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132. Understanding Knowledge Management Systems Continuance: A Decomposed Model

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Abstract

Knowledge management (KM) research has yielded extensive theoretical explanations on the motivations of an individual to share knowledge using various types of face-to-face or virtual communication, each with different sets of influential factors. We propose that by decomposing individual belief into multidimensional belief constructs specific to knowledge contribution and knowledge-seeking contexts, those diverse factors can be consistently related to the antecedents of behavioral intention. Based on information systems (IS) continuance research and extant literature on KM, we formulate the research models for knowledge management systems (KMS) continuance for knowledge-contribution and -seeking behaviors, and test them with empirical data.

Keywords: KMS continuance, belief, behavior, knowledge contribution, knowledge seeking

Introduction

By implementing knowledge management systems (a class of IT-based systems applied to managing organizational knowledge, Alavi and Leidner 1999), referred to as KMS, organizations assume their performance could be improved by ensuring knowledge transfer and sharing (Gray and Mayster 2004). However, this is surely not always the case. In practice, the installed IT applications are almost always underutilized (Jaspersen et al. 2005; Nevo et al. 2003). KMS can only meet the organization's expectations when the technologies are continually used by the employees in those implementing organizations (Venkatesh et al. 2003).

Since continued use, or continuance, is generally considered to be a more important factor in assuring successful system implementation (Bhattacharjee 2001; Jaspersen et al. 2005; Limayem et al. 2003), IS continuance has been a focus of research in recent years. However, there has been little continuance research in the knowledge management (KM) area (one example is the study by Tiwana and Bush, 2005). As a result, how to get employees to continually use KMS so as to improve organizational performance is still a central question for not only researchers but also practitioners (Taylor 2004).

In addition, successful KMS continuance requires that some system users be willing to document their knowledge in the KMS and that some be willing to seek and reuse the codified knowledge in KMS as well (Ba et al. 2001; Kankanhalli et al. 2005a). KMS users may have distinct needs and motivations when conducting different behaviors in the KMS, i.e., the behaviors associated with knowledge contribution and knowledge seeking. Obviously a dual-perspective study is needed. While the prevalent KM literature considers the transfer of knowledge from the contribution perspective (e.g., Bock et al. 2005; Kankanhalli et al. 2005a; Wasko and Faraj 2005), little research has been done from the seeking perspective (Gray and Meister 2004; Kankanhalli et al. 2005b). Research on managing knowledge in

organizations or communities has generated a wealth of empirical evidence characterized by diverse sets of factors influencing knowledge sharing or KMS utilization. However, there is a lack of a synthesis of factors that can be consistently related to the antecedents of behavioral intention.

This study is motivated by the need to integrate the fragmented, sometimes contradictory research on the individual's intention regarding knowledge contribution and knowledge seeking and to progress toward a better understanding of KMS continuance behavior. We suggest that two sets of belief dimensions from knowledge-contribution and knowledge-seeking perspectives can be derived from the literature.

Theoretical Background

IS Continuance Research

IS continuance refers to continued use behavior of a particular IS (Bhattacharjee 2001). Prior IS research has implicitly examined the continuance concept by suggesting that IS adopters reevaluate their earlier acceptance decision during a final "confirmation" stage and decide whether to continue or discontinue using an innovation (Rogers 1995). Recently, several scholars explicitly elaborate the importance of IS continuance and the significance of understanding IS continuance behavior (Bhattacharjee 2001; Bhattacharjee and Premkumar 2004; Cheung and Limayem 2005; Jasperson et al. 2005).

Bhattacharjee (2001) adapts the expectation-confirmation theory (ECT) to theorize and validate one of the very first IS continuance models. He identifies that the intention toward IS continuance is strongly predicted by the user's satisfaction, and perceived usefulness is a secondary predictor. In this early model, the conceptualization of satisfaction is from a consumer perspective derived from marketing literature. However, "satisfaction is a transient, experience-specific affect, while attitude is a relatively more enduring affect transcending all prior experiences" (Bhattacharjee 2001, p. 354). Therefore, a later two-stage study (Bhattacharjee and Premkumar 2004) uses the user's belief and attitude to determine continuance or discontinuance.

On the basis of reviewing eight user-acceptance models, Venkatesh et al. (2003) formulate a unified model, called the unified theory of acceptance and use of technology (UTAUT). UTAUT implicitly deals with IS continuance by positing experience as a significant moderator in most of the relationships in the model. Specifically, UTAUT posits two main determinants of usage behavior (usage intention and facilitating conditions), and three direct determinants of intention (performance expectancy, effort expectancy, and social influence). Its results indicate that the effect of effort expectancy decreases in the continuance stage, while the effect of social influence on intention and the effect of facilitating conditions on continuance behavior become significant.

Despite the noteworthy contributions of these influential studies on IS continuance, the predominant role of intention is questioned by the argument that IS usage would transcend conscious behavior and become part of normal routine activity (Cheung and Limayem 2005; Cooper and Zmud 1990). Based on this line of research, scholars examine the moderating effect of habit on the relationship between IS continuance intention and continuance behavior and prove that the impact of user's intention on IS continuance behavior weakens over time.

Jasperson et al. (2005) extend the scope of interest by describing post-adoption behavior as the interplay between the organizational intervention and individual cognition. Jasperson et al. propose a two-level model in which users develop post-adoptive intentions based on their cognitions. Although this study did not empirically validate its model, it sheds light on the need to seek a more complete understanding of user's belief rather than viewing perceived usefulness as a single factor in predicting the user's behavior. Besides perceived usefulness, other user's beliefs are fragmented across models and probably contextually differentiated.

The Structure of Belief: Contextual Factors in KM Research

Belief is defined as the subjective probability of a relation between the object of the belief and some other object, value, concept, or attribute (Fishbein and Ajzen 1975). Simply put, belief means that a person thinks a given behavior will lead to certain consequences. There is extant literature on KM or KMS implementation, sometimes contradictory, that attempts to address the significant factors in successful knowledge sharing. A set of stable, decomposed belief structures for different KM contexts may help to depict the relationships between the belief structures and the behavioral intention (Taylor and Todd 1995). In the following part, we identify the relevant factors based on a deliberate review of literature on knowledge contribution and seeking.

Factors influencing knowledge contribution

Image is defined as the perception of an increase in positive reputation due to contributing knowledge (Kankanhalli et al. 2005a). Prior research finds that building reputation is a strong motivator for active participation in electronic networks of practice (Donath 1999). Recent work confirms that people contribute knowledge when they perceive their professional reputations will be enhanced (Wasko and Faraj 2005).

Enjoyment in helping others is defined as the perception of pleasure obtained from helping others through knowledge contribution (Kankanhalli et al. 2005a). Prior research shows that people who contribute their knowledge gain satisfaction stemming from their intrinsic enjoyment in helping others (Wasko and Faraj 2000). In turn, enjoyment in helping others can significantly impact the knowledge contributor's IS usage (Kankanhalli et al. 2005a).

Reciprocity benefit is defined as the benefit expectancy of a future request for knowledge being met as a result of the current contribution (Kankanhalli et al. 2005a). There is evidence that people who share knowledge in online communities believe in reciprocity (Wasko and Faraj 2000). In addition, reciprocity is thought to exert influence on information sharing by means of a "return-in-kind" attitude (Kolekofski and Heminger 2003).

Factors influencing knowledge seeking

Perceived usefulness is defined as the degree to which an individual believes that knowledge seeking in the KMS would enhance his or her work performance (Davis 1989; Davis et al. 1989). This definition is consistent with that of performance expectancy in UTAUT (Venkatesh et al. 2003). Perceived usefulness is a salient belief in IS use that has a predominant and persistent effect on usage intention across time and various IS contexts (Bhattacharjee 2001; Venkatesh and Morris 2000).

Seeker knowledge growth is defined as the perceived benefit of enhancing his or her own learning and experience by a knowledge seeker (Wasko and Faraj 2000). In other words, it is

the perception by users that participation in the online communities results in learning and personal access to new knowledge or innovations (Wasko and Faraj 2000).

Factors influencing both knowledge contribution and knowledge seeking

Organizational reward is defined as the importance of economic incentives provided for knowledge contributors and knowledge seekers (Kankanhalli et al. 2005a). Rewards are considered important components of the KM process (Argote et al. 2003). In order to encourage knowledge-sharing behaviors, organizations may provide various forms of reward such as salary raises, bonuses, job security, and promotion opportunities (Bock et al. 2005; Kankanhalli et al. 2005a). In prior research, Hall (2001) presents the effectiveness of organizational reward in shaping employees' attitude. However, some researchers have found inverse evidence indicating that organizational reward may exert a negative effect on individual's attitude toward knowledge sharing (Bock et al. 2005).

Management influence is defined as the degree to which an employee perceives that the management believes he or she should contribute or seek knowledge via KMS (Venkatesh et al. 2003). There exists abundant research on the importance of management support or leadership in KM initiatives (Massey et al. 2002; Pan et al. 2001). The more the employees believe that information sharing is "correct and socially expected workplace behavior", the more they would be willing to share (Constant et al. 1994).

Effort expectancy is defined as the degree of effort associated with the knowledge-contribution or -seeking behavior, in terms of time and endeavor required (Kankanhalli et al. 2005a). Effort expectancy is a significant determinant of intention and behavior (Kankanhalli et al. 2005a; Venkatesh et al. 2003). Some research documents the significance of efforts required in knowledge-seeking behavior such as appropriate tools (Hall 2001), ease of searching and finding (Wickramasinghe 2002), personalization (Ong and Lai 2004), and so forth. Too much time and effort needed could be an inhibitor for knowledge seeking.

Social relationship is defined as an individual's perception toward other KMS users (supervisors, subordinates, and peers) with whom the person has social interactions (Cummings et al. 2002; Tiwana and Bush 2005). Information sharing is believed to be distinguishable from other simple exchange behavior where individuals act merely from rational self-interest (Jarvenpaa and Staple 2000). Researchers believe that knowledge sharing is a kind of social interaction among people (Bock and Kim 2002). The existing literature provides sufficient evidence that social relationship can facilitate collective action, while the lack of relationship between the contribution side and the seeking side is identified as a major barrier to knowledge transfer (Nevo et al. 2003; Szulanski 1996). From prior literature, we identify three aspects of social relationship that are particularly conducive to knowledge sharing: trust (McEvily et al. 2003; Nahapiet and Ghoshal 1998; Yates-Mercer and Bawden 2002), norms (Kankanhalli et al. 2005a; Nahapiet and Ghoshal 1998), and tie strength (Levin and Cross 2004; Nahapiet and Ghoshal 1998; Reagans and McEvily 2003).

Factors theorized not to be dimensions of belief

Self-efficacy is defined as the judgment of one's ability to use a technology to accomplish a particular job or task (Compeau and Higgins 1995). Prior research identifies that self-efficacy's effect on intention can be fully mediated by perceived ease of use (Venkatesh 2000;

Venkatesh et al. 2003). Consistent with prior research, we will not consider self-efficacy accounts to be a key dimension of belief with the presence of effort expectancy.

Subjective norm is one’s perception that most people who are important to him or her think he or she should or should not perform the behavior in question (Ajzen 1991; Fishbein and Azjen 1975; Taylor and Todd 1995). However, Taylor and Todd (1995) suggest the decomposition of this normative belief into referent groups (i.e., peers and superiors) since their expectation may differ. In this study, we have adopted the constructs of management influence and social relationship to represent the effects of top management and the colleagues, which are more specific than subjective norm.

Perceived behavioral control reflects perceptions of internal and external constraints on behavior (Taylor and Todd 1995). The role of this construct that encompasses self-efficacy, resource facilitating conditions, and technology facilitating conditions has been tapped by effort expectancy and facilitating conditions in the UTAUT (Venkatesh et al. 2003). We therefore follow the argument of UTAUT to drop this embodied concept.

Research Model

We suggest that a unified KMS continuance model can be applied to both knowledge-contribution and knowledge-seeking contexts for explaining the potential determinants on KMS continuance behavior. However, the structure of user’s beliefs varies in two different behavioral contexts. Figures 1 and 2 depict the research models from contribution and seeking perspectives, respectively.

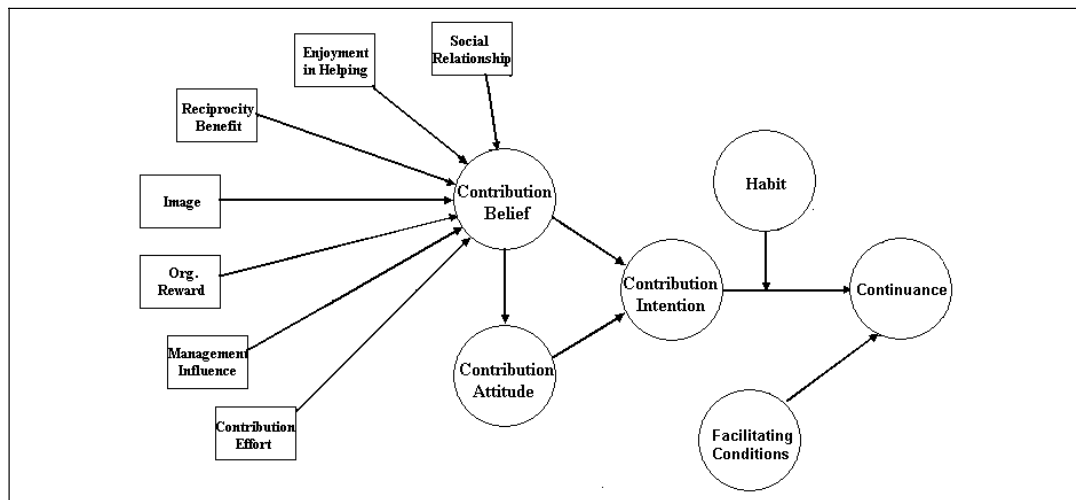


Figure 1. KMS Continuance Model – Contribution Perspective

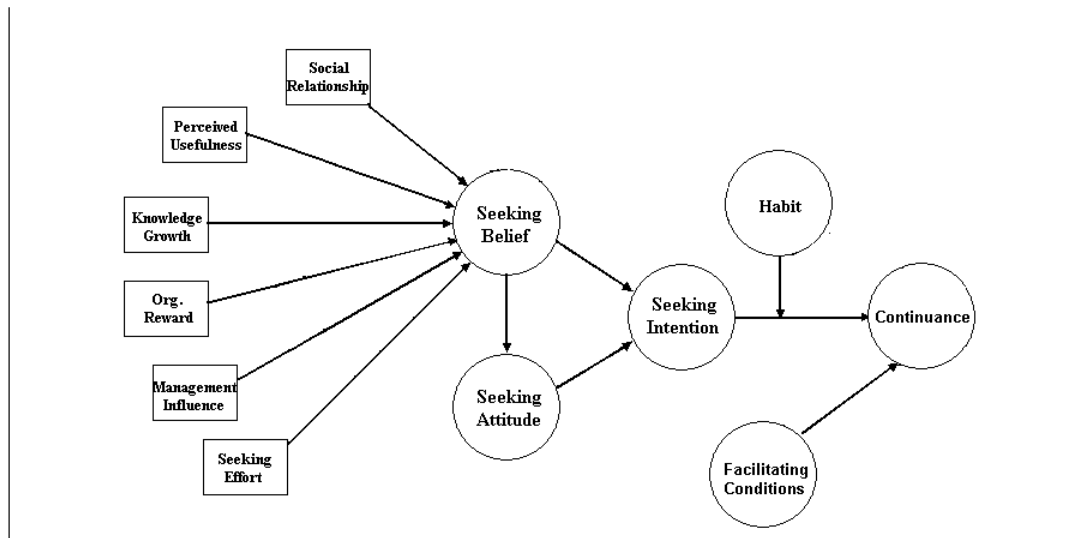


Figure 2. KMS Continuance Model – Seeking Perspective

The determinants of continuance

Prior research has extensively elaborated behavioral intention as a significant direct determinant of IS continuance (Bhattacharjee 2001; Venkatesh et al. 2003). Given that a strong IS habit can weaken the relationship between intention and continuance, continuance intention still presents a significant effect on continuance behavior (Cheung and Limayem 2005). Therefore, we theorize the following:

H1a: *Users' contribution intention has significant impact on KMS continuance to contribute.*

H1b: *Users' seeking intention has significant impact on KMS continuance to seek.*

Further, Venkatesh et al. (2003) provide empirical evidence that the facilitating conditions have significant effect on IS usage in the continuance stage.

H2a: *Facilitating conditions have significant impact on KMS continuance to contribute.*

H2b: *Facilitating conditions have significant impact on KMS continuance to seek.*

Recent research has noted that habit can moderate the relationship between continuance intention and continuance behavior (Cheung and Limayem 2005). Specifically, the more usage is performed out of habit, the less intentional behavior is involved. Hence:

H3a: *The influence of contribution intention on KMS continuance for knowledge contribution is moderated by user's habit.*

H3b: *The influence of seeking intention on KMS continuance for knowledge seeking is moderated by user's habit.*

The determinants of intention

Based on Bhattacharjee and Premkumar's cognitive change model (2004), we propose that the user's belief and attitude both have direct effects on intention, and the role of belief is partially mediated via the attitude construct.

H4a: *Users' contribution belief has significant impact on their contribution intention.*

H4b: *Users' seeking belief has significant impact on their seeking intention.*

H5a: *Users' contribution attitude has significant impact on their contribution intention.*

H5b: *Users' seeking attitude has significant impact on their seeking intention.*

H6a: *Users' contribution belief is positively associated with their attitude.*

H6b: *Users' seeking belief is positively associated with their attitude.*

Method

Testing of the proposed hypotheses was predicated on a Web-based survey in an international IT company. The company has implemented the KMS since January of 2004. About 20,000 employees worldwide can log in to the system to share their knowledge, collaborate, and communicate with each other. The core modules of this KMS include an online knowledge repository, corporate knowledge map, online forums, and knowledge networks. System users with more than 6 months of usage experience were chosen as our research subjects. Such a criterion was used so the samples would be eligible for our study on continuance behavior. Although the adoption decision to implement the KMS was made by management, individual employees' usage of this system was entirely voluntary.

Data collection

Data was collected through questionnaires at two points in time, one month apart. We randomly selected 500 eligible KMS users (i.e., with usage experience of beyond 6 months) in the system. These users were invited to answer a set of (both contribution and seeking) questionnaires online assessing their belief, attitude, KMS continuance intention, habit, and perceived organizational facilitation. Participation in this survey was voluntary, with an offered incentive of a small amount of cash coupon. In sum, 161 participants answered the questionnaire regarding knowledge-contribution behavior and 201 answered regarding knowledge-seeking behavior. One month later, their usage behavior data was collected separately by asking the respondents to report their time spent in the KMS for knowledge contribution and seeking.

Measures

We used operational measures that have been validated by prior research (see Appendix A). Consistent with the recommendations of Fishbein and Ajzen (1975), all questions in the survey were adjusted to reflect the specific context of KMS continuance rather than general IS continuance. The scales were also shortened in order to make possible the inclusion of all constructs of interest into the questionnaire. All constructs are modeled using reflective indicators. Except for the attitude construct, we used a 5-point Likert scale to measure them (from strongly disagree to strongly agree, the items involving closeness and frequency were adjusted accordingly). The items measuring attitude are anchored by different end points to avoid commonalities in the scale anchors and formats (Podsakoff et al. 2003). As other IS researchers (e.g., Venkatesh et al. 2003) have done, the actual continuance behavior was measured via a single indicator—the usage time spent in the system.

An initial version of the instrument was refined through two rounds of pilot tests in the same company. We further interviewed some respondents to avoid vague concepts and keep questions simple, concise, and relevant to the target respondents. The instrument development resulted in a significant degree of refinement and restructuring of the survey instrument (Nunnally, 1978).

Data analysis

Rather than using exploratory approaches such as regression analysis, this study selected a confirmatory approach using partial least squares (PLS). PLS was appropriate and useful for our study because it requires a minimal sample size in order to validate a model compared to other structural equation modeling techniques (e.g., LISREL, AMOS, and EQS) (Chin et al. 2003). PLS Graph Version 3.00 was used to test the proposed models in two steps. A

confirmatory factor analysis was first conducted to assess the unidimensionality of the items. Following that, the structural relationship was examined.

Results

The measurement model

The measurement model was assessed in terms of content validity, discriminant validity, and convergent validity. The content validity in this study was established from the existing literature. Furthermore, the pilot tests improved the validity of our measures.

Discriminant validity was verified by assessing correlation of latent variables. In Table 1, except for one high correlation between intention and habit (0.67 in the contribution model, 0.66 in the seeking model), all correlations were satisfactory: the square root of the average variance extracted for each construct was higher than the inter-construct correlations (Chin 1998). A further variance inflation factor (VIF) test was conducted using the SPSS software. The VIF values of the two variables indicated acceptable collinearity. In addition, we tested all the items that measured independent variables to establish discriminant validity. All indicators loaded more highly on their own construct than on other constructs. Since the model contains a second-order variable (social relationship), we created a superordinate second-order construct using factor scores for the first-order construct (Chin et al. 2003).

Table 1(a). Correlation between constructs – Contribution model

	CA	CI	FC	HBT
Contribution Attitude (CA)	0.81 *			
Continuance Intention (CI)	0.57	0.86*		
Facilitating Conditions (FC)	0.37	0.44	0.81 *	
Habit (HBT)	0.55	0.67	0.32	0.91 *

Table 1(b). Correlation between constructs – Seeking model

	SA	CI	FC	HBT
Seeking Attitude (SA)	0.82*			
Continuance Intention (CI)	0.36	0.86*		
Facilitating Conditions (FC)	0.29	0.23	0.91*	
Habit (HBT)	0.57	0.66	0.27	0.91*

*Diagonal elements were square roots of the average variance extracted.

Finally, item loadings and internal consistencies were checked for convergent validity. As Table 2 presents, all the reflective items loaded on their corresponding construct, and the composite reliability values ranged from 0.79 to 0.98, all above the recommended levels of 0.70 for a reliable construct (Chin 1998). As for average variance extracted by the measures, the scores were between 0.66 and 0.83, which exceeded the acceptable value of 0.50 (Fornell and Larcker 1981). The path loadings ranged from 0.69 to 0.93, implying that the items were all significant at the 0.01 level. These results suggest that all constructs used in this study are acceptable and reliable.

Table 2(a). Item loadings for contribution (N=161)			Table 2(b). Item loadings for seeking (N=201)		
Constructs	Item	Loading	Constructs	Item	Loading
Contribution Attitude CR=0.92 AVE=0.69	ATTI_C1	0.78	Seeking Attitude CR=0.91 AVE=0.68	ATTI_S1	0.80
	ATTI_C2	0.86		ATTI_S2	0.85
	ATTI_C3	0.84		ATTI_S3	0.82
	ATTI_C4	0.87		ATTI_S4	0.81
	ATTI_C5	0.81		ATTI_S5	0.84
Continuance Intention CR=0.89, AVE=0.74	INT_C1	0.88	Continuance Intention CR=0.90, AVE=0.75	INT_S1	0.90
	INT_C2	0.88		INT_S2	0.87
	INT_C3	0.82		INT_S3	0.83
Facilitating Conditions CR=0.79, AVE=0.66	FC_C1	0.69	Facilitating Conditions CR=0.90, AVE=0.82	FC_S1	0.93
	FC_C2	0.93		FC_S2	0.88
Habit CR=0.98, AVE=0.83	HBT_C1	0.92	Habit CR=0.98, AVE=0.83	HBT_S1	0.91
	HBT_C2	0.89		HBT_S2	0.90
	HBT_C3	0.92		HBT_S3	0.92

The structural model

The results of PLS analysis indicate that, as expected, all hypothesized paths in the two research models are statistically significant (see Figures 3 and 4). In the KMS continuance stage, from both contribution and seeking perspectives, user's intention and facilitating conditions exhibit direct and significant effects on continuance behavior, while the relationship between intention and continuance is moderated by habit. User's intention is found to be determined jointly by user's belief and attitude. In both research models, user's belief presents as the first predictor of intention, and user's attitude is found to be the second predictor.

However, the dimensional structures of user's belief vary between knowledge-contribution and knowledge-seeking behavioral contexts, as we proposed. The results show that when a user decides to contribute knowledge in the KMS, the significant cognitions include (in order of importance) social relationship, enjoyment in helping others, management influence, and contribution effort. Considerations of reciprocity benefit, image, and organizational reward were found to be insignificant. In a knowledge-seeking context, the user's belief is mainly formed by perceived usefulness of the KMS, social relationships, and the seeking effort. Seeker's knowledge growth, organizational reward, and management influence were found to be insignificant.

Discussion

Discussion of the empirical results

The present study set out to consolidate the existing theory and research to form theoretical models for KMS continuance for knowledge-contribution and -seeking behaviors. Our findings provide strong support for the proposed two direct determinants of continuance intention (user's belief and attitude), and two direct determinants of actual continuance behaviors (user's intention and organizational facilitating conditions).

The facilitating conditions were shown to account for continuance behaviors together with behavioral intention, which supports the conclusion in UTAUT that facilitating conditions matter in continuance stage (Venkatesh et al. 2003). **The explanatory power of the facilitating conditions is slightly weakened in the seeking perspective.** A plausible reason is that, regarding the need-driven behaviors such as knowledge seeking, intention is still the main causal mechanism used to explain why people continue or discontinue using an IS.

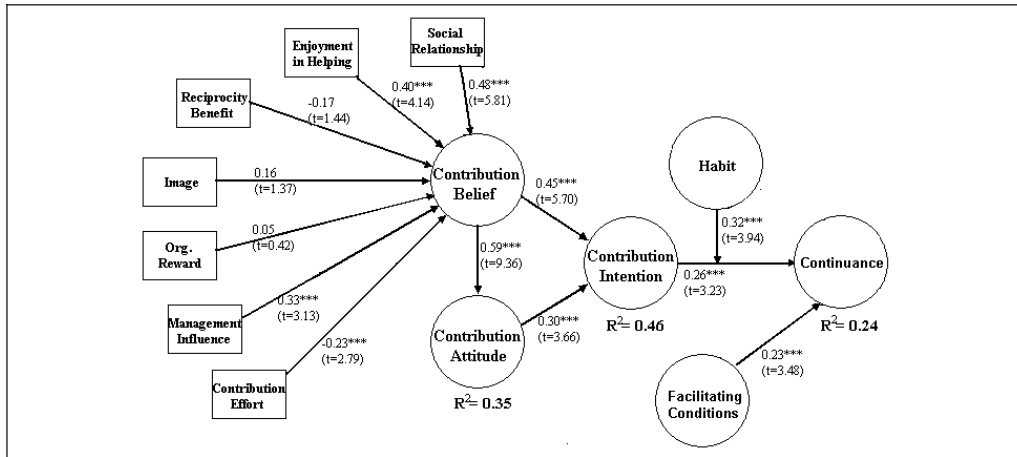


Figure 3. Results of PLS Analysis – Contribution Perspective

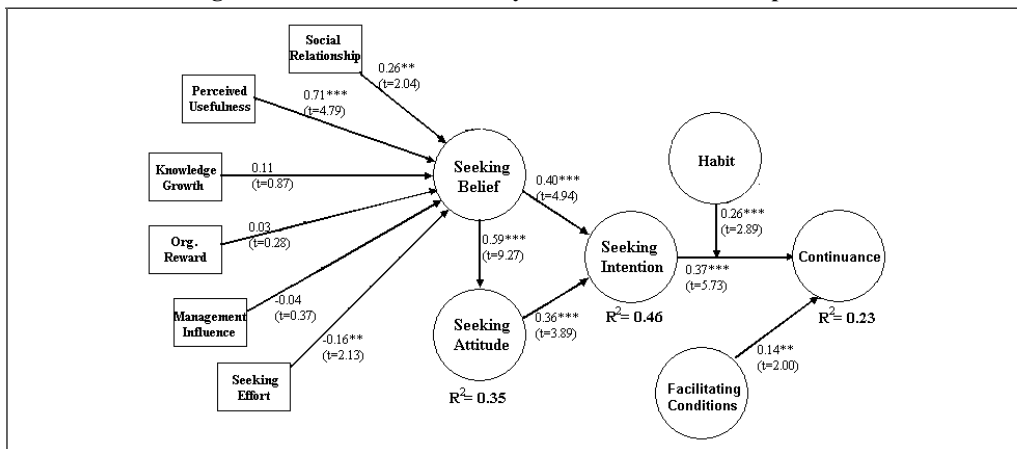


Figure 4. Results of PLS Analysis – Seeking Perspective

In agreement with other scholars (Cheung and Limayem 2005), we find that habit exhibits a strong moderating effect on the relationship between intention and behavior in both contexts. Motivated by the need to better understand KMS continuance from contribution and seeking perspectives, this study gives strong evidence for how cognitive beliefs may differ in terms of the role they play in influencing the users' behavioral intention in different contexts. By decomposing beliefs, this study makes the relationships between those fragmented factors found in previous KM research clear and context-specific.

Social relationship is found to represent a significant aspect of KMS user's belief. It has been widely realized that social relationship can affect an individual's attitude toward knowledge sharing (e.g., Bock et al. 2005; Tiwana and Bush 2005). Our study further advances the understanding of how social relationship, as one of the aspects of user's belief, affects KMS users' attitude and intention, and eventually determines the KMS continuance behavior.

An interesting finding of this study is that **management influence may exert different effects on KMS users in contribution and seeking behaviors**. As in the literature review, the common argument is that management can greatly influence employees' attitude and intention so as to promote knowledge-sharing behavior. However, according to our results, the management influence takes effect only in the knowledge-contribution context. When a user aims at knowledge seeking, his or her cognitive belief structures simply includes the

performance expectancy, effort expectancy, and social relationship, which accords with the results of previous work (Venkatesh et al. 2003).

Our findings support the prior research that the reciprocity benefit of knowledge contribution is not a significant cognition in knowledge sharing. This may indicate that reciprocal expectation may not be an important concern in the continuance stage. Given that intrinsic benefits are proven effective in stimulating people's knowledge-contribution behavior in the early stage of IS adoption, its influence may weaken over time. When the user steps into the post-adoption stage, the intrinsic motivations such as enjoyment in helping begin to stabilize and become the dominant beliefs.

As is evident from the literature, the effect of organizational reward on knowledge contribution and seeking is still subject to controversy. The previous work has found reward to be a significant determinant of knowledge contribution (see Kankanhalli et al. 2005a). Other work has found that reward has a negative effect on knowledge-sharing attitudes (see Bock et al. 2005). Our results suggest that organizational reward is irrelevant to an individual's KMS continuance behavior. It should be noted that all relationships tested in this study are embedded in a voluntary setting. Therefore, it is necessary to recognize the potentially contingent impact of reward.

We are aware that the amount of variance explained (R-square) in the continuance behavior in this study is not ideal (24% in contribution and 23% in seeking). One reason could be that we did not include other potential determinants (e.g., prior usage) and control variables (e.g., individual characteristics and the type of tasks an individual is taking in the organization) in this study. Previous work has found that prior behavior significantly impacts future behavior (Cheung and Limayem 2005). However, the factual research setting limited the possible retrieval of data on prior usage in our study.

A total of 46 percent of variance in user's intention can be explained in this study. Compared with the explanatory power of 70 percent in prior research (Bhattacharjee and Premkumar 2004; Venkatesh et al. 2003), this value is below our expectation. The discrepant results might be partially attributed to different theoretical objectives and corresponding research approaches. As Taylor and Todd (1995) comment regarding why TRA and TPB cannot explain usage intentions as well as TAM: "The measures of ease of use and usefulness in TAM were based on well developed, refined and validated measures (David 1989). In the contrast, the belief measures used for TRA and TPB were based on a salient belief elicitation measure which develops a scale idiosyncratic to a specific setting. Under such conditions, measures of beliefs may be less than ideal" (p. 151). This statement implies that for a specific research context, such as KMS continuance in this study, focusing on the understanding of a set of decomposed beliefs will inevitably result in somewhat unsatisfactory measures. Furthermore, from a practical perspective, we did not include the user's personal characteristics (i.e., age and gender) in our study since they are unable to be manipulated by management. Evidence shows that by adding these factors' moderating effects, behavioral intention can be explained to a greater extent (Venkatesh et al. 2003).

Limitations and future study

Prior to discussing the implications of this work, it is necessary to recognize some inherent limitations of this study. First, the data was collected within one company. This was done for

the sake of sampling convenience and to rule out unnecessary variance generated by various forms of KMS in different companies. However, one danger of this approach is that the external validity of the results cannot be ensured. Future studies can replicate this study using responses from different organizational settings and with different KMS to generalize the results. Second, due to the scale of the survey and the process of eliciting unqualified participation, the size of the sample for final analysis is quite limited. Although the sample size is acceptable for PLS analysis, its relatively small size (i.e., 144 for contribution, 201 for seeking) limits the generalizability of the findings. A larger and more heterogeneous sample would bring more statistical power and allow more rigorous model testing. Third, as discussed earlier, this study is only able to explain less than a quarter of the variance in KMS continuance. Future research is needed to extend our theoretical models to account for any unexplained behavioral variance in knowledge-contribution and knowledge-seeking contexts, e.g., prior usage, organizational culture, etc. Finally, we may need to carefully consider the measurement development and refinement such as how to measure organizational reward and organizational facilitating conditions.

Implications for theory

This study advances the theoretical development in the area of KMS continuance. Based on previous studies on KM success, this study integrates the existing theoretical explanations by decomposing individual belief into multidimensional belief constructs specific to knowledge-contribution and knowledge-seeking contexts. The proposed KMS continuance models not only successfully apply the current IS continuance theory in a KM context, but also consistently relate the diverse key success factors in knowledge sharing to the antecedents of behaviors from contribution and seeking perspectives. Thus, this study provides a more complete understanding of KMS continuance (compared to the more parsimonious IS continuance model). In addition, our results using data in industrial settings support the moderating effect of habit in IS continuance (Cheung and Limayem 2005).

Implications for practice

This study may contribute to an understanding of how corresponding stimuli for knowledge contribution and knowledge seeking should be paid more attention to help modify employees' beliefs after initial system adoption. For example, some factors work well to promote knowledge contribution, but may not be relevant to knowledge seeking, and vice versa. Caution must be exercised when the management attempts to use rewards (such as salary raises, bonuses, job security, or promotion) to encourage people to use the KMS in the long run since the effect of rewarding on user's behavior could be sophisticated. Moreover, organizations must ensure that they have provided sufficient facilitation conditions to all KMS users to avoid unintentional abandonment of the system.

Conclusion

This study develops and tests a refined view of KMS continuance in organizations. The decomposed models clearly indicate that social relationship, enjoyment in helping others, management influence, and contribution efforts are four important aspects of contribution belief. In addition, perceived usefulness was found to be the strongest cognitive belief that influences knowledge seeking, followed by social relationship and seeking effort as the second and third predictors of seeking intention, respectively.

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Appendix A: Constructs and Items

Constructs	Questionnaire Items	Sources
Perceived usefulness	I find KMS to be useful for my work.	Bhattacharjee and Premkumar (2004) Venkatesh et al. (2003)
	Using KMS improves my performance.	
	Using KMS increases my productivity.	
	Using KMS enables me to accomplish tasks more quickly.	
Seeker knowledge growth	Seeking knowledge in KMS promotes my knowledge growth/development.	Wasko and Faraj (2000)
	Seeking knowledge in KMS reinforces my competence.	
	Seeking knowledge in KMS helps me strengthen my concepts in my field.	
	Seeking knowledge in KMS sharpens my knowledge.	
Seeking effort	It takes too much time for me to find the required knowledge in the KMS.	Kankanhalli et al. (2005b) Ong and Lai (2004)
	It requires a lot of effort for me to locate the knowledge I need in the KMS.	
	The KMS makes it easy for me to search/retrieve knowledge documents.	
Contribution effort	The KMS makes it difficult for me to create knowledge documents.	Kankanhalli et al. (2005a) Ong and Lai (2004)
	The KMS makes it difficult for me to upload knowledge documents.	
	The KMS makes it difficult for me to transfer knowledge documents.	
Enjoyment in Helping	I enjoy sharing my knowledge with others through KMS.	Kankanhalli et al. (2005a)
	I enjoy helping others by sharing my knowledge through KMS.	
	It feels good to help someone else by sharing my knowledge through KMS.	
	Sharing my knowledge with others through KMS gives me pleasure.	
Image	Sharing my knowledge through KMS improves my image within the organization.	Kankanhalli et al. (2005a)
	People in the organization who share their knowledge in KMS have more prestige than those who do not.	
	Sharing my knowledge in KMS improves others' recognition of me.	
	When I share my knowledge in KMS, the people I work with respect me.	
	When I share my knowledge in KMS, my supervisors praise me.	
Reciprocity Benefit	When I share my knowledge in KMS, ...	Kankanhalli et al. (2005a)
	... I believe that I will get an answer for giving an answer.	
	... I expect somebody to respond when I'm in need.	
	... I expect to get back knowledge when I need it.	
Organizational Reward	... I believe my queries for knowledge will be answered in future.	Bock et al. (2005) Kankanhalli et al. (2005a) Self-developed based on interviews
	It is important to ... when I use KMS to contribute/seek knowledge.	
	... get additional points for promotion	
	... get a higher salary	
	... get a better work assignment	
Management influence	... get more job security	Venkatesh et al. (2003) Self-developed
	... receive additional points for work rotation	
	The senior management has been helpful in the KMS use.	
Social relationship - Trust	In general, the company has supported the KMS use.	Nahapiet and Ghoshal (1998)
	The company has given a high priority to KMS use.	
	I have faith in other KMS users and trust them.	
Social relationship - Tie strength	I have belief in the good intent and concern of other KMS users.	Levin and Cross (2004) Reagans and McEvily (2003)
	I have belief in other KMS users' reliability.	
	How close was your relationship with other KMS users? (<i>distant, less than close, somewhat close, close, very close</i>)	
Social relationship - Norms	To what extent did you typically interact with other KMS users? (<i>to no extent, to little extent, to some extent, to a great extent, to a very great extent</i>)	Bock et al. (2005) Kankanhalli et al. (2005a)
	On average, how often do you communicate with other KMS users? (<i>never, less often, monthly, weekly, daily</i>)	
	There is a norm of cooperation in my organization.	
Habit (HBT)	There is a norm of teamwork in my organization.	Cheung and Limayem
	There is a norm of openness to conflicting views in my organization.	
	I use KMS as a matter of habit.	
	Using KMS is natural to me.	

	Using KMS has become a habit to me.	(2005)
Contribution /Seeking attitude (CA/SA)	All things considered, continuing to use KMS for contribution/seeking is a ... <i>bad idea</i> ... <i>good idea</i>	Bhattacharjee and Premkumar (2004) Bock et al. (2005)
	... <i>foolish move</i> ... <i>wise move</i>	
	... <i>negative step</i> ... <i>positive step</i>	
	I have an (<i>extremely negative</i> ... <i>extremely positive</i>) attitude toward KMS continuance.	
	Knowledge contribution/seeking in KMS is (<i>valueless</i> ... <i>valuable</i>) to me.	
Facilitating conditions (FC)	I have the resources necessary to use the KMS.	Venkatesh et al. 2003
	I have the knowledge necessary to use the KMS.	
Contribution /Seeking intention (CI/SI)	I intend to continue using KMS to contribute/seek knowledge in the future.	Bhattacharjee (2001) Cheung and Limayem (2005)
	My intentions are to continue using KMS to contribute/seek knowledge in the next month.	
	If I could, I would like to continue using KMS to contribute/seek knowledge.	