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An Empirical Study Of The Mediating Mechanisms of Knowledge Contribution

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ABSTRACT

Knowledge contribution is critical to the success of Knowledge Management (KM) initiatives. While extensive research has been done to understand how different individual and organizational factors affect knowledge contribution behavior, few have studied the mediating mechanisms affecting the contribution act. This study develops and empirically validates a model of how people contribute their knowledge in the distributed team environment. Particularly, we explore two mediating mechanisms of awareness and effort required in searching and matching. Our results indicate that the mediating mechanisms model provides a better specification of the antecedents of contribution behavior. Our findings and implications are discussed in the paper.

Keywords

contribution behavior, distributed teams, knowledge management, Wiki

INTRODUCTION

This study seeks to answer the question: "How can knowledge contribution in distributed teams be improved?" While some research has shed light on the inhibitors and facilitators of knowledge contribution, most have treated knowledge contribution as a single activity (e.g. Bock et al 2005; Wasko & Faraj, 2005; Kankanhalli et al., 2005). This study seeks to extend prior research on knowledge contribution by focusing on the mediating mechanisms of knowledge contribution (Olivera et al 2008). Adapting the framework from Olivera et al (2008), we explore three contribution activities: 1) awareness, 2) searching and matching, and 3) formulation and delivery. "Awareness" refers to the cognitive activity through which a person recognizes an opportunity to contribute. "Searching and matching" is a cognitive activity through which individuals determine whether and how the knowledge domain of what needs to be contributed matches their own personal knowledge. "Formulation and delivery" is a cognitive and behavioral activity through which the contribution is articulated and communicated. This paper examines how knowledge contribution can be enhanced through better awareness of the opportunities to contribute and reduced effort in search and matching.

RESEARCH MODEL AND HYPOTHESIS

Mediating Mechanisms

In order for individuals to contribute their knowledge, it is necessary for them to recognize and be aware of the opportunity to contribute (Bendapudi et al. 1996; Olivera et al. 2008). Many IS implementations fail due to a lack of awareness of the systems that have been implemented. Consequently, users do not exploit the full capabilities of the system and leverage on them for their work. Similarly, while KMS can facilitate knowledge contribution, without awareness of the opportunity to contribute through the KMS, it is unlikely for individuals to formulate and deliver their knowledge through the KMS.

H1: Frequency of awareness (FAW) of the opportunities to contribute has a positive impact on frequency of formulation and delivery (FFD).

Searching and matching is another important activity preceding the actual formulation and delivery of content. Individuals engage in searching and matching to determine if they possess or are able to locate the knowledge required to fulfill what needs to be contributed. Hence effort in searching and matching is a form of costs in the contribution process, which can inhibit the initiation of the formulation and delivery activity. When searching and matching effort required is low, individuals are able to proceed onto formulation and delivery with greater ease. If a match cannot be found and greater searching effort is required, individuals are more likely to give up and not proceed to the formulation and delivery stage hence resulting in fewer formulation and delivery.

H2: Effort required in searching & matching (ESM) has a negative impact on frequency of formulation and delivery.

Team Social Capital

Social capital is defined as the resources embedded within networks of human relationships (Nahapiet & Ghoshal, 1998). The source of social capital lies in the social structure within which an individual is located (Adler and Kwon 2002). In recent years, social capital concepts have been offered as explanations for a variety of pro-social behaviors, including collective action, community involvement, and differential social achievements that the

concept of individual based capital (such as human or financial capital) is unable to explain (Coleman 1990). Two types of social capital are particularly relevant for the study of knowledge contribution, namely structural and cognitive social capital (Uphoff and Wijayaratna 2000). Structural social capital facilitates mutually beneficial collective action through established roles and social networks supplemented by rules, procedures and precedents (Hitt et al. 2004). Cognitive social capital, which includes shared norms, values, attitudes, and beliefs, predisposes people towards mutually beneficial collective action (Krishna and Uphoff 2002).

At the team level, team cognitive social capital refers to the shared norms, values, attitudes, and beliefs in the team (Kankanhalli et al 2005). A norm represents a degree of consensus in the social system (Coleman 1990). In distributed teams, team KMS norm defines the degree of consensus amongst team members on using the specific KMS for knowledge sharing. The stronger the team KMS norm, the more team members will perceive using the KMS to contribute their knowledge as a normative behavior that is expected of them. Such members will thus be more vigilant in looking out for opportunities to contribute hence resulting in a greater level of awareness.

H3a: Perceived team KMS norm (PTKN) has a positive impact on individual's awareness of opportunity to contribute.

Team KMS norm is also expected to affect the effort required in searching and matching. In teams where contribution through the KMS is a normative behavior, members are likely to be more familiar with the contribution process and the contents that should be contributed through the respective KMS. For example, project teams that decide to use organizational wikis for knowledge sharing are likely to jointly discuss and decide on the purpose of the wiki and the types of contents that should be contributed through the wiki. Such an understanding provides a more specific idea of what can and should be contributed which in turn may reduce the effort of searching and matching.

H3b: Perceived team KMS norm has a negative impact on individual's effort required for searching and matching.

Team affiliation refers to the perception of togetherness within teams (Koys & Decotiis, 1991). Team affiliation is another form of team cognitive social capital wherein members with a higher level of team affiliation have greater shared values, attitudes and beliefs. Team affiliation can have a positive impact on awareness of contribution for two reasons. First, high team affiliation generates greater liking for the team and a sense of belonging which creates a greater motivation for team members to be more vigilant in looking out for opportunities to contribute. Team members who feel more affiliated to the team are also likely to work more closely with the team, which can enhance mutual understanding and awareness of the knowledge needs of other team members. These can result in greater awareness of the opportunities to contribute as well as reduced effort in searching and matching.

H4a: Perceived team affiliation (PTA) has a positive impact on individual's awareness of opportunity to contribute.

H4b: Perceived team affiliation has a negative impact on individual's effort required for searching and matching.

Team structural social capital refers to the established roles and social networks supplemented by rules, procedures and precedents of the team (Hitt et al. 2004). From the perspective of social capital theory, individuals may be motivated to contribute when contributing their knowledge through the KMS is part of their workflow as determined by their job roles in the team. For example, in some project teams consisting of software developers and systems analysts, the organizational wiki is used for sharing software documentation in the team. The software developers who are supposed to develop the software codes and documentation may see contributing to the wiki as part of their workflow as they are required to write the software documentation which is supposed to be done in the wiki platform. Such institutional job requirements may increase the motivation for software developers to be more aware of the opportunities to contribute.

H5a: Institutional job requirement (IJR) has a positive impact on individual's awareness of opportunity to contribute.

Furthermore, when contribution through the KMS is viewed as an institutional job requirement, individuals are likely to be more familiar with the contribution process and have a better idea of the specific contents that should be contributed through the KMS. This knowledge in turn reduces the cognitive effort involved in searching and matching for contents for formulation and delivery.

H5b: Institutional job requirement has a negative impact on individual's effort required for searching and matching.

Individual Factors

Social exchange is a social psychology theory that explains human behavior in social exchange (Blau, 1964). According to social exchange theory, individuals behave in the way that maximize their benefits and minimize their costs (Molm, 1997). Prior studies have shown that knowledge contribution can be facilitated through extrinsic (such as monetary rewards or job promotion) and intrinsic motivations (such as enjoyment in helping, reciprocity and self-enhancement) at the individual level (e.g. Wasko and Faraj 2005, Kankanhalli et al 2005). For knowledge sharing within work teams, motivations to contribute can be manifested in terms of individual or group level benefits. For example, better contribution may result in individual job promotion (an individual benefit) but it could also facilitate better knowledge sharing at the

group level which in turn lead to better group productivity (a group benefit). The greater the perceived benefits of knowledge contribution, the more likely individuals will look out for opportunities to contribute through the KMS.

H6: Perceived benefits (PB) of knowledge contribution will have a positive impact on individual's awareness of the opportunity to contribute.

KMS familiarity refers to individuals' knowledge and experience about the use and environment of KMS. This construct is adapted from the literature in organizational behaviors which defined familiarity as the knowledge that group members have about specific job, crew, and work-environment configurations (Goodman & Leyden, 1991). Individuals who are more familiar with the KMS are more likely to recognize the opportunities to contribute. Their knowledge and experience with the KMS is likely to reduce the effort of searching and matching and formulation and delivery.

H7a: KMS familiarity (KMSF) will have a positive impact on individual's awareness of the opportunity to contribute.

H7b: KMS familiarity will have a negative impact on individual's effort required in searching and matching.

H7c: KMS familiarity will have a positive impact on individual's frequency of formulation and delivery.

KMS Characteristics

KMS play a key role in facilitating knowledge management, particularly in large MNCs. Quality of the KMS can facilitate or inhibit the contribution process. Yet to our best knowledge, the IT artifact has largely been neglected in prior research on knowledge contribution (with the exception of Ma & Agarwal 2007). In our study we focus on the quality of the interface/navigation and the authoring tool as well as the general search, indexing and retrieval tools available in the organization.

Prior research (Delone & McLean 1992) has suggested that the quality of a system can affect its usage. We divide the quality of a KMS into that for the interface/navigation and that of the authoring tool. We postulate that the quality of the user interface and navigation facilitates both the searching and matching as well as the formulation and delivery activities but the quality of the authoring tool facilitates mainly the formulation and delivery activity.

This is because an intuitive and user friendly interface and navigation can ease general usage of the KMS such as browsing, looking for contents or creating and uploading contents. When the interface or contents are hard to locate, team members will have difficulty knowing what to contribute and where to contribute. Hence a good quality interface/navigation can ease both searching and matching and formulation and delivery.

H8a: The quality of the interface/navigation (QIN) in the KMS will have a negative impact on the effort required for searching and matching.

H8b: The quality of the interface/navigation in the KMS will have a positive impact on the frequency of formulation and delivery.

Authoring tools refer to the features and functionalities in the KMS that supports the creation, formulation and uploading of the contents to the KMS. Formulation and delivery requires individuals to articulate the content and deliver it in the KMS. If the quality of the authoring tool is low, it will increase the effort required for formulation and delivery. Take Wiki for example, if the authoring tool supports more languages and file formats, it will ease the effort involved in creating and delivering the contents to the KMS. This should in turn increase the frequency of formulation and delivery.

H8c: The quality of authoring tools (QAT) will have a positive impact on the frequency of formulation and delivery.

Finally, searching and retrieval technologies are critical components of KMS (Alavi & Leidner, 2001). This is particularly true for organizations with many disparate systems for different electronic documents. In order to efficiently search these different systems, it is imperative to have a good search, indexing and retrieval tool. For example, Google has greatly reduced the effort involved in searching and matching of Internet/web-based contents to our search criteria. While searching and matching depends on individual's actual content knowledge and the knowledge of where contents are stored, effective search, indexing and retrieval tools can reduce the effort of searching and matching. Hence the quality of search, indexing and retrieval technologies is expected to be negatively related to the effort required for searching and matching.

H8d: The quality of search, indexing, and retrieval technologies (QSIR) will have a negative impact on the effort required in searching and matching.

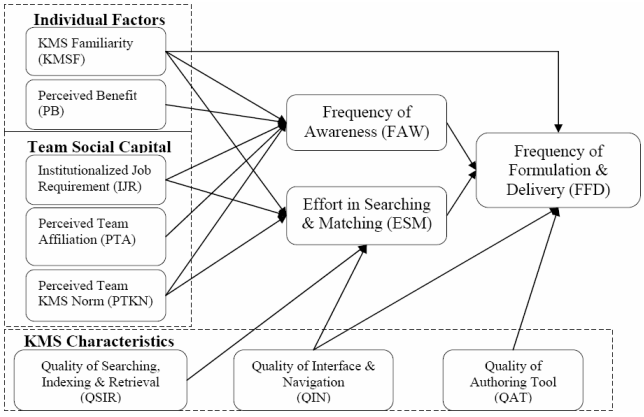

Figure 1. Research Model

RESEARCH METHODOLOGY

To empirically validate our model, a survey was conducted in a large organization known as GlobalWork (Real name is not used to maintain anonymity). GlobalWork is a Multi-national Company that specializes in automotive and industrial technology. Its global IT department operates in several countries across different continents. Employees are given a variety of knowledge management tools (E.g. Portals, Shared folders, Instant Messengers, Internet Conferencing) to share knowledge worldwide. From our interview with the senior manager, we found that knowledge sharing is a common practice in the organization. In the pilot study phase, three globally distributed teams were selected to participate in the survey. The teams were made up of 44 employees distributed over eight countries. The focal KMS was the organizational wiki which is used by the teams to share project documentations, schedules, requirements etc.

The constructs in the model were operationalized using existing literatures where possible. For example, perceived benefit is adapted from Thompson et al. (1991), perceived team affiliation is based on Bock et al. (2005), quality of authoring tool was evaluated from functionality, flexibility and productivity (MacKnight & Balagopalan, 1989), and quality of interface/navigation was adapted from DeLone & McLean (2003). Items for the remaining constructs are self-developed based on their definitions. A conceptual validation of the constructs was carried based on Moore and Benbasat's (1991) sorting procedures. The sorting results indicated good conceptual validity with the average Cohen's Kappa score being 0.836 and the overall item replacement ratio being 89.47%. A web-based survey was then conducted with the three teams that participated in the pilot phase of the study. The response rate is 77.3% (34 out of 44).

DATA ANALYSIS AND RESULTS

The model was tested using Partial Least Square (PLS). The reliability, convergent validity and discriminant validity of the measurement model was assessed in accordance to Churchill's (1979) framework for instrument development. Convergent validity was assessed by item, reliability, composite reliability and average variance extracted (AVE) of construct. Factor analysis and item correlation were used to assess the discriminant validity (Fornell & Larcker, 1981). Results indicate that most constructs achieve the good reliability, convergent validity and discriminant validity. Results of the hypotheses testing are shown in Table 1 under the 'Impact on Mediating Variables' column. Out of 15 different hypotheses, 11 were supported. These findings will be discussed in the following section.

DISCUSSION

Summary of Findings

Our results show that a greater frequency of awareness accompanied by lower efforts required in searching and matching will result in a greater frequency of formulation and delivery. Given that formulation and delivery is an important step in knowledge contribution as it completes the contribution act (Olivera et al 2008), this finding also suggests that individuals will complete a contribution act if they are more aware about the opportunities to contribute and if the contents to be contributed do not require much effort in searching.

KMS familiarity, institutional job requirement, perceived team affiliation, perceive team KMS norm have a positive impact on frequency of awareness of the opportunity to contribute through the KMS while KMS familiarity and institutional job requirement has a negative impact on effort required to search and match and quality of authoring tool has a positive impact on frequency of formulation and delivery. Hence organizations can provide training to increase awareness about the KMS so as to increase KMS familiarity. Management can also promote the use of the KMS by making knowledge contribution through the KMS part of individuals' workflow and/or to encourage and reinforce the importance of using the KMS for knowledge sharing to all team members during team meetings so as to build a greater team KMS norm.

Independent Variables	Impact on Mediating Variables		Impact on Frequency of Contribution
	Mediating Variables	ß	
KMSF	FAW	***0.189	***0.186
	ESM	***-0.376	
	FFD	***0.292	
PB	FAW	-0.090	-0.071
IJR	FAW	***0.399	***0.442
	ESM	-0.201	
PTA	FAW	***0.181	***0.126
PTKN	FAW	***0.199	-0.073
	ESM	***0.295	
QSIR	ESM	-0.014	***0.240
QAT	FFD	***0.553	0.071
QIN	ESM	***0.405	***0.307
	FFD	-0.060	
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

Table 1 Comparison of Two Models

Finally, our study suggests that organizations can improve knowledge contribution through a better KMS that provides high quality authoring tool. This is to aid

individuals in reducing the effort required in formulating and delivering the knowledge content.

Implications and Future Work

This study develops and empirical validates a mediating model of knowledge contribution. Our findings suggest that a mediating model can provide a better specification of the effects of different antecedents in knowledge contribution. For example in the last column of table 1, we present the PLS results for a non-mediating model whereby a similar set of antecedents were tested against 'frequency of contribution' as the dependent variable. With the non-mediating model, quality of authoring tool has no impact on frequency of contribution whereas in the mediating model, it is shown to affect contribution through the frequency on formulation and delivery. Also the non-mediating model suggests institutional job requirement has a positive effect on knowledge contribution, but our mediating model shows it affect frequency of contribution through a positive influence on awareness and a negative influence on searching and matching.

While our preliminary work has provided interesting empirical validation of a mediating mechanisms model of knowledge contribution, there are several limitations, including a small sample size and a single field site. Future work is being planned to collect more data to increase the power of our analyses.

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