2)
	Technical competence. (PE3)
	Working as part of a team or work group. (PE4)
	Help others when it is not part of his/her job. (PE5)
Job performance with reference to the KMS	Using the KMS helps me find solutions to work problems. (PER1)
	Using the KMS reduces the time I spend on the completion of job tasks. (PER2)
	Using the KMS improves the quality of my work. (PER3)
Conscientiousness	I…
	am always prepared. (CON1)
	pay attention to details. (CON2)
	make plans and stick to them. (CON3)
	waste my time (reversed coded). (CON4)
	find it difficult to get down to work (reversed coded). (CON5)
Change management support	The change management support was available whenever I needed it. (CMS1)
	The change management consultants understood my problems well. (CMS2)
	The change management consultants resolved the problems I faced. (CMS3)
Training satisfaction	Overall, I was satisfied with the training. (TRN1)
	The training provided comprehensive coverage of the system and how I would use it in my job. (TRN2)
	The training materials were comprehensive. (TRN3)
Expertise	Please rate your subordinates' overall expertise on a 100-point scale with 100 refers to the highest level of expertise:
Rank	Which of the following best describes your position in this company: 1. junior manager 2. middle manager 3. senior manager 4. non-managerial employee
Tenure	Please indicate the number of years you have been working for this company: _____
Gender	Male ☐ Female ☐
Age	_____ years

have to covary, cognitive absorption was modeled as a second-order formative construct, with reflective items for each of the five dimensions (see Petter et al. 2007). With respect to deep structure use, the measure sought to cover both breadth of use and depth of use. To measure breadth of use, system logs were examined to identify the number of features an employee used. To identify the features that support the completion of tasks, a survey was created and experienced users (recommended by the units' managers) were asked to complete it. The survey was sent out to 25 experienced users in each business unit and had between 21 and 25 respondents in each business unit. The survey had three columns. The first column asked participants to write down the tasks that were critical in their jobs. In the example of the sales unit, five tasks (i.e., making sales promotion decisions, predicting sales, developing sales strategies, evaluating sales proposals, and analyzing competitors) were most frequently cited. The second column asked participants to write down, for each task, the KMS features that were critical for the task completion. The third column asked participants to explain how the KMS features support the tasks by elaborating on the relationships between core aspects of the tasks and the KMS features. For each task, a set of similar features cited most frequently to support the task were identified. In the example of the sales unit, a set of features that transform raw data to useful information were identified given that they were cited frequently as helpful in making sales promotion decisions. Given that different business units would use the system differently to complete different types of job tasks, measures of depth of use for different business units were developed. Depth of use was modeled using formative indicators. Combining breadth of use and depth of use, deep structure use was modeled as a second-order formative construct.

Task Nonroutineness. The three-item scale for *task nonroutineness* was adapted from Goodhue and Thompson (1995) and Majchrzak et al. (2005). Given that the purpose was to understand the effect of rich KMS use on job performance when employees leverage a KMS for the completion of tasks with varying degree of nonroutineness, the questions were phrased by relating tasks to the KMS being studied.

Perceived Support for Contextualization. The 11-item scale for perceived support for contextualization was adapted from Majchrzak et al. (2005) to fit the context of the KMS being studied. Given that the five dimensions of perceived support for contextualization (i.e., ownership, easy travel, indeterminancy, multiple perspectives, and emergence) do not have to covary, perceived support for contextualization was modeled as a second-order formative construct, with reflective items for each of the five dimensions.

Absorptive Capacity. This measure sought to cover the two major components of absorptive capacity (i.e., assimilate or understand new knowledge and utilize new knowledge). The first component was captured by using a scale adapted from Zhang et al. (2011) and another scale was developed to measure the second component. The new scale was developed by following DeVellis' (2003) guidelines. Items for capability to leverage knowledge were derived from their conceptual definitions, descriptions, narratives, and applications found in prior literature (e.g., Alavi and Leidner 2001; Becerra-Fernandez and Sabherwal 2001). First, the item pool was generated and then domain experts were asked to examine them and provide feedback based on which additions, deletions, or modifications were made to improve the content validity of these scales (DeVellis 2003). Fifty MBA students, who had a few years of work experience, were recruited to participate in a card sorting exercise to ensure that the newly developed scales and other scales were independent of each other. There were three items on a seven-point Likert agreement scale (1 = strongly disagree; 7 = strongly agree) in the final measure of capability to leverage knowledge. Following the card sorting exercise, a pilot test was conducted using 55 MBA students and the pilot test showed the scales exhibited adequate convergent and discriminant validity. Absorptive capacity was then modeled as a second-order formative construct that included capability to understand knowledge and capability to utilize knowledge.

Transformational Leadership. Transformational leadership was measured using the Multifactor Leadership Questionnaire (MLQ Form 5X) that captures four dimensions (i.e., intellectual stimulation, inspirational motivation, individualized consideration, and idealized influence; Bass and Avolio 1995). Given that these four dimensions do not have to covary, transformational leadership was modeled as a second-order formative construct, with reflective items for each of the four dimensions. 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, thus supporting aggregation (see Bliese 2000; James 1982).

Job Performance. Annual job performance was measured 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 employee

job performance. Job performance of each employee was gathered from the supervisor, peer coworkers identified as those who worked in the same groups or worked on the same projects as the employees, subordinates, and the employees themselves. Job performance was measured using ratings from multiple raters on the five dimensions adapted from prior research (e.g., Kraimer et al. 2005) to focus on overall job effectiveness. The multiple evaluators' ratings on the five items were on a seven-point scale, where seven was excellent and one was very poor. Therefore, job performance was modeled as a second-order formative construct, with five indicators that each measured job performance from different perspectives and different raters provided ratings for each of these five indicators. As noted earlier, self-rated performance was also measured with reference to the KMS using items adapted from Kankanhalli et al. (2011).

Control Variables. Gender (coded as men = 0), organizational tenure, organizational rank, expertise, conscientiousness (items 4 and 5 were reverse coded), lean use, and previous job performance were included as control variables. Employees' level of functional expertise was assessed by their supervisors on a 100-point scale. This measure is an overall rating of an employee's functional knowledge and skills. For example, a sales manager might give a rating for an employee with reference to the employee's various knowledge and skills in sales (e.g., planning, strategizing, and negotiation). Lean use was measured as duration of use and frequency of use obtained from system logs (Venkatesh 2000; Venkatesh et al. 2008). Frequency of use was measured by how many times a user logged into the system on a weekly basis and duration of use was measured as the average time the user spent using the system during a week. The mean and standard deviation for frequency of use was 13.21 and 4.85 and the mean and standard deviation for duration of use was 22.85 and 12.17. Previous job performance was measured identical to job performance but without reference to a KMS. These variables have been included because they have been found in prior research to predict individual performance (Cross and Cummings 2004; Mehra et al. 2001). For instance, conscientiousness, a personality trait, was included because it has been a consistent predictor of individual performance (Tett and Burnett 2003). Although measured, other personality variables (i.e., extraversion, openness, agreeableness, and neuroticism) were not included because they are not consistent predictors of individual performance. Conscientiousness was measured on a seven-point scale using a short (five-item) version adapted from Gosling et al. (2003). Likewise, training satisfaction and change management support were included as controls for job performance because they have been shown to be relevant in the context of a large-scale IT implementation (Venkatesh et al. 2011).

Results

Preliminary Analysis. A factor analysis with varimax rotation was conducted. The factor loadings and cross-loadings of the scales are reported in Appendix B. Item loadings of multi-item scales were greater than .70 and the cross-loadings were all lower than the loadings and the difference in loadings was larger than .10, 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 2. All ICRs were greater than .70, thus indicating internal consistency. As noted earlier, the guidelines of Petter et al. (2007) were followed in specifying formative constructs. For each formative construct, variance explained and the weight range of their formative indicators are shown in Appendix C. The weights of all the formative indicators were significant. Cognitive absorption ($r = .14$, $p < .05$), deep structure use ($r = .47$, $p < .001$), and previous job performance ($r = .29$, $p < .001$) were positively correlated with job performance without reference to the KMS. Similar patterns of correlations were observed for job performance with reference to the KMS.

Hierarchical Linear Modeling (HLM). Given that variables were measured at different levels (i.e., rich KMS use, task nonroutineness, perceived support for contextualization, absorptive capacity, and job performance at the individual level, and transformational leadership at the business unit level), HLM was used to analyze the data. Further, HLM takes into account the nonindependence of observations, and adjusts the degrees of freedom to account for relationships (individuals) nested within business units (Bryk and Raudenbush 1992; Singer and Willett 2003). A prerequisite for running HLM models is significant higher-level unit variance in the outcome measure (Hofmann 1997; Hofmann et al. 2000). Here, this means it was necessary to examine if there was significant between-business unit variance in job performance. A NULL two-level model with no predictors of job performance showed that significant variance was explained between business units.

Model Testing. Table 3 presents the results of the model testing. The raw score variables, without centering, were used to allow for examination of unique individual-level and business unit-level effects (Hofmann and Gavin 1998). The control variables were included first, followed by the main effects and, finally, the interaction effects. To test the interactions, cognitive absorption, deep structure use, task nonroutineness, perceived support for contextualization, absorptive capacity, and transformational leadership were standardized prior to creating the interaction terms to reduce collinearity

Table 2. Study 1: Descriptive Statistics and Correlations

	Mean	S Dev	1	2	3	4	5	6	7	8	9	10
1. Age	38.55	7.76	NA									
2. Gender (0: men)	.27	.44	.02	NA								
3. Organizational rank	7.78	4.40	.23***	-.17**	NA							
4. Organizational tenure	4.45	1.20	.24***	-.15*	.24***	NA						
5. Conscientiousness (CON)	5.10	0.87	.13*	.08	.08	.14*	.74					
6. Expertise	4.33	1.17	.17**	-.16**	.15*	.16**	.19**	.77				
7. Change management support (CMS)	4.07	1.14	-.15*	-.17**	-.17**	-.19**	.14*	.10	.73			
8. Training satisfaction (TRN)	4.65	1.30	-.19**	-.13*	-.23***	-.21***	.13*	.07	.15*	.76		
9. Lean use	14.78	4.37	-.24***	-.20**	-.21***	-.17**	.14*	.05	.13*	.10	NA	
10. Previous job performance	5.15	1.70	.19**	-.15*	.26***	-.24***	.06	.14*	.12*	.05	.19**	.74
11. Cognitive absorption (CA)	4.47	1.65	-.26***	-.17**	-.29***	-.25***	.19**	.14*	.05	.07	.24***	.24***
12. Deep structure use (DSU)	4.39	1.76	-.24***	-.16**	-.27***	-.29***	.13*	.15*	.05	.13*	.25***	.26***
13. Task nonroutineness (TSK)	3.95	1.36	-.17**	.08	-.20**	-.23***	.16**	.08	.13*	.12*	.10	-.15*
14. Perceived support for contextualization (PSC)	4.13	1.30	-.19**	-.13*	-.21**	-.24***	.08	.05	.05	.10	.07	.06
15. Absorptive capacity (AC)	4.47	1.65	-.20**	-.06	-.24***	-.26***	.16**	.20**	.06	.07	.05	.19**
16. Transformational leadership (TL)	4.21	1.38	.17**	.09	.15*	.14*	.10	.11*	.08	.09	.04	.17**
17. Job performance (without reference to the KMS) (PE)	4.89	1.71	.14*	-.10	.15*	.16**	.17**	.13*	.11*	.13*	.28***	.29***
18. Job performance (reference to the KMS) (PER)	4.66	1.65	.11*	-.14*	.15*	.14*	.26***	.10	.09	.12*	.21***	.30***

	11	12	13	14	15	16	17	18
11. Cognitive absorption (CA)	.71							
12. Deep structure use (DSU)	.28***	.75						
13. Task nonroutineness (TSK)	-.08	-.16**	.74					
14. Perceived support for contextualization (PSC)	.15*	.19**	.15*	.71				
15. Absorptive capacity (AC)	.19**	.24***	-.10	-.13*	.73			
16. Transformational leadership (TL)	.21**	.25***	-.04	.08	.12*	.75		
17. Job performance (without reference to KMS) (PE)	.14*	.47***	.10	.14*	.15*	.20**	.75	
18. Job performance (reference to KMS) (PER)	.13*	.37***	.09	.08	.08	.19**	.57***	.80

Notes:

1. n = 1.441
2. Internal consistency reliabilities (ICRs) appear on the diagonal.
3. *p < .05; **p < .01; ***p < .001.

between the main effects and interaction terms (Aiken and West 1991).

Table 3 shows the results of predicting job performance with and without reference to the KMS. Given that job performance refers to the overall job effectiveness of an employee, the results are presented using a scale for job performance that does not make reference to the KMS. The main effects model (model 2) explained 12% more variance in job performance than did the model with control variables only (model 1). The effect of cognitive absorption on job performance was not significant ($\beta = .07$, $p > .05$) but the effect of deep structure use on job performance was positive and significant ($\beta = .33$, $p < .001$). Thus, H1 was not supported but H2 was supported. Adding task nonroutineness, perceived support for contextualization, absorptive capacity, and transformational leadership as moderators (model 3) explained 16% more variance in job performance than did the model with control variables and main effects (model 2). Task nonroutineness was a significant moderator of the relationships between cognitive absorption and job performance ($\beta = .13$, $p < .05$) and between deep structure use and job performance ($\beta = .15$, $p < .05$). Thus, H3a and H3b were supported. Perceived support for contextualization was not a significant moderator of the relationships between cognitive absorption and job performance ($\beta = .07$, $p > .05$) and between deep structure use and job performance ($\beta = .04$, $p > .05$). Thus, H4a and H4b were not supported. Absorptive capacity was not found to be a significant moderator of the relationship between cognitive absorption and job performance ($\beta = .07$, $p > .04$). Thus, H5a

Table 3. Study 1: Predicting Job Performance

	Performance without reference to the KMS						Performance with reference to the KMS					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
R^2	.16		.28		.44		.17		.28		.47	
ΔR^2			.12***		.16***				.11***		.19***	
Level 2: Business unit												
Predictor:												
Transformational leadership (TL)					.13*	.06					.12*	.07
Level 1: Individual												
Control variables:												
Age	.08	.15	.05	.16	.02	.18	.06	.14	.04	.19	.03	.21
Gender	-.05	.20	-.04	.28	-.02	.29	-.08	.26	-.07	.27	-.04	.28
Organizational rank	.05	.19	.03	.21	.01	.22	.08	.24	.06	.25	.04	.31
Organizational tenure	.10	.22	.07	.28	.04	.29	.07	.30	.04	.33	.03	.34
Conscientiousness	.15*	.08	.13*	.09	.07	.14	.16**	.06	.14*	.07	.11*	.07
Expertise	.06	.15	.05	.17	.03	.22	.05	.21	.04	.22	.02	.22
Change management support	.07	.13	.04	.17	.02	.19	.05	.14	.04	.19	.02	.23
Training satisfaction	.08	.10	.05	.11	.01	.14	.05	.16	.04	.17	.01	.19
Lean use	.19**	.04	.17**	.05	.11*	.08	.15*	.06	.13*	.08	.08	.13
Previous job performance	.23***	.05	.21***	.05	.17**	.06	.20**	.06	.17**	.07	.15*	.07
Predictors:												
Cognitive absorption (CA)			.07	.16	.02	.19			.05	.31	.04	.29
Deep structure use (DSU)			.33***	.04	.19**	.07			.32***	.06	.23***	.06
Task nonroutineness (TSK)					.07	.27					.05	.31
Perceived support for contextualization (PSC)					.08	.21					.04	.28
Absorptive capacity (AC)					.08	.24					.05	.25
Interactions:												
CA x TSK					.13*	.08					.12*	.05
CA x PSC					.07	.17					.05	.28
CA x AC					.04	.23					.03	.17
CA x TL					.13*	.05					.11*	.09
DSU x TSK					.15*	.06					.14*	.10
DSU x PSC					.04	.14					.03	.19
DSU x AC					.28***	.08					.29***	.05
DSU x TL					.17**	.07					.19**	.06

Notes:

1. *p < .05; **p < .01; ***p < .001.
2. CA = cognitive absorption, DSU = deep structure use, TSK = task nonroutineness, PSC = perceived support for contextualization, AC = absorptive capacity, TL = transformational leadership.
3. Because the main effects of TSK, PSC, AC and TL are not theorized, they were only added in model 3 when the interactions are added.

was not supported. Absorptive capacity moderated the relationship between deep structure use and job performance ($\beta = .28$, $p < .001$). Thus, H5b was supported. Transformational leadership moderated the relationships between cognitive absorption and job performance ($\gamma = .13$, $p < .05$) and between deep structure use and job performance ($\gamma = .17$, $p < .01$). Thus, H6a and H6b were supported.

To better understand the patterns of the moderating effects of task nonroutineness, absorptive capacity, and transformational leadership, the significant interactions were plotted by following Aiken and West's (1991) guidelines. These plots are shown in Figures 3(a) to 3(e). The patterns of results were similar. Figure 3(a) is an example that helps us understand the findings. Figure 3(a) indicates the positive effect of cognitive absorption on job performance was stronger for tasks that have a higher level of nonroutineness. Following Aiken and West (1991) and Dawson and Richter (2006), the slopes of the lines representing task nonroutineness at one standard deviation below and above the mean were tested to

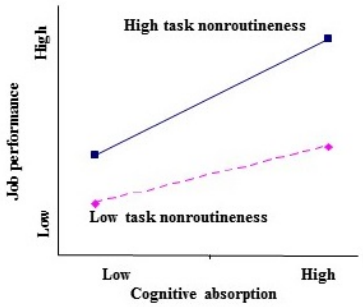

Figure 3(a). Moderator: Task Nonroutineness

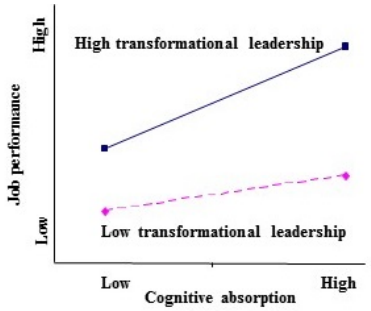

Figure 3(b). Moderator: Transformational Leadership

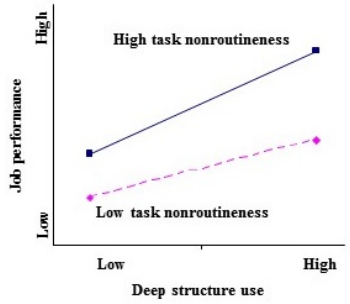

Figure 3(c). Moderator: Task Nonroutineness

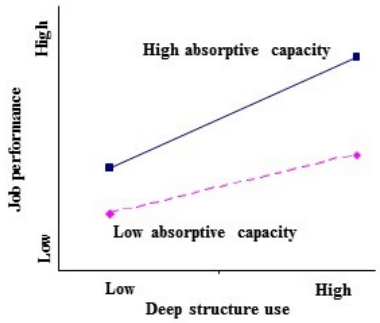

Figure 3(d). Moderator: Absorptive Capacity

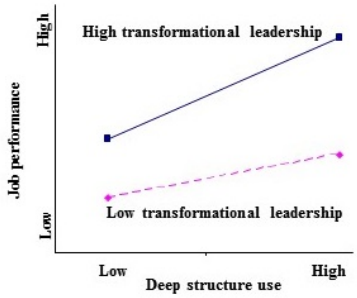

Figure 3(e). Moderator: Transformational Leadership

Figure 3. Study 1 Interaction Plots: Effects of Rich Use on Job Performance

see whether the two slopes representing high and low levels of task nonroutineness were significantly different from each other (see Dawson and Richter 2006). The two slopes ($t = 1.69$, $p < .05$) were significantly different from each other, suggesting job performance varied across different levels of task nonroutineness.

Study 2: Qualitative Study

To gain insights about the phenomenon, especially relationships that were not supported in the quantitative study (Venkatesh et al. 2013), semi-structured interviews were conducted after the quantitative data were analyzed. Although it would have been preferable to conduct interviews of employees from all seven business units, this work was limited to one business unit due to constraints posed by the organization that was mindful of employees' time. The choice was made to interview employees from the sales unit who were knowledge workers targeted to benefit from the KMS implementation. This business unit was mainly responsible for sales and promotion of financial products and customer relationship management. In the remainder of this

section, we discuss the qualitative study that was conducted in the sales unit.

Participants and Data Collection

When surveys were distributed to collect quantitative data, respondents were asked whether they would be willing to participate in a follow-up interview to share their experience with using the KMS. Among the 172 participants in the sales unit who provided usable responses to the survey, 95 indicated a willingness to participate in a follow-up semi-structured interview and provided their contact information. A median split was done on the key variables (i.e., rich use, task nonroutineness, perceived support for contextualization, absorptive capacity, and job performance) for these 95 participants. Then, participants who had variation on these variables were selected. Originally, those who were one standard deviation above or below the mean values of these variables were selected. Given that only a small number of participants met these criteria, the criteria were relaxed to include those who were half a standard deviation above and below the mean values. As a result, 73 participants were identified. Each of these 73 employees was contacted by e-mail for follow-up interviews. Some of them could not participate mainly due to schedule conflicts. Finally, 48 employees were interviewed. Employees were asked about their general reactions to the new KMS, the patterns of their use, challenges in using the KMS, and whether and how the KMS was helping them perform their jobs. There were eight standard questions (see Appendix D) and additional questions were asked depending on the answers to the initial questions, thus following a semi-structured interview approach. This allowed for a better comparison across interviews and greater depth in each interview. Each interview lasted between 30 and 60 minutes. All the interviews were taped and then transcribed using a professional transcription agency. Transcripts of the interviews were about 300 pages.

Data Analysis

Open coding, which "allowed the relevant information to emerge in grounded fashion through the iterative process of examination, connection to their world, and reexamination" (Trauth and Jessup 2000, p. 54), was used to develop themes and meanings. First, patterns were identified from the qualitative data by grouping similar themes into first-order concepts, categorizing similar first-order concepts into second-order themes, and aggregating second-order themes into higher-level theoretical dimensions (Miles and Huberman 1984; Venkatesh et al. 2010). The first-order concepts are statements extracted from the original interview script that are relevant to understand the hypotheses. For instance, two examples of such statements were (1) "using different features speeds up my work" and (2) "I like to use various functions for the same task because some functions address the limitations of others." The second-order themes are labels given to the first-order concepts that describe the same relationships. For example, the two statements above describe the relationship between breadth of use and job performance. Hence, a label of "breadth of use and job performance" was assigned as the second-order theme. A higher-level theoretical dimension is created if second-order themes can be aggregated. For example, the two second-order themes (i.e., "breadth of use and job performance" and "depth of use and job performance") can be aggregated to a higher-level abstraction, namely "deep structure use and job performance." Agar's (1986) approach was used to construe these categories by labeling strips (i.e., a single statement or a few employees' comments about a single idea, with different categories; Trauth and Jessup 2000). Two coders independently engaged in this task and no significant differences between the two coders were found. Then, the NUD*IST software was used to conduct a content analysis of the qualitative data to generate information about the importance of each theoretical category. For example, NUD*IST could count not only the number of times a theoretical category has been quoted, but also the number of times a theoretical category had been quoted by different people, thus helping us concentrate on a core set of theoretical categories (see Bala and Venkatesh 2007; Venkatesh et al. 2010). The theoretical categories that emerged matched the theorized relationship, thus providing support to the model.

Results

This work used the hypothetico-deductive (H-D) logic to test the hypotheses by following the steps described in Chatterjee et al. (2013). The H-D logic emphasizes falsification in hypothesis testing such that a single instance of disconfirming evidence is logically sufficient to refute a hypothesis (Chatterjee et al. 2013). Table 4 presents these results. If a coding was consistent with the hypothesis, a √ mark is displayed; otherwise, an X is displayed. For a hypothesis that was supported, there was evidence or quotes for at least one the cells marked √; and for all the cells marked X, there is a note indicating "No participants could be classified in this cell" (see H2, H3a, H3b, and H5b). For a hypothesis that was refuted, there was evidence or quotes for at least one of the cells marked X (see H1, H4a, and H5a); or there is a note indicating "No participants could be classified in this cell" for all of the cells marked √. This work used two examples (one direct effect and one moderating effect) to illustrate how the coding and hypotheses testing were done. With respect to H1

Table 4. Study 2—Results*

Hypothesis #	Hypotheses	Sample Size	Overall Result	Scenarios	Coding	Supported?	Representative Evidence	Explanation
H1	Cognitive absorption (CA) will positively affect job performanc e (PERF).	15	Refuted	Low CA and low PERF	0	√	"…I only used it whenever I had to"	The effect of CA on PERF is not linear and the effect is likely to be dependent on contingency factors, e.g., task nonroutineness.
				Low CA and high PERF	1	X	"…I largely use it to generate a list of customers targeted for sales promotions"	
				High CA and low PERF	2	X	"…fascinated with the system… interested in figuring out advanced functions"	
				High CA and high PERF	3	√	"I used the system a lot…it reduced the time of generating the inventory report…it is useful…I like it"	
H2	Deep structure use (DSU) will positively affect PERF.	17	Supported	Low DSU and low PERF	0	√	"I don't know how the system can help me work faster…there are too many features…I don't want to spend time learning these features…I really get confused"	Leveraging features that are complementary to each other enhances performance. It is also important that the right features were used to support the job tasks. Moreover, deep structure use can enhance employees' knowledge acquisition and problem solving skills that contribute positively to job performance.
				Low DSU and high PERF	1	X	No participants could be classified in this cell.	
				High DSU and low PERF	2	X	No participants could be classified in this cell.	
				High DSU and high PERF	3	√	"Using different features speeds up my work," "I like to use various functions for the same task because some functions address the limitations of others," "I take it as a good opportunity to learn new things by trying out different features…the process of exploring various features is valuable…I get a better understanding of various features and have a better idea of applying the right features to support important tasks"	

Table 4. Study 2—Results (Continued)*

Hypothesis #	Hypotheses	Sample Size	Overall Result	Scenarios	Coding	Supported?	Representative Evidence	Explanation
H3a	Task nonroutine-ness (TSK) will moderate the relationship between CA and PERF.	21	Supported	Low CA, low TSK and low PERF	0	√	"I don't deal with many complex tasks…I would use the system but I do not really enjoy using it"	For routine tasks that are usually simple and structured, a state of cognitive absorption indicates huge amount of time is allocated for the completion of a simple task. It is not necessary because some of the time could be used to get more work done. For nonroutine tasks that are complex, cognitive absorption is effective because it might take employees significant amount of time and cognitive resources to figure out the right ways of using the system to support the completion of the complex tasks.
				Low CA, low TSK and high PERF	1	√	"only a few clicks…I largely use it to generate a list of customers targeted for sales promotions"	
				Low CA, high TSK and low PERF	2	√	"…maybe I need to spend more time learning about it, figuring out how to use it…the tasks I am working on are complex"	
				Low CA, high TSK and high PERF	3	X	No participants could be classified in this cell.	
				High CA, low TSK and low PERF	4	√	"My tasks are not very complicated…I have spent tremendous amount of time on it"	
				High CA, low TSK and high PERF	5	X	No participants could be classified in this cell.	
				High CA, high TSK and low PERF	6	X	No participants could be classified in this cell.	
				High CA, high TSK and high PERF	7	√	"I am so engrossed…I spend hours comparing solutions from various sources…they are not simple tasks"	
H3b	Task nonroutine-ness (TSK) will moderate the relationship between DSU and PERF.	23	Supported	Low DSU, low TSK and low PERF	0	√	"I only used the system to generate some reports…I don't think it is necessary to learn more about the system"	For routine tasks that are usually simple and structured, deep structure use may not always have a positive effect on job performance, probably because engaging in deep structure use is somewhat time consuming and does not seem to be efficient. For nonroutine tasks, deep structure use that seeks to understand the fit between tasks and features may be useful because it helps find out the right ways of using the system to tackle unstructured problems.
				Low DSU, low TSK and high PERF	1	√	"I don't like to spend time comparing the effectiveness of different functionalities for easy and simple tasks"	
				Low DSU, high TSK and low PERF	2	√	"I received many ad hoc requests from customers…I don't have much idea [sic] of how the system can be used to support my work"	
				Low DSU, high TSK and high PERF	3	X	No participants could be classified in this cell.	
				High DSU, low TSK and low PERF	4	√	"I have used many tools and features in the system…most of the problems can be resolved by following certain rules"	
				High DSU, low TSK and high PERF	5	X	No participants could be classified in this cell.	
				High DSU, high TSK and low PERF	6	X	No participants could be classified in this cell.	
				High DSU, high TSK and high PERF	7	√	"It is important to explore the system, to understand the pros and cons of different features and then you are more likely to find a solution for an unexpected situation"	

Table 4. Study 2—Results (Continued)*

Hypothesis #	Hypotheses	Sample Size	Overall Result	Scenarios	Coding	Supported?	Representative Evidence	Explanation
H4a	Perceived support for contextualization (PSC) will moderate the relationship between CA and PERF.	22	Refuted	Low CA, low PSC and low PERF	0	√	"It is difficult to integrate information obtained from different sources in the system…I am not a big fan of the system"	Cognitive absorption represents a state of immersion in which users are having fun exploring the system. Providing contextual information may not always benefit an employee who is concentrating on using the system. For example, when a user is occupied with the system to accomplish a job task, e.g., analyzing some sales data for a certain region to find out why the sales decreased, sometimes he or she may not find the contextual information, such as ownership of a piece of knowledge or labeling of knowledge, to be useful. Another possible explanation is that some employees, especially those who were not good at multi-tasking, might feel the contextual cues as a distraction when they focused on using the system to get some job tasks done.
				Low CA, low PSC and high PERF	1	√	"I don't feel there is lots of fun [sic]…the system is not very user friendly"	
				Low CA, high PSC and low PERF	2	√	"It seems powerful with various tools and features…I don't rely too much on the system"	
				Low CA, high PSC and high PERF	3	X	"I don't spend too much time using the system…easy to access and synthesize information"	
				High CA, low PSC and low PERF	4	√	"I was very focused when using the system…it is difficult to validate the source of information and it is difficult to track the evolution of the knowledge"	
				High CA, low PSC and high PERF	5	X	No participants could be classified in this cell.	
				High CA, high PSC and low PERF	6	X	"I like the system and used it a lot…easy to identify the authors and contact them for further discussion"	
				High CA, high PSC and high PERF	7	√	No participants could be classified in this cell.	
H4b	Perceived support for contextualization (PSC) will moderate the relationship between DSU and PERF.	19	Refuted	Low DSU, low PSC and low PERF	0	√	"Too many parameters…too many reports…I don't use it much…I found it difficult to use"	In a state of deep structure use, users exploit various features and the familiarity with the features is likely to improve efficiency and effectiveness in the completion of job tasks, resulting in better performance. Providing too much contextual information about the system may sometimes create information overload, resulting in marginal benefits when an employee engages in deep structure use.
				Low DSU, low PSC and high PERF	1	√	No participants could be classified in this cell.	
				Low DSU, high PSC and low PERF	2	√	"I don't use the system much although I know it comes with lots of neat features…"	
				Low DSU, high PSC and high PERF	3	X	No participants could be classified in this cell.	
				High DSU, low PSC and low PERF	4	√	No participants could be classified in this cell.	
				High DSU, low PSC and high PERF	5	X	"I like comparing tools…it is difficult to compare and synthesize results generated by different methods"	
				High DSU, high PSC and low PERF	6	X	No participants could be classified in this cell.	
				High DSU, high PSC and high PERF	7	√	No participants could be classified in this cell.	

Table 4. Study 2—Results (Continued)*

Hypothesis #	Hypotheses	Sample Size	Overall Result	Scenarios	Coding	Supported?	Representative Evidence	Explanation
H5a	Absorptive capacity (AC) will moderate the relationship between CA and PERF.	24	Refuted	Low CA, low AC and low PERF	0	√	"I am not very strong at picking up new things…I should have spent more time learning the system"	I believe the effect of CA on PERF is dependent on task characteristics, e.g., TSK. I surmise that there could be a 3-way interaction of CA, TSK, and AC on job performance.
				Low CA, low AC and high PERF	1	√	"I used the system…only to get some work done and I will not spend too much time playing with it…I don't like to learn too many new things"	
				Low CA, high AC and low PERF	2	√	No participants could be classified in this cell.	
				Low CA, high AC and high PERF	3	X	"I learn new things quickly…I can get my job done…I don't enjoy using the system"	
				High CA, low AC and low PERF	4	√	"I like to play with the system …too much new knowledge and it is difficult to digest all of them [sic]"	
				High CA, low AC and high PERF	5	X	"It takes me lots of time [sic] to learn the new system…sometimes I will spend a couple of hours to figure out a function"	
				High CA, high AC and low PERF	6	X	"I play with the system all the time…I enjoy the process of learning and I am quite good at picking up new knowledge"	
				High CA, high AC and high PERF	7	√	"The more I use the system, the more I like it…I have learned many new things"	
H5b	Absorptive capacity (AC) will moderate the relationship between DSU and PERF.	25	Supported	Low DSU, low AC and low PERF	0	√	"too many tools…it is difficult to understand all [sic]"	During the process of deep structure use, users are likely to encounter problems and challenges. To resolve the problems, users may need to learn new knowledge. Under such a circumstance, capability to assimilate new knowledge is critical for the completion of job tasks.
				Low DSU, low AC and high PERF	1	√	"It is not easy to understand the pros and cons of all the features…it is not my strength to acquire new knowledge"	
				Low DSU, high AC and low PERF	2	√	"I did not spend much time exploring the system…not because I am afraid of learning new knowledge"	
				Low DSU, high AC and high PERF	3	X	No participants could be classified in this cell.	
				High DSU, low AC and low PERF	4	√	"I compare different features, understanding their advantages and limitations…not an easy task given my limited technical knowledge"	
				High DSU, low AC and high PERF	5	X	No participants could be classified in this cell.	
				High DSU, high AC and low PERF	6	X	No participants could be classified in this cell.	
				High DSU, high AC and high PERF	7	√	"I like to pursue new knowledge…the more features I know, the better I know how to use them more effectively"	

*Given the analysis focused on only the sales unit, the moderating hypotheses for transformational leadership were not applicable.

that theorized the positive effect of cognitive absorption (CA) on job performance (PERF), four scenarios (i.e., from 0 to 3; see the column "Scenarios" in Table 4), were coded. According to the philosophy of falsification (Lee 1989; Lee and Hubona 2009), the hypothesis was refuted as long as there was evidence to support scenarios of 1 or 2 or if evidence to support scenarios 0 and 3 cannot be obtained. With respect to H3a that theorized how task nonroutineness (TSK) moderated the effect of cognitive absorption on job performance, eight scenarios (i.e., from 0 to 7; see the column "Scenarios" in Table 4), were coded. The hypothesis would be refuted if there was evidence to support scenarios 3, 5, or 6 or if evidence to support the scenarios 0, 1, 2, 4, or 7 was not obtained.

Evidence of rich KMS use and the three contingency factors (i.e., task nonroutineness, perceived support for contextualization, and absorptive capacity) was collected from the interview transcripts. However, evidence of performance ratings (i.e., low and high) was obtained from the organization's archives. Specifically, low PERF refers to performance rating at half a standard deviation below the mean, whereas high PERF refers to performance rating at half a standard deviation above the mean. The column "explanation" unearths explanations and theoretical mechanisms that resulted in the falsification of certain hypothesized relationships. For hypotheses that were supported, it digs deeper into the mechanisms that were not evident in earlier theory development. For example, H2 was supported in both the quantitative and qualitative studies. The qualitative study provides evidence about how employees used features that were complementary to each other to enhance their job performance. The qualitative study also indicates the importance of using the features in the right way so that they can support the completion of job tasks more effectively and efficiently, a theoretical mechanism that has not been fully elaborated in earlier theory development. This is consistent with the objectives of using mixed method studies for triangulation and complementation (Greene et al. 1989; Venkatesh et al. 2013). In addition, the qualitative study has shed light on the relationships that were not supported in the quantitative study. For example, the qualitative study explains why H1 was not supported. Specifically, the reason that cognitive absorption was not related to job performance lies in that the effect of cognitive absorption was dependent on task type. Whereas the effect of cognitive absorption on job performance might be trivial when employees use a KMS to perform routine tasks, the effect will be much stronger when they use a KMS to perform nonroutine tasks. Regarding H5a, we surmise the moderating effect of absorptive capacity was dependent on task type and there is a three-way interaction of cognitive absorption, absorptive capacity, and task nonroutineness.[6]

Discussion

This work sought to understand job performance in the context of KMS use by adapting and extending prior work on rich conceptualizations of system use (Burton-Jones and Straub 2006). A model that examined the effect of rich KMS use on job performance was developed and four key contextual factors related to the use–performance link were identified and included in the model. A mixed methods approach that included a quantitative study and a qualitative study was developed to validate the model. Based on a quantitative study, the model was largely supported and explained 44% of the variance in job performance. The major findings were that deep structure use contributed positively to job performance, and contingency factors related to task, system, user, and leadership moderated the relationship between rich KMS use and job performance. Similar pattern of results were also found in the qualitative study. It served to cross-validate the results from the quantitative study, provided a richer and more complete view on how employees experience job success, and explained the unsupported findings from the quantitative study.

Theoretical Implications

This work contributes to research in several ways. First, this work contributes to the literature related to IT implementations in general and KMS implementations in particular (see Alavi and Leidner 2001; Rai et al. 2010; Sykes et al. 2011; Venkatesh and Bala 2012; Venkatesh, Thong, and Xu 2016). Whereas prior work has examined the effect of KMS use on job performance, this work extends prior work by adopting a rich conceptualization of KMS use and incorporating important contingency factors to develop a better understanding of the use–performance link. Using a lean conceptualization approach, we only knew whether use or nonuse, use frequency, and intensity affect job performance, but less was known about what kind of use contributes to job performance. This work sought to address the limitation by incorporating a rich conceptualization of use. Specifically, the work found that employees are likely to perform better when they explore more features and use the features that are appropriate for

[6]In light of the findings from the qualitative study, the quantitative data were reanalyzed. The three-way interaction was tested and the effect was found to be significant. Specifically, the effect of cognitive absorption on job performance was stronger when employees high on absorptive capacity performed nonroutine tasks.

specific tasks. In addition, it found that the relationship between rich KMS use and job performance was not linear, and it was important to incorporate contingency factors to gain a better understanding of the relationship. By including the contingency factors related to task, system, user, and leadership, this work demonstrated how the effect of rich KMS use on job performance will be strengthened or attenuated under different circumstances. This work thus sheds light on our understanding of why prior studies were inconclusive about the use-performance link. This work is among the first to simultaneously examine four important aspects of the work environment (i.e., task, system, user, and leadership) as contingency factors related to the use–performance relationship. Moreover, whereas most prior research has focused on examining the relationship between technology use and task performance, this work includes job performance as the ultimate outcome variable. This helps us understand a broader consequence of system use given that job performance not only captures task performance, but also performance on other activities that support the completion of core tasks (e.g., Motowidlo and Van Scotter 1994). By demonstrating a positive effect of system use on job performance, this work demonstrated the value of system use not only to support task completion, but also to overall job effectiveness.

Second, this paper extends research on rich use of IT by adapting it to the context of KMS implementation and develops a better understanding of how rich use of a KMS affects job performance. Although the concept of rich use has been examined in prior research (e.g., Burton-Jones and Straub 2006), its impact on job performance in the context of a KMS implementation had not been adequately understood. In order to gain a better understanding of the relationship between rich use of KMS and job performance, the concept of rich use was adapted to the context of KMS implementations. Specifically, prior measures for cognitive absorption and deep structure use were adapted to fit the context of a KMS implementation. For example, the KMS features that are relevant to deep structure use were identified to gain a better understanding of how deep structure use of a KMS affects job performance. Another related benefit is that future research can use these measures to examine how rich use of a KMS affects other outcomes (e.g., innovative performance, stress).

Third, this paper contributes to the management literature on job performance by incorporating context into theory development (Bamberger 2008; Rousseau and Fried 2001). There have been numerous appeals for the greater consideration of context in management (Johns 2006; for an example, see Venkatesh et al. 2010) and IS research (Hong et al. 2014). One important contextual element in this work is the incorporation of the unique characteristics of a KMS to explain job performance. Given that a KMS is a large-scale and complex IT, a conceptualization of rich use of a KMS would better capture the nature and quality of use. Consequently, rich KMS use should better predict job performance. Another important contextual element is the work environment of a KMS implementation from which the important contingency factors were identified to understand the use–performance relationship. Drawing on various literatures related to task characteristics, knowledge management, and leadership, this work identified task nonroutineness, absorptive capacity, and transformational leadership as key boundary conditions of the use–performance link.

Finally, this paper integrates both quantitative and qualitative approaches to achieve greater robustness in the model validation. By combining both approaches, the risks of drawing erroneous conclusions resulting from the limitations of using only one approach are mitigated. For example, although a qualitative approach may capture the richness of organizational behavior by in-depth interviews, the conclusions may be less generalizable; likewise, one limitation of a quantitative approach is that it yields little information about the underlying meaning of the data (Venkatesh et al. 2013; Venkatesh, Brown, and Sullivan 2016). The integration of both approaches thus minimizes biases associated with a particular method and facilitates richer understanding of a social phenomenon (Creswell and Clark 2007). A similar pattern of findings in both the qualitative and the quantitative studies was observed. Although the quantitative study helped us find the direction and strength of a relationship, the qualitative study provided a richer understanding of why such a relationship exists. Thus, the integration of both quantitative and qualitative approaches helped us triangulate the findings. The qualitative approach also helped us understand why some of the hypotheses were not supported, thus helping us achieve a richer understanding of the phenomenon.

Limitations and Future Research

First, this work adapted and extended prior work on the rich conceptualization of system use by developing a model to understand job performance in the context of KMS use. Future research should test the generalizability of the current model by studying other complex technologies, such as e-healthcare systems and enterprise resource planning systems (e.g., Rai et al. 2010; Sykes 2015; Sykes and Venkatesh 2017; Sykes et al. 2014; Venkatesh and Bala 2012). Second, this work sought to gain a better understanding of the use–performance link by incorporating various contingency factors. Future research may draw from different theoretical perspectives to identify other contingency factors. One

potential theoretical lens is cultural values. For example, employees who have a high tolerance for ambiguity and uncertainty may be more likely to benefit from rich use of a system than those who have a low tolerance for ambiguity and uncertainty because those who have a high tolerance for ambiguity and uncertainty will be likely to try out new features. Third, due to practical constraints, such as disrupting too many employees from their routine work, the number of interviewees was limited. Consequently, the sample size for hypotheses testing using the H-D logic might not be adequate to capture different scenarios. Therefore, future research should be conducted with larger samples. Finally, this work mainly focused on how rich KMS use affects job performance and the primary objective of implementing a KMS was to facilitate knowledge creation, sharing, and application (Alavi and Leidner 2001), and future work should examine factors driving employees to create, share, and apply knowledge.

Practical Implications

This work sought to help organizations reap the benefits of KMS implementations and one such important benefit is to enhance employees' job performance. To achieve this objective, organizations should facilitate rich use of KMSs. Organizations should provide adequate training to their employees and leverage power users to facilitate greater knowledge transfer. Power users are likely to enjoy using the system and they are likely to explore the system, such as learning more features or experimenting with new ways of using different features. They are likely to have a better understanding of the pros and cons of different features, especially those who play a critical role in supporting the completion of core tasks. Power users can deliver training sessions to end users by sharing their own experiences. For example, power users can make employees realize the benefits of using more features (e.g., the complementary effect of using a number of features). End users are likely to follow power users and spend more time finding out how to leverage various features of a KMS. In addition to training, organizations can provide incentives (e.g., bonus, recognition), which are generally desirable to employees (see Ryan and Deci 2000), to facilitate deep structure use. To motivate employees to use various features of a KMS, organizations can acknowledge or reward employees for developing new patterns of use (e.g., use of complementary features) that facilitate the completion of job tasks.

This work found that the effect of rich KMS use on job performance will be stronger when tasks are perceived to be less structured and uncertain. This indicates rich use of a KMS is more important for nonroutine tasks. Organizations should strengthen training on rich use of a KMS for employees who are likely to handle nonroutine tasks. For example, *ad hoc* requests from managers or supervisors might be nonroutine tasks. To help employees who handle such tasks, organizations could provide more training on deep structure use, such as how to use different types of searches to find the relevant information.

To use a KMS to improve job performance, employees need to enhance their capacity to absorb new knowledge. Such a capacity helps employees resolve problems arising from rich use of a KMS. Consequently, employees can perform better. Both organizations and employees should think about approaches that would help employees enhance their absorptive capacity. Organizations can provide employees with training on how to develop skills in obtaining new knowledge or assign employees tasks that will help them acquire and apply new knowledge. Employees should also think about how to improve their absorptive capacity on their own. They may choose to work on projects conducive to growing their skills in integrating and applying knowledge or they can get advice from coworkers who have more experience in absorbing new knowledge.

It is important for organizations to provide effective leadership during a KMS implementation. This work shows business unit leaders play a key role in affecting employees' job performance. Specifically, transformational leaders were effective in helping their employees to better leverage a KMS to enhance job performance. Managers should consider behaving in ways that exhibit transformational leadership actions. Organizations should also consider planning ahead to construct an effective management team before a KMS implementation. They should consider hiring leaders from either internal or external sources with transformational leadership skills to manage implementations. Organizations can also provide training to leaders to develop transformational leadership skills.

Conclusions

The main purpose of this paper was to develop a better understanding of how to leverage a KMS to enhance job performance by adopting the context theorizing approach. A mixed methods approach was adopted here to validate the model. We found that employees' performance was affected by the extent to which they engage in rich use of a KMS and the use–performance relationship was dependent on task nonroutineness, absorptive capacity, and transformational leadership. This work thus contributes to the KMS literature by developing a better understanding of the relationship between KMS use and job performance as well as providing guidance to organizations and employees on how to enhance employees' job performance through effective use of KMSs.

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References

Agar, M. H. 1986. *Speaking of Ethnography*, Thousand Oaks, CA: Sage.

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.

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

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.

Armstrong, S., and Overton, T. S. 1977. "Estimating Non-Response Bias in Mail Surveys," *Journal of Marketing Research* (14:3), pp. 396-402.

Bala, H., and Venkatesh, V. 2007. "Assimilation of Interorganizational Business Process Standards," *Information Systems Research* (18:3), pp. 340-362.

Bamberger, P. 2008. "From the Editors beyond Contextualization: Using Context Theories to Narrow the Micro-macro Gap in Management Research," *Academy of Management Journal* (51:5), pp. 839-846.

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

Bass, B. M., and Avolio, B. J. 1995. *Multifactor Leadership Questionnaire: Manual Leader Form, Rater, and Scoring Key for MLQ (Form 5x-Short*), Redwood City, CA: Mind Garden.

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

Benbasat, I., Dexter, A. S., and Todd, P. 1986. "An Experimental Program Investigating Color-enhanced and Graphical Information Presentation: An Integration of the Findings," *Communications of the ACM* (29:11), pp. 1094-1105.

Bliese, P. D. 2000. "Within-Group Agreement, Non-Independence, and Reliability: Implications for Data Aggregation and Analysis," in *Multilevel Theory, Research and Methods in Organizations,* K. J. Klein and S. W. Kozlowski (eds.), San Francisco: Jossey-Bass, pp. 349-381.

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.

Brown, S. A. 2005. "Absorptive Capacity in Information Systems," in *The Blackwell Encyclopedic Dictionary of Management Information Systems* (2nd ed.), G. B. Davis (ed.), Volume VII of the *Encyclopedia of Management*, C. L. Cooper, C. Argyris, and W. H. Starbuck (eds.), Oxford: Blackwell.

Bryk, A. S., and Raudenbush, S. W. 1992. *Hierarchical Linear Models: Applications and Data Analysis Methods*, Newbury Park, CA: Sage.

Burns, J. M. 1978. *Leadership*, New York: The Free 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.

Chatterjee, S., Merhout, J. W., Sarker, S., and Lee, A. S. 2013. "An Examination of the Electronic Market Hypothesis in the US Home Mortgage Industry: A Deductive Case Study," *Information Technology & People* (26:1), pp. 4-27.

Chiaburu, D. S., Oh, I.-S., Berry, C. M., Li, N., and Gardner, R. G. 2011. "The Five-Factor Model of Personality Traits and Organizational Citizenship Behaviors: A Meta-Analysis," *Journal of Applied Psychology* (96:6), pp. 1140-1166.

CIO Magazine. 2011. "IT in 2011: Four Trends that Will Change Priorities," available online at http://www.cio.com/article/651497/IT_in_2011_Four_Trends_that_Will_Change_Priorities.

Cohen, W. M., and Levinthal, D. A. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* (35:1), pp. 128-152.

Creswell, J. W., and Clark, V. L. P. 2007. *Designing and Conducting Mixed Methods Research*, Thousand Oaks, CA: Sage.

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.

Csikszentmihalyi, M. 1990. *Flow: The Psychology of Optimal Experience*, New York: Harper and Row.

Dalal, R. S., Lam, H., Weiss, H. M., Welch, E. R., and Hulin, C. L. 2009. "A Within-Person Approach to Work Behavior and Performance: Concurrent and Lagged Citizenship-Counterproductivity Associations, and Dynamic Relationships with Affect and Overall Job Performance," *Academy of Management Journal* (52:5), pp. 1051-1066.

Davis, E. W., and Heidorn, G. E. 1971. "An Algorithm for Optimal Project Scheduling under Multiple Resource Constraints," *Management Science* (17:2), pp. B803-B816.

Dawson, J. F., and 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.

DeVellis, R. F. 2003. *Scale Development: Theory and Applications,* Thousand Oaks, CA: Sage.

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

Enns, H. G., Huff, S. L., and Higgins, C. A. 2003. "CIO Lateral Influence Behaviors: Gaining Peers'Commitment to Strategic Information Systems," *MIS Quarterly* (27:1), pp. 155-176.

Fairchild, A. J., and MacKinnon, D. P. 2009. "A General Model for Testing Mediation and Moderation Effects," *Prevention Science* (10:2), pp. 87-99.

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

Faraj, S., and Yan, A. 2009. "Boundary Work in Knowledge Teams," *Journal of Applied Psychology* (94:3), pp. 604-617.

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.

Fuller, R. M., and Dennis, A. R. 2009. "Does Fit Matter? The Impact of Task–Technology Fit and Appropriation on Team Performance in Repeated Tasks," *Information Systems Research* (20:1), pp. 2-17.

Gallivan, M., Rai, A., and Eynon, J. 2003. "The Challenge of Knowledge Management Systems: Analyzing the Dynamic Processes Underlying Performance Improvement Initiatives," *Information Technology and People* (16:3), pp. 326-352.

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

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

Greene, J. C., Caracelli, V. J., and Graham, W. F. 1989. "Toward a Conceptual Framework for Mixed-Method Evaluation Designs," *Educational Evaluation and Policy Analysis* (11:3), pp. 255-274.

Griffin, M. A., Neal, A., and Parker, S. K. 2007. "A New Model of Work Role Performance: Positive Behavior in Uncertain and Interdependent Contexts," *Academy of Management Journal* (50:2), pp. 327-347.

Griffith, T. L., Sawyer, J. E., and Neale, M. A. 2003. "Virtualness and Knowledge in Teams: Managing the Love Triangle of Organizations, Individuals, and Information Technology," *MIS Quarterly* (27:2), pp. 265-287.

Handzic, M. 2009. "Evaluating KMS Effectiveness for Decision Support: Preliminary Results," in *Knowledge Management and Organizational Learning*, W. R. King (ed.), New York: Springer, pp. 236-250.

Haerem, T., and Rau, D. 2007. "The Influence of Degree of Expertise and Objective Task Complexity on Perceived Task Complexity and Performance," *Journal of Applied Psychology* (92), pp. 1320-1331.

He, J. W., and Wei, K. 2006. "Knowledge Management Systems (KMS) Continuance in Organizations: A Social Relational Perspective," *Knowledge Science, Engineering and Management* (4092), pp. 34-41.

Herold, D. M., Fedor, D. B., Caldwell, S., and Liu, Y. 2008. "The Effects of Transformational and Change Leadership on Employees' Commitment to a Change: A Multilevel Study," *Journal of Applied Psychology* (93:2), pp. 346-357.

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

Hofmann, D. A., and Gavin, M. B. 1998. "Centering Decisions in Hierarchical Linear Models: Implications for Research in Organizations," *Journal of Management* (24:5), pp. 623-641.

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*, K. J. Klein, and S. W. Kozlowski (eds.), San Francisco: Jossey-Bass, pp. 467-511.

Hong, W., Chan, F. K. Y., Thong, J. Y. L., Chasalow, L. C., and Dhillon, G. 2014. "A Framework and Guidelines for Context-specific Theorizing in Information Systems Research," *Information Systems Research* (25:1), pp. 111-136.

James, L. 1982. "Aggregation Bias in Estimates of Perceptual Measures," *Journal of Applied Psychology* (67:2), pp. 219-229.

Jansen, J. J., van den Bosch, F. A. J., and Volberda, H. W. 2005. "Managing Potential and Realized Absorptive Capacity: How Do Organizational Antecedents Matter?," *Academy of Management Journal* (48:6), pp. 999-1015.

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.

Johns, G. 2006. "The Essential Impact of Context on Organizational Behavior," *Academy of Management Review* (31:2), pp. 386-408.

Kankanhalli, A., Lee, O.-K. D., and Lim, K. H. 2011. "Knowledge Reuse Through Electronic Repositories: A Study in the Context of Customer Service Support," *Information & Management* (48:2-3), pp. 106-113.

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.

Keller, R. 2012. "Predicting Performance and Innovativeness of Scientists and Engineers," *Journal of Applied Psychology* (97:1), pp. 225-233.

Kettinger, W., Zhang, C., and Marchand, D. 2011. "CIO and Business Executive Leadership Approaches to Establishing Company-Wide Information Orientation," *MIS Quarterly Executive* (10:4), pp. 157-174.

Ko, D.-G., and Dennis, A. R. 2011. "Profiting from Knowledge Management? The Impact of Time and Experience," *Information Systems Research* (22:1), pp. 134-152.

Ko, D.-G., Kirsch, L. J., and King, W. R. 2005. "Antecedents of Knowledge Transfer from Consultants to Clients in Enterprise System Implementations," *MIS Quarterly* (29:1), pp. 59-85.

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.

Lee, A. 1989. "A Scientific Methodology for MIS Case Studies," *MIS Quarterly* (13:1), pp. 33-50.

Lee, A. S., and Hubona, G. S. 2009. "A Scientific Basis for Rigor in Information Systems Research," *MIS Quarterly* (33:2), pp. 237-262.

MacKenzie, S. B., Podsakoff, P. M., and Fetter, R. 1993. "The Impact of Organizational Citizenship Behaviors on Evaluations of Sales Performance," *Journal of Marketing* (57:1), pp. 70-80.

Majchrzak, A., Malhotra, A., and John, R. 2005. "Perceived Individual Collaboration Know-How Development Through Information Technology-Enabled Contextualization: Evidence from Distributed Teams," *Information Systems Research* (16:1), pp. 9-27.

Mann, J. 2010. *What to Do When Knowledge Management Goes Wrong* (Vol. G00207068), Gartner Group, Stamford, CT.

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), pp. 355-371.

McCall, H., Arnold, V., and Sutton, S. 2008. "Use of Knowledge Management Systems and the Impact on the Acquisition of Explicit Knowledge," *Journal of Information Systems* (22:2), pp. 77-101.

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.

Miles, M. B., and Huberman, A. M. 1984. *Qualitative Data Analysis: A Sourcebook of New Methods,* Newbury Park, CA: Sage.

Mingers, J. 2001. "Combining IS Research Methods: Towards a Pluralist Methodology," *Information Systems Research* (12:3), pp. 240-259.

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

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.

Motowidlo, S. J., and Van Scotter, J. R. 1994. "Evidence That Task Performance Should Be Distinguished from Contextual Performance," *Journal of Applied Psychology* (79:4), pp. 475-480.

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.

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

Petter, S., Straub, D. W., and Rai, A. 2007. "Specifying Formative Constructs in Information Systems Research," *MIS Quarterly* (31:4), pp. 623-656.

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

Rai, A., Venkatesh, V., Bala, H., and Lewis, M. 2009. "Transitioning to a Modular Enterprise Architecture: Drivers, Constraints, and Actions," *MIS Quarterly Executive* (9:2), pp. 83-94.

Roberts, N., Galluch, P. S., Dinger, M., and Grover, V. 2012. "Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research," *MIS Quarterly* (36:2), pp. 625-A6.

Rothbard, N. P., and Wilk, S. L. 2011. "Waking Up on the Right or Wrong Side of the Bed: Start-of-Workday Mood, Work Events, Employee Affect, and Performance," *Academy of Management Journal* (54:5), pp. 959-980.

Rousseau, D., and Fried, Y. 2001. "Location, Location, Location: Contextualizing Organizational Research," *Journal of Organizational Behavior* (22:1), pp. 1-13.

Ryan, R. M., and Deci, E. L. 2000. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being," *American Psychologist* (55:1), pp. 68-78.

Setia, P., Venkatesh, V., and Joglekar, S. 2013. "Leveraging Digital Technologies: How Information Quality Leads to Localized Capabilities and Customer Service Performance," *MIS Quarterly* (37:2), pp. 565-590.

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

Sykes, T. A. 2015. "Support Structures and Their Impacts on Employee Outcomes: A Longitudinal Field Study of an Enterprise System Implementation," *MIS Quarterly* (39:2), pp. 473-495.

Sykes, T. A., and Venkatesh, V. 2017. "Explaining Post-Implementation Employee System Use and Job Performance: Impacts of the Content and Source of Social Network Ties," *MIS Quarterly* (41:3), pp. 917-936.

Sykes, T. A., Venkatesh, V., and Johnson, J. 2014. "Enterprise System Implementation and Employee Job Performance: Understanding the Role of Advice Networks," *MIS Quarterly* (38:1), pp. 51-72.

Sykes, T. A., Venkatesh, V., and Rai, A. 2011. "Explaining Physicians' Use of EMR Systems and Patient Satisfaction in the Shakedown Phase," *Journal of the American Medical Informatics Association* (18:2), pp. 125-130.

Taylor, W. A. 2004. "Computer-Mediated Knowledge Sharing and Individual User Differences: An Exploratory Study," *European Journal of Information Systems* (13:1), pp. 52-64.

Tepper, B. J., Moss, S. E., and Duffy, M. K. 2011. "Predictors of Abusive Supervision: Supervisor Perceptions of Deep-Level Dissimilarity, Relationship Conflict, and Subordinate Performance," *Academy of Management Journal* (54:2), pp. 279-294.

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.

Trauth, E. M., and Jessup, L. M. 2000. "Understanding Computer-Mediated Discussions: Positivist and Interpretive Analyses of Group Support System Use," *MIS Quarterly* (24:1), pp. 43-79.

Trevino, L. K., and Webster, J. 1992. "Flow in Computer-Mediated Communication Electronic Mail and Voice Mail Evaluation and Impacts," *Communication Research* (19:5), pp. 539-573.

Tsai, W. 2001. "Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance," *Academy of Management Journal* (44:5), pp. 996-1004.

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

Venkatesh, V. 1999. "Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation," *MIS Quarterly* (23:2), pp. 239-260.

Venkatesh, V. 2000. "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model," *Information Systems Research* (11:4), pp. 342-365.

Venkatesh, V., and Bala, H. 2012. "Adoption and Impacts of Interorganizational Business Process Standards: The Role of Partnering Synergy," *Information Systems Research* (23:4), pp. 1131-1157.

Venkatesh, V., Bala, H., and Sykes, T. A. 2010. "Impacts of Information and Communication Technology Implementations on Employees' Jobs in India: A Multi-Method Longitudinal Field Study," *Production and Operations Management* (19:5), pp. 591-613.

Venkatesh, V., Brown, S. A., and Bala, H. 2013. "Bridging the Qualitative–Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems," *MIS Quarterly* (37:1), pp. 21-54.

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.

Venkatesh, V., Brown, S., and Sullivan, Y. W. 2016. "Guidelines for Conducting Mixed Methods Research: An Extension and Illustration," *Journal of the Association for Information Systems* (17:7), pp. 435-494.

Venkatesh, V., Thong, J. Y. L., and Xu, X. 2016. "Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead," *Journal of the Association for Information Systems* (17:5), pp. 328-376.

Venkatesh, V., Zhang, X., and Sykes, T. A. 2011. "Doctors Do Too Little Technology: A Longitudinal Field Study of an Electronic Healthcare System Implementation," *Information Systems Research* (22:3), pp. 523-546.

Vessey, I. 1991. "Cognitive Fit: A Theory-Based Analysis of the Graphs Versus Tables Literature," *Decision Sciences* (22:2), pp. 219-240.

VisionCor. 2010. "A VisionCor Case Study Knowledge Management: Cisco Systems Service and Support Advocacy," VisionCor, Charlotte, NC (available online at Cisco_Enterprise_Solutions_Delivery_Services.pdf).

Whetten, D. A. 2008. "An Examination of the Interface between Context and Theory Applied to the Study of Chinese Organizations," *Management and Organization Review* (5:1), pp. 29-55.

Whetten, D. A. 1989. "What Constitutes a Theoretical Contribution," *Academy of Management Review* (14:4), pp. 490-495.

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

Zhang, X., Venkatesh, V., and Brown, S. 2011. "Designing Collaborative Systems to Enhance Team Performance," *Journal of the Association for Information Systems* (12:8), pp. 556-584.

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RESEARCH ARTICLE

KNOWLEDGE MANAGEMENT SYSTEM USE AND JOB PERFORMANCE: A MULTILEVEL CONTINGENCY MODEL

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Appendix A

Prior Research on Factors Affecting KMS Success

Authors	IVs	DV	Theoretical Perspectives	Methodology	Context	Nature of KMS	Major Findings	Role of Performance	Journal
McCall et al. (2008)	KMS use	Decision performance and knowledge acquisition	ACT-R theory	Experiment	Students who enrolled in a managerial accounting class	WebCT, an internet-based course portal	In the short term, KMS increased decision performance, but in the long term, it did not help development of domain expertise	Test scores, encoding of explicit knowledge and problem-solving skills	Journal of Information Systems
Gallivan et al. (2003)	Use of a "help desk" KMS	Employees' performance	Studies employing system dynamics	Case study	University employees in the computer service center	An integrated multi-function KMS that combines a call tracking system and a knowledge repository	KMS use decreased performance	Efficiency metrics to measure performance	Information Technology and People
Gonzalez et al. (2005)	Use of a knowledge management-centric help desk	Employees' performance	Literature related to knowledge management, help desk operations and technologies	Experiment	Help desk agents	A KMS serves as an intermediary between help desk agent and all data, information and knowledge sources	Use of a knowledge management-centric help desk improved employees' performance	Performance as time to resolve problems and the throughput of the help desk	Decision Support Systems

Authors	IVs	DV	Theoretical Perspectives	Methodology	Context	Nature of KMS	Major Findings	Role of Performance	Journal
Handzic (2009)	KMS use	Decision performance	Literature related to decision making and knowledge management	Experiment	Graduate students who enrolled in Master or Doctoral courses in IS	KMS as a decision-aiding component for a simulated production planning game	The effect of KMS use on decision performance was not conclusive	Performance as decision accuracy	Knowledge Management and Organizational Learning, Annals of Information Systems
Kankanhalli et al. (2011)	KMS reuse	Employees' performance	Literature related to KMS capability for knowledge reuse and KMS user motivation	Survey	Customer service officers supporting phone banking services in a multinational bank	Knowledge repository	Knowledge reuse was positively related to employees' performance	Performance as faster, better and less costly customer service due to use of the knowledge repository	Information and Management
Ko and Dennis (2011)	KMS use	Individual sales performance	Literature related to KMS implementation	Data collected from multiple sources, i.e., KMS system, personnel management system and third-party contractor	Knowledge workers, i.e., sales representatives from the pharmaceutical industry	Lotus Notes-based system for the mobile sales representatives and use of the system was not mandatory	KMS use had significant positive impact on individual performance and experience moderated the relationship such that the effect was stronger for individuals with more experience, but the effect of experience diminished over time	Employee sales performance	Information Systems Research
Quigley et al. (2007)	Knowledge sharing norms, shared knowledge, trust	Manager's performance as market share	Incentive theory and social motivation theory	Survey and experiment	Simulation game	CELCOM 21, a computer-based interactive management decision-making simulation	Trust in knowledge providers strengthened the effect of self-efficacy of knowledge seekers on their performance; knowledge sharing and self-set goals had both direct and interactive effects on individual performance	Performance measured as market share	Organization Science

Appendix B

Loadings and Cross-Loadings

	FI	TD	HE	CO	CU	TSK	OWN	TRV	IND	MUL	EMG	INF	MOT	STM	ICN	CUN	CUT	PER	CON	CMS	TRN
FI1	**.82**	.32	.32	.40	.29	.27	.25	.21	.32	.42	.39	.26	.34	.27	.37	.26	.25	.37	.24	.39	.24
FI2	**.81**	.25	.39	.17	.19	.21	.27	.26	.17	.23	.26	.17	.25	.40	.33	.29	.17	.24	.34	.33	.44
FI3	**.73**	.18	.24	.23	.31	.43	.31	.29	.27	.22	.39	.22	.25	.41	.35	.30	.31	.28	.27	.31	.39
FI4	**.80**	.35	.42	.34	.29	.32	.41	.39	.44	.24	.25	.26	.43	.41	.44	.20	.24	.26	.42	.40	.17
TD1	.44	**.81**	.42	.23	.29	.40	.27	.38	.18	.23	.36	.43	.36	.18	.23	.29	.36	.21	.23	.18	.23
TD2	.40	**.82**	.24	.27	.42	.17	.26	.21	.33	.41	.41	.19	.37	.34	.37	.33	.28	.20	.44	.42	.24
TD3	.36	**.71**	.43	.24	.41	.43	.23	.40	.25	.24	.19	.24	.21	.42	.20	.24	.32	.32	.19	.18	.29
TD4	.37	**.80**	.17	.42	.44	.24	.37	.32	.34	.24	.39	.40	.34	.34	.44	.26	.41	.33	.32	.19	.28
HE1	.32	.44	**.82**	.28	.37	.39	.20	.42	.19	.27	.36	.27	.30	.38	.32	.18	.19	.25	.43	.28	.42
HE2	.36	.18	**.72**	.43	.18	.27	.24	.36	.39	.19	.26	.21	.43	.38	.34	.24	.32	.27	.31	.35	.35
HE3	.30	.17	**.74**	.20	.29	.17	.35	.42	.27	.21	.39	.20	.44	.26	.20	.39	.32	.25	.34	.41	.33
CO1	.42	.28	.25	**.78**	.29	.22	.43	.40	.38	.33	.43	.25	.18	.17	.30	.17	.33	.26	.36	.20	.31
CO2	.24	.32	.34	**.72**	.36	.17	.17	.38	.32	.27	.38	.35	.37	.41	.24	.35	.21	.19	.33	.31	.36
CU1	.36	.39	.29	.19	**.83**	.41	.34	.21	.21	.20	.40	.36	.40	.19	.33	.18	.33	.29	.44	.41	.44
CU2	.25	.41	.37	.44	**.70**	.29	.41	.22	.24	.35	.31	.43	.27	.30	.32	.43	.21	.36	.17	.28	.25
CU3	.37	.26	.36	.44	**.76**	.36	.33	.18	.20	.37	.23	.33	.40	.37	.27	.29	.20	.39	.33	.38	.22
TSK1	.43	.43	.41	.39	.27	**.71**	.24	.42	.36	.25	.21	.37	.31	.38	.29	.41	.25	.44	.22	.27	.25
TSK2	.24	.36	.41	.36	.38	**.76**	.44	.30	.36	.44	.43	.37	.24	.34	.37	.36	.17	.36	.44	.31	.29
TSK3	.27	.42	.34	.29	.18	**.76**	.31	.19	.24	.29	.26	.30	.34	.31	.18	.40	.41	.44	.22	.42	.17
OWN1	.35	.33	.35	.37	.17	.29	**.74**	.36	.33	.42	.34	.20	.21	.32	.23	.33	.30	.18	.21	.27	.19
OWN2	.23	.26	.30	.34	.34	.20	**.73**	.24	.39	.34	.28	.42	.17	.42	.29	.44	.26	.38	.43	.42	.38
TRV1	.36	.20	.39	.18	.42	.18	.17	**.69**	.21	.43	.44	.34	.38	.28	.19	.31	.34	.40	.27	.36	.21
TRV2	.19	.28	.37	.37	.44	.34	.44	**.78**	.18	.21	.18	.33	.27	.31	.24	.21	.25	.35	.33	.33	.42
TRV3	.21	.43	.37	.38	.42	.30	.20	**.83**	.21	.20	.32	.17	.24	.27	.37	.32	.36	.19	.27	.18	.39
IND1	.38	.23	.33	.31	.42	.26	.21	.34	**.75**	.30	.24	.35	.40	.17	.17	.42	.40	.44	.40	.25	.37
IND2	.36	.22	.35	.19	.44	.31	.23	.38	**.75**	.19	.17	.25	.25	.25	.39	.36	.37	.20	.23	.31	.24
MUL1	.35	.20	.36	.40	.35	.18	.39	.17	.31	**.81**	.31	.20	.26	.18	.31	.27	.44	.40	.19	.24	.37
MUL2	.44	.24	.18	.39	.28	.35	.29	.42	.28	**.80**	.26	.23	.38	.32	.40	.27	.26	.18	.25	.37	.17
EMG1	.21	.20	.31	.28	.42	.26	.42	.27	.25	.36	**.70**	.24	.34	.31	.21	.40	.32	.26	.39	.19	.23
EMG2	.37	.19	.43	.31	.34	.24	.20	.24	.24	.35	**.81**	.43	.30	.43	.22	.37	.20	.19	.44	.33	.24
INF1	.21	.34	.24	.35	.21	.28	.24	.41	.44	.34	.33	**.71**	.32	.30	.29	.43	.23	.40	.31	.41	.38
INF2	.35	.41	.40	.22	.30	.25	.26	.30	.39	.42	.17	**.76**	.27	.30	.39	.22	.22	.30	.43	.35	.30
INF3	.38	.18	.34	.17	.27	.18	.28	.17	.43	.41	.44	**.71**	.31	.44	.36	.18	.22	.21	.25	.22	.28
INF4	.29	.43	.42	.27	.29	.19	.21	.38	.24	.27	.17	**.70**	.41	.44	.20	.20	.22	.35	.44	.44	.26
INF5	.29	.40	.33	.37	.39	.17	.43	.42	.21	.17	.38	**.70**	.33	.40	.29	.38	.20	.25	.26	.39	.24
INF6	.19	.38	.19	.27	.38	.39	.30	.42	.22	.35	.21	**.78**	.25	.18	.19	.44	.24	.23	.37	.22	.25
INF7	.18	.20	.30	.36	.28	.27	.27	.28	.26	.32	.39	**.79**	.35	.19	.41	.20	.36	.32	.44	.19	.42
INF8	.27	.27	.30	.26	.32	.35	.21	.39	.27	.19	.32	**.73**	.37	.30	.39	.35	.28	.31	.25	.28	.41
MOT1	.22	.30	.43	.18	.30	.22	.34	.36	.22	.31	.32	.29	**.72**	.43	.38	.17	.43	.23	.23	.18	.28
MOT2	.43	.25	.35	.24	.40	.44	.24	.36	.23	.34	.24	.20	**.79**	.43	.31	.38	.44	.20	.33	.41	.18
MOT3	.36	.39	.29	.29	.43	.28	.31	.43	.39	.33	.35	.23	**.71**	.22	.26	.39	.31	.35	.37	.38	.34
MOT4	.21	.27	.23	.43	.20	.35	.23	.32	.24	.43	.17	.17	**.81**	.19	.36	.43	.28	.19	.41	.39	.17
STM1	.28	.20	.36	.40	.32	.28	.36	.35	.40	.43	.35	.38	.31	**.78**	.37	.39	.25	.40	.22	.34	.35
STM2	.22	.17	.34	.40	.40	.38	.19	.20	.41	.26	.17	.24	.17	**.82**	.25	.24	.36	.39	.27	.34	.42
STM3	.19	.32	.22	.25	.40	.24	.22	.36	.44	.27	.34	.20	.30	**.70**	.43	.32	.42	.18	.44	.22	.27
STM4	.39	.29	.43	.41	.24	.41	.24	.36	.32	.29	.28	.43	.20	**.83**	.39	.32	.18	.24	.17	.34	.36
ICN1	.25	.39	.44	.31	.30	.41	.17	.18	.33	.37	.21	.33	.22	.37	**.69**	.25	.22	.36	.27	.29	.42
ICN2	.24	.20	.24	.21	.17	.29	.20	.41	.18	.39	.29	.33	.25	.34	**.71**	.34	.22	.29	.23	.26	.19
ICN3	.33	.42	.19	.24	.41	.32	.37	.22	.34	.29	.21	.28	.44	.17	**.80**	.39	.40	.40	.29	.34	.20
ICN4	.33	.27	.44	.24	.34	.33	.24	.40	.19	.26	.33	.44	.43	.17	**.83**	.41	.43	.23	.41	.39	.38
CUN1	.44	.26	.26	.35	.20	.43	.19	.17	.44	.35	.41	.25	.25	.29	.31	**.75**	.26	.24	.42	.19	.27
CUN2	.39	.23	.17	.41	.17	.25	.23	.41	.44	.37	.39	.27	.41	.21	.31	**.83**	.21	.34	.33	.26	.23
CUN3	.18	.44	.29	.26	.24	.19	.17	.17	.28	.35	.33	.37	.31	.19	.31	**.76**	.18	.17	.30	.26	.38
CUN4	.26	.31	.27	.38	.44	.42	.23	.38	.21	.28	.39	.42	.28	.41	.21	**.74**	.18	.41	.19	.19	.18

	FI	TD	HE	CO	CU	TSK	OWN	TRV	IND	MUL	EMG	INF	MOT	STM	ICN	CUN	CUT	PER	CON	CMS	TRN
CUT1	.38	.38	.39	.36	.25	.28	.29	.25	.22	.23	.41	.42	.42	.31	.35	.41	**.75**	.31	.34	.19	.38
CUT2	.28	.18	.34	.35	.36	.23	.21	.36	.32	.33	.38	.39	.36	.33	.34	.34	**.76**	.43	.33	.20	.30
CUT3	.28	.23	.26	.31	.31	.35	.24	.34	.23	.42	.26	.38	.37	.23	.17	.32	**.74**	.28	.42	.22	.23
PER1	.36	.35	.35	.39	.19	.35	.19	.39	.18	.37	.32	.37	.36	.23	.28	.39	.29	**.78**	.42	.28	.42
PER2	.42	.26	.40	.38	.40	.36	.41	.17	.34	.33	.17	.29	.39	.23	.23	.21	.28	**.77**	.36	.44	.21
PER3	.17	.33	.35	.38	.40	.39	.34	.22	.30	.41	.44	.40	.33	.31	.20	.24	.43	**.76**	.35	.42	.23
CON1	.37	.31	.40	.27	.44	.34	.31	.21	.22	.32	.40	.17	.35	.37	.38	.36	.18	.25	**.82**	.41	.34
CON2	.17	.18	.19	.36	.39	.22	.33	.37	.37	.20	.31	.39	.27	.40	.32	.36	.21	.31	**.73**	.23	.17
CON3	.27	.44	.37	.43	.41	.22	.44	.37	.32	.32	.42	.31	.29	.39	.30	.35	.22	.35	**.82**	.35	.38
CON4	.42	.23	.27	.42	.27	.22	.42	.41	.30	.39	.17	.42	.27	.19	.18	.32	.36	.39	**.83**	.31	.31
CON5	.44	.32	.39	.39	.29	.21	.42	.18	.25	.23	.35	.36	.32	.32	.44	.28	.24	.28	**.81**	.33	.20
CMS1	.18	.17	.28	.26	.18	.25	.20	.28	.19	.36	.42	.29	.42	.28	.24	.37	.29	.33	.34	**.69**	.34
CMS2	.29	.34	.37	.27	.27	.35	.41	.36	.19	.25	.43	.20	.42	.34	.17	.37	.24	.36	.24	**.83**	.18
CMS3	.24	.18	.31	.38	.39	.21	.20	.33	.39	.36	.28	.33	.37	.17	.31	.23	.32	.35	.24	**.79**	.41
TRN1	.18	.27	.43	.31	.31	.21	.37	.17	.40	.40	.21	.24	.28	.20	.42	.28	.26	.32	.34	.34	**.81**
TRN2	.32	.19	.31	.27	.25	.39	.20	.32	.21	.32	.32	.25	.19	.36	.30	.43	.43	.39	.24	.18	**.78**
TRN3	.39	.22	.24	.32	.18	.44	.36	.24	.18	.26	.42	.17	.21	.39	.22	.17	.28	.21	.25	.37	**.80**

Notes:

1. FI = focused immersion, TD = temporal dissociation, HE = heightened enjoyment, CO = control, CU = curiosity, TSK = task nonroutineness, OWN = ownership, TRV = easy travel, IND = indeterminancy, MUL = multiple perspectives, EMG = emergence, CUN = capability to understand knowledge, CUT = capability to utilize knowledge, INF= idealized influence, MOT = inspirational motivation, STM = intellectual stimulation, ICN = individual consideration, PER = performance with reference to the KMS, CON = conscientiousness, CMS = change management support, TRN = training satisfaction.

2 Cross-loadings less than .25 are not shown.

Appendix C

Variance and Weight Range

Formative Constructs	Variance	Weight Range
Cognitive absorption	.65	between .42 and .61
Deep structure use	.66	.77 and .64
Depth of use	.62	between .32 and .53
Perceived support for contextualization	.58	between .25 and .40
Absorptive capacity	.52	.35 and .57
Transformational leadership	.62	between .33 and .61
Job performance without reference to the KMS	.60	between .30 and .50
Previous job performance without reference to the KMS	.66	between .28 and .66

Appendix D

Initial Set of Semi-Structured Interview Questions

1. Please tell me why the organization needed to implement the system.
2. Please comment on the training that you were given during the implementation of the system.
3. Please comment on the organizational support made available to you after the roll-out of the system.
4. Please describe how your work has been affected by the system.
5. Please comment on the major benefits of using the system.
6. Please comment on the major challenges you encounter in doing your job after the implementation of the system.
7. Please describe how you use the system to support your job.
8. Please describe how you tackle the various problems arising from using the system.

Note: Other questions were asked depending on the responses received.

References

Gallivan, M., Rai, A., and Eynon, J. 2003. "The Challenge of Knowledge Management Systems: Analyzing the Dynamic Processes Underlying Performance Improvement Initiatives," *Information Technology and People* (16:3), pp. 326-352.

González, L. M., Giachetti, R. E., and Ramirez, G. 2005. "Knowledge Management-Centric Help Desk: Specification and Performance Evaluation," *Decision Support Systems* (40:2), pp. 389-405.

Handzic, M. 2009. "Evaluating KMS Effectiveness for Decision Support: Preliminary Results," in *Knowledge Management and Organizational Learning*, W. R. King (ed.), New York: Springer, pp. 236-250.

Kankanhalli, A., Lee, O.-K. D., and Lim, K. H. 2011. "Knowledge Reuse Through Electronic Repositories: A Study in the Context of Customer Service Support," *Information & Management* (48:2-3), pp. 106-113.

Ko, D.-G., and Dennis, A. R. 2011. "Profiting from Knowledge Management? The Impact of Time and Experience," *Information Systems Research* (22:1), pp. 134-152.

McCall, H., Arnold, V., and Sutton, S. 2008. "Use of Knowledge Management Systems and the Impact on the Acquisition of Explicit Knowledge," *Journal of Information Systems* (22:2), pp. 77-101.

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," *Organization Science* (18:1), pp. 71-88.

Shanteau, J. 1992. "Competence in Experts: The Role of Task Characteristics," *Organizational Behavior and Human Decision Processes* (53:2), pp. 252-266.