Contributing Knowledge to Electronic Knowledge Repositories:

An Empirical Investigation

Atreyi Kankanhalli

Bernard C.Y. Tan

Department of Information Systems
National University of Singapore
3 Science Drive 2, Singapore 117543
Republic of Singapore

Kwok-Kee Wei

Department of Information Systems
City University of Hong Kong
83 Tat Chee Avenue
Kowloon, Hong Kong SAR

Please address all correspondence on this paper to Atreyi Kankanhalli (Dr.)

Phone: (65) 6874-4865; Fax: (65) 6874-6868; Email: atreyi@comp.nus.edu.sg

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Abstract

Organizations are attempting to leverage their knowledge resources by employing knowledge management (KM) systems, a key form of which are electronic knowledge repositories (EKRs). A large number of KM initiatives fail due to reluctance of employees to share knowledge through these systems. Motivated by such concerns, this study formulates and tests a theoretical model to explain EKR usage by knowledge contributors. The model employs social exchange theory to identify cost and benefit factors affecting EKR usage, and social capital theory to account for the moderating influence of contextual factors. The model is validated through a large-scale survey of public sector organizations. The results reveal that knowledge self-efficacy and enjoyment in helping others significantly impact EKR usage by knowledge contributors. Contextual factors (generalized trust, pro-sharing norms, and identification) moderate the impact of codification effort, reciprocity, and organizational reward on EKR usage, respectively. It can be seen that extrinsic benefits (reciprocity and organizational reward) impact EKR usage contingent on particular contextual factors whereas the effects of intrinsic benefits (knowledge self-efficacy and enjoyment in helping others) on EKR usage are not moderated by contextual factors. The loss of knowledge power and image do not appear to impact EKR usage by knowledge contributors. Besides contributing to theory building in KM, the results of this study inform KM practice.

Keywords

Knowledge management, electronic knowledge repositories, knowledge contribution, social exchange, social capital.

ISRL Categories

AA07, AJ, BA03, EI0208

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1.   Introduction

The strategic management of organizational knowledge is a key factor that can help organizations to sustain competitive advantage in volatile environments. Organizations are turning to knowledge management (KM) initiatives and technologies to leverage their knowledge resources. According to analyst firm IDC, business spending on KM could rise from $2.7 billion in 2002 to $4.8 billion in 2007 (Babcock 2004). Concurrently, with the organizational interest in KM, a large number of academic papers have been published on KM (Schultze and Leidner 2002). These developments reflect the significance of KM among scholars and practitioners.

KM is defined as "a systemic and organizationally specified process for acquiring, organizing, and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work" (Alavi and Leidner 1999, p.6). KM systems are "a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application" (Alavi and Leidner 2001, p.114). Two models of KM systems have been identified in the information systems literature: the repository model and the network model (Alavi 2000).[1] The repository model corresponds to the codification approach to KM (Hansen et al. 1999). This approach emphasizes codification and storage of knowledge so as to facilitate knowledge reuse through access to the codified expertise. A key technological component of this approach are electronic knowledge repositories (EKRs) (Grover and Davenport 2001). The network model corresponds to the personalization approach to KM (Hansen et al. 1999). This approach emphasizes linkage among people for the purpose of knowledge exchange. Important technological components of this approach are knowledge directories that provide

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[1] Zack (1999) alternately labels these two models as integrative and interactive architectures respectively.

location of expertise (Ruggles 1998) and electronic forum software that allow people to interact within communities of practice (Brown and Duguid 1991).

While technological capabilities are important, having sophisticated KM systems does not guarantee success in KM initiatives (McDermott 1999; Cross and Baird 2000). This is because social issues appear to be significant in ensuring knowledge sharing success (Ruppel and Harrington 2001). Both social and technical barriers to usage of KM systems have been listed and calls have been made to address both sets of issues together (McDermott 1999; Zack 1999) in order to be able to reap the benefits of KM that have been experienced by some organizations (Davenport et al. 1998; O'Dell and Grayson 1998).

This study focuses on EKRs since they are fundamental to organizational knowledge capture and dissemination, yet the factors affecting EKR usage are not well understood (Markus 2001). EKRs are electronic stores of content acquired about all subjects for which the organization has decided to maintain knowledge (Liebowitz and Beckman 1998). EKRs can comprise multiple knowledge bases as well as the mechanisms for acquisition, control, and publication of the knowledge.[2] The process of knowledge sharing through EKRs involves people contributing knowledge to populate EKRs (e.g., customer and supplier knowledge, industry best practices, and product expertise) and people seeking knowledge from EKRs for reuse. Success of EKRs requires that knowledge contributors be willing to part with their knowledge and knowledge seekers be willing to reuse the codified knowledge (Ba et al. 2001). The distinction between contributors and seekers is conceptual in that the same individual can be a contributor or a seeker at different points in time. This study examines EKR usage from the perspective of knowledge contributors as this is the first step towards knowledge leverage through EKRs. Unless knowledge contributors are willing to provide content to EKRs, knowledge reuse through EKRs cannot take place.

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[2] According to the definition, the capabilities of EKRs are analogous to the mnemonic functions of organizational memory information systems (Stein and Zwass 1995). However the organizational memory information systems conceptualization concentrates more on the sub-systems level description.

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Several prior studies have adopted a conceptual (e.g., Kollock 1999; Markus 2001) or qualitative approach (e.g., Goodman and Darr 1998; Orlikowski 1993; Wasko and Faraj 2000) in attempts to understand the behavior of knowledge contributors. Other studies have conducted experiments (e.g., Constant et al. 1994) or surveys (e.g., Bock et al. 2003, Constant et al. 1996, Jarvenpaa and Staples 2000; Wasko and Faraj 2003) to model and explain contributor behavior with varying success. Existing empirical studies focus on the benefits (acting as motivators) rather than the costs (acting as inhibitors) of knowledge contribution, despite suggestions from practitioner literature (e.g., O'Dell and Grayson 1998) and conceptual literature (e.g., Ba et al. 2001) that cost factors can be important in determining knowledge sharing behavior. This study advances theoretical development on knowledge contribution in two important ways. First, it simultaneously investigates both cost and benefit factors affecting EKR usage. Second, it incorporates contextual factors to illustrate how these may moderate the relationships between cost and benefit factors and EKR usage. The results suggest organizational interventions and technology design considerations that can promote knowledge contribution to EKRs, thereby facilitating reuse of organizational knowledge.

2.   Theoretical Background

The dependent variable we are interested to investigate is the degree of EKR usage by knowledge contributors. In investigating the usage of EKRs, the first choice of theoretical bases would appear to be theories such as the technology acceptance model (Davis 1989) that have been successful in explaining the usage of information systems (e.g., Venkatesh and Davis 2000). Though the technology acceptance model may partially explain the behavior of knowledge contributors[3], this model does not directly account for the social cost and benefit factors experienced by knowledge contributors that may affect their usage of collective technologies such as EKRs. However, the social and individual cost and benefit factors in knowledge sharing can be accounted for by social exchange theory. The impact of cost and benefit factors on EKR usage by knowledge contributors is likely to be contingent upon contextual factors (Constant et al. 1996; Goodman and Darr 1998;

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[3] The technology acceptance model has been suggested as a means to extend the theoretical model developed in this study (see Section 6.3).

Jarvenpaa and Staples 2000; Orlikowski 1993). Social capital theory accounts for several important contextual factors in knowledge exchange. Therefore, this study uses the social exchange theory and the social capital theory as its theoretical bases.

2.1   Cost and Benefit Factors

Cost and benefit factors in our study are derived based on social exchange theory. Social exchange theory explains human behavior in social exchanges (Blau 1964), which differ from economic exchanges in that obligations are not clearly specified. In such exchanges, people do others a favor with a general expectation of some future return but no clear expectation of exact future return. Therefore, social exchange assumes the existence of relatively long-term relationships of interest as opposed to one-off exchanges (Molm 1997). Knowledge sharing through EKRs can be seen as a form of generalized social exchange (Fulk et al 1996) where more than two people participate and reciprocal dependence is indirect, with the EKR serving as the intermediary between knowledge contributors and seekers. Knowledge contributors share their knowledge with no exact expectation of future return. The quantity and value of knowledge contributed is difficult to specify and so is the return obtained. Hence, knowledge contributors are likely to work on the assumption of relatively longer-term relationships of interest.

Resources (tangible and intangible) are the currency of social exchange. Resources given away during social exchange or negative outcomes of exchange can be seen as costs. Resources received as a result of social exchange or positive outcomes of exchange can be seen as benefits. Social exchange theory posits that people behave in ways that maximize their benefits and minimize their costs (Molm 1997). In agreement with this theory, researchers have suggested that increasing the benefits and reducing the costs for contributing knowledge can help to encourage knowledge sharing using KM systems (Markus 2001; Wasko and Faraj 2000), including EKRs.

During social exchange, costs can be incurred in the form of opportunity costs and actual loss of resources (Molm 1997). Opportunity costs are rewards foregone from alternative behavior not chosen. For example the time and effort required to codify and input

knowledge into EKRs (Ba et al. 2001; Markus 2001) can act as an opportunity cost that precludes knowledge contributors from performing alternative tasks at that time and accruing the corresponding rewards. Also, knowledge contributors may perceive a loss of power and unique value within the organization associated with the knowledge they transfer to EKRs (Davenport and Prusak 1998; Gray 2001). Such loss of knowledge power can be considered as an actual loss of resource during knowledge contribution.

During social exchange, benefits acting as motivators of human behavior can be extrinsic or intrinsic in nature (Deci and Ryan 1980; Vallerand 1997). Extrinsic benefits are sought after as means to ends desired by people. For example, knowledge contributors may receive organizational rewards for their contributions (Beer and Nohria 2000; Hall 2001) through which they can obtain a better lifestyle. As a result of contribution, knowledge contributors may also enhance their image or reputation in the organization (Ba et al. 2001; Constant et al. 1994; Constant et al. 1996), which can serve to increase their self-concept. By sharing their knowledge, knowledge contributors may receive reciprocal benefits i.e., their future requests for knowledge being met by others (Connolly and Thorn 1990; Kollock 1999; Wasko and Faraj 2000), which can facilitate their work. Intrinsic benefits are sought after as ends by themselves. For example, through contribution, knowledge contributors can be satisfied by enhancing their knowledge self-efficacy or confidence in their ability to provide valuable knowledge that is useful to the organization (Constant et al. 1994; Constant et al. 1996). Also, by contributing knowledge to EKRs, knowledge contributors have the opportunity to help others (Ba et al. 2001; Wasko and Faraj 2000). Previous studies on altruism have shown that people enjoy and derive pleasure from such acts of helping others (Baumeister 1982; Krebs 1975). Research has established extrinsic and intrinsic benefits as motivators of human behavior in several domains (Vallerand 1997), including knowledge sharing (Osterloh and Frey 2000).

2.2   *Contextual Factors*
Contextual factors in our study are derived from social capital theory. Social capital refers to the resources embedded within networks of human relationships (Nahapiet and

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Ghoshal 1998). These networks include proximate as well as virtual communities (Rheingold 2000). Social capital theory posits that social capital provides the conditions necessary for knowledge exchange to occur. Three key aspects of social capital that can define the context for knowledge exchange are trust, norms, and identification (Nahapiet and Ghoshal 1998). Trust, norms, and identification can be considered as social capital since they are organizational resources or assets rooted within social relationships that can improve the efficiency of coordinated action. Practitioner literature has described the impacts of these factors without considering whether their effects are direct or moderating. However, several prior academic studies (e.g., Constant et al. 1994; Jarvenpaa and Staples 2000) have hinted at the moderating role of these aspects of social capital in knowledge sharing situations. Specifically, these three factors are believed to be able to amplify or dampen the effects of particular cost and benefit factors on knowledge sharing behavior.

Trust is the belief that the intended action of others would be appropriate from our point of view (Mistzal 1996). It indicates a willingness of people to be vulnerable to others due to beliefs in their good intent and concern, competence and capability, and reliability (Mishra 1996). McKnight et al. (1998) term these trusting beliefs as benevolence belief, competence belief, and predictability belief, respectively. Generalized trust is an impersonal form of trust that does not rest with a specific individual but rests on behavior that is generalized to a social unit as a whole (e.g., a community of knowledge workers exchanging knowledge through EKRs) (Putnam 1993). In the context of our study, generalized trust refers to the belief in the good intent, competence, and reliability of employees with respect to contributing and reusing knowledge through EKRs. With strong generalized trust, people may trust each other without having much personal knowledge about each other. Generalized trust has been viewed as a key factor that provides a context for cooperation (Tsai and Ghoshal 1998) and effective knowledge exchange (Adler 2001). When generalized trust is strong, the effort required for knowledge sharing may not be salient to knowledge contributors because they believe that knowledge shared is not likely to be misused by reusers (Davenport and Prusak 1998). Conversely, when generalized trust is weak, knowledge contributors may find the

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effort required for knowledge sharing to be salient because they believe that others may inappropriately use their knowledge. For example, consultants at Ernst and Young declined to make the effort to contribute knowledge to repositories in situations where trust did not exist (Markus 2001).

A norm represents a degree of consensus in the social system (Coleman 1990). Norms have the effect of moderating human behavior in accordance with the expectations of the group or community. Pro-sharing norms that have been reported to enhance the climate for knowledge sharing are norms of teamwork (Starbuck 1992), collaboration and sharing (Goodman and Darr 1998; Jarvenpaa and Staples 2000; Orlikowski 1993), willingness to value and respond to diversity, openness to conflicting views, and tolerance for failure (Leonard-Barton 1995). The effects of costs and extrinsic benefits on knowledge contribution behavior are likely to be contingent on these norms. The effects of intrinsic benefits on knowledge contribution are not likely to be affected by contextual factors since these benefits are seen as ends in themselves. The cost and extrinsic benefit factors may not influence contribution behavior under conditions of strong pro-sharing norms. Specifically, when pro-sharing norms are strong, the costs of knowledge sharing may not be a deterrent to knowledge contributors. Conversely when pro-sharing norms are weak, the costs of contribution may be salient. For example, it has been found that the costs of knowledge sharing were a deterrent to KM system usage when there was incompatibility between the collective nature of the technology and the competitive norm of the organizational context (Orlikowski 1993). The extrinsic benefits of knowledge sharing may not be salient to knowledge contributors when pro-sharing norms are strong. For example, in environments where such norms are strong, there is greater openness to the potential for value creation through knowledge exchange (Nahapiet and Ghoshal 1998) even when extrinsic benefits to stimulate knowledge contribution may not exist.

Identification is a condition where the interests of individuals merge with the interests of the organization, resulting in the creation of an identity based on those interests (Johnson et al. 1999). Identification sets the context within which communication and knowledge exchange occur among organizational members (Nahapiet and Ghoshal 1998). Three

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components of identification that have been identified in the literature are similarity of values, membership in the organization, and loyalty towards the organization (Patchen 1970). Similarity of values reflects the extent to which members of an organization possess joint goals and interests. Membership is the degree to which self-concept of members is linked to the organization. Loyalty refers to the extent to which members support and defend the organization. Identification is likely to provide a context for pro-social behavior by raising the concern for collective interests which merge with the individual's own interests (Johnson et al. 1999; O'Reilly and Chatman 1986). Under conditions of strong identification, the effects of certain costs and benefits pertaining to knowledge sharing may get nullified in the face of collective outcomes (Constant et al. 1996). Therefore, when identification is strong, the effort required for knowledge sharing may not be a deterrent to knowledge contributors because the concern for organizational outcomes may dominate. Similarly, in such contexts, the need for organizational reward for knowledge sharing may not be salient to knowledge contributors because the regard for collective outcomes is strong.

3.   Research Model and Hypotheses

The research model for explaining EKR usage by knowledge contributors incorporates constructs from social exchange theory and social capital theory (see Figure 1). Previous studies have emphasized the importance of cost and benefit factors in determining knowledge sharing behavior (Ba et al. 2001; Markus 2001). Prior research has also highlighted the importance of contextual social capital factors in influencing the conditions for knowledge sharing (Cohen and Prusak 2001; Nahapiet and Ghoshal 1998). Therefore, cost factors (i.e., loss of knowledge power and codification effort) and benefit factors (i.e., organizational reward, image, reciprocity, knowledge self-efficacy, and enjoyment in helping others) are hypothesized to impact EKR usage by knowledge contributors contingent on particular contextual factors (i.e., generalized trust, pro-sharing norms, and identification).
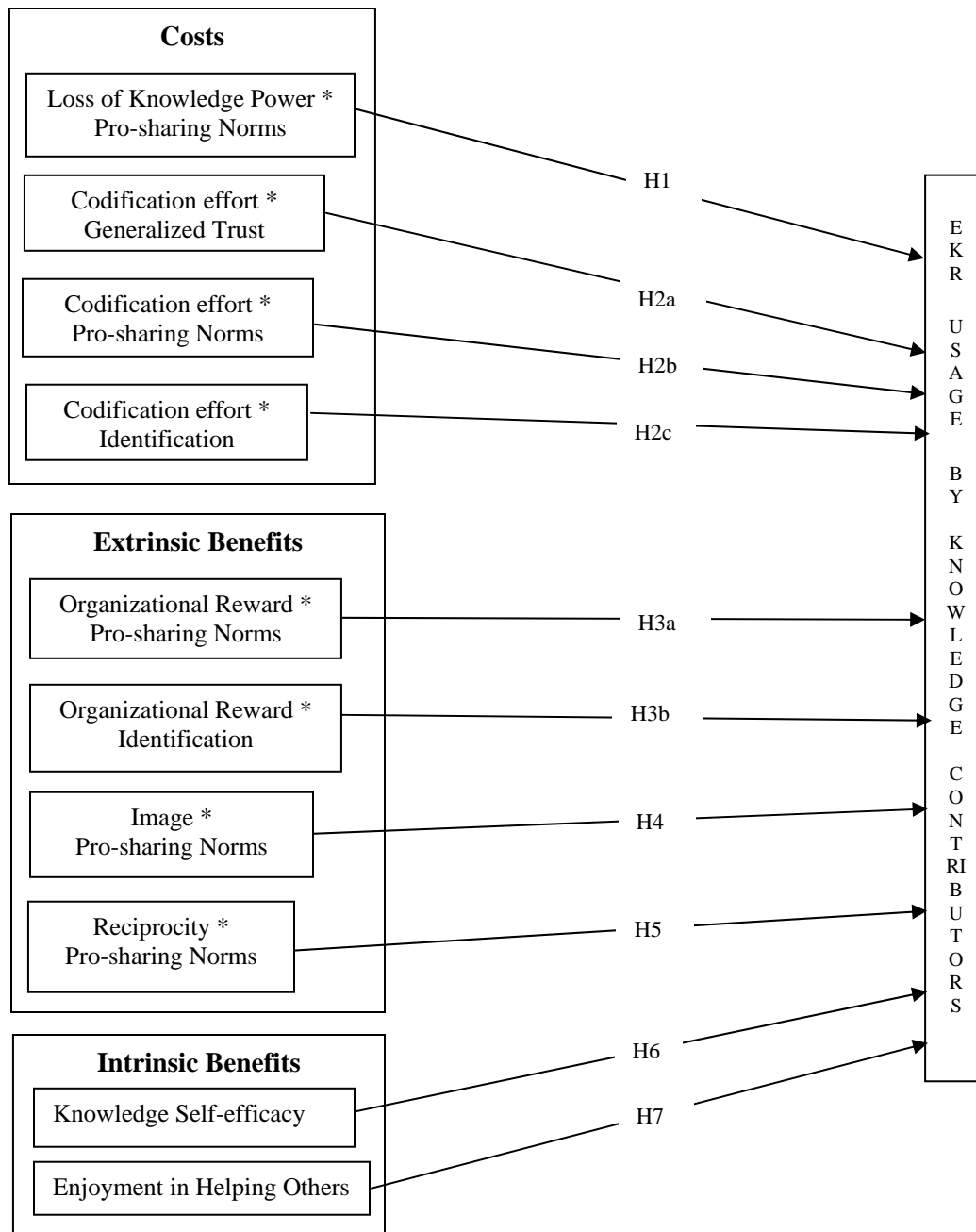
Costs

Loss of Knowledge Power *
Pro-sharing Norms

Codification effort *
Generalized Trust

Codification effort *
Pro-sharing Norms

Codification effort *
Identification

H1

H2a

H2b

H2c

Extrinsic Benefits

Organizational Reward *
Pro-sharing Norms

Organizational Reward *
Identification

Image *
Pro-sharing Norms

Reciprocity *
Pro-sharing Norms

H3a

H3b

H4

H5

Intrinsic Benefits

Knowledge Self-efficacy

Enjoyment in Helping Others

H6

H7

EKR USAGE BY KNOWLEDGE CONTRIBUTORS

Figure 1 - The Research Model for EKR Usage by Knowledge Contributors

3.1   Loss of Knowledge Power

Previous research suggests that by contributing a part of their unique knowledge, knowledge contributors give up sole claim to the benefits stemming from such knowledge (Gray 2001). Therefore, knowledge contributors retain less proprietary knowledge upon which to argue their value to the organization. This may reduce the

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power position of knowledge contributors in relation to the organization, making them more replaceable. These arguments have also been echoed by scholars in economics (e.g., Williamson 1975) and organization strategy (e.g., Mintzberg 1973; Pfeffer 1992) in that uniqueness is considered a key aspect of organizational power because the lower the substitutability of an individual, the greater is his or her power (Hickson et al. 1971). The KM literature reports the loss of power due to knowledge contribution as a barrier to knowledge sharing (Davenport and Prusak 1998; Orlikowski 1993). Since knowledge is perceived as a source of power, knowledge contributors may fear losing their power or value if others know what they know (Gray 2001; Thibaut and Kelley 1986). Potential knowledge contributors may keep themselves out of a knowledge exchange if they feel they can benefit more by hoarding their knowledge rather than by sharing it (Davenport and Prusak 1998).

While the above discussion suggests a negative relationship between loss of knowledge power and EKR usage by knowledge contributors, this relationship may be contingent on pro-sharing norms. When such norms are strong, the barriers to knowledge transfer witnessed in contexts that value personal expertise may be ineffective (Jarvenpaa and Staples 2000). In such conditions when other employees are seen to be sharing knowledge, the deterrent effect of the loss of knowledge power (which is relative to other employees) may not be significant. Conversely with weak pro-sharing norms, knowledge contributors may be concerned about loss of knowledge power when they contribute knowledge to EKRs.

H1: Loss of knowledge power is negatively related to EKR usage by knowledge contributors under conditions of weak pro-sharing norms.

3.2   Codification Effort

The act of knowledge contribution to EKRs involves explication and codification of knowledge. This can entail costs to knowledge contributors as an expense of time and effort (Ba et al. 2001; Markus 2001). Effort has been observed to be a significant predictor of technology adoption (Agarwal 2000). The time required for codifying knowledge can be considered as an opportunity cost. Orlikowski (1993) reported a

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situation where consultants avoided knowledge contribution due to high opportunity cost. They were unwilling to use the KM system as this would have required them to incur non-chargeable hours or give up their personal time. After contributing knowledge, there may be additional requests for clarification and assistance from knowledge recipients, which take up more codification time from knowledge contributors (Goodman and Darr 1998).

The above arguments suggest a negative relationship between codification effort and EKR usage by knowledge contributors, but this relationship is likely to be contingent on generalized trust. Strong generalized trust implies a general belief in the good intent of others (Putnam 1993). When generalized trust is strong, knowledge contributors are likely to believe that knowledge recipients would not misuse their knowledge and would give them credit for their codification effort. Under such circumstances, knowledge contributors may be confident that their effort would be appreciated and may not be concerned about the effort they have to put in when contributing knowledge to EKRs. Conversely, codification effort may become a deterrent to knowledge contribution when generalized trust is weak.

H2a: Codification effort is negatively related to EKR usage by knowledge contributors under conditions of weak generalized trust.

Codification effort may also be negatively related to EKR usage by knowledge contributors contingent on pro-sharing norms. With strong teamwork as well as cooperation and collaboration norms, people tend not to be bothered about the effort required to contribute knowledge since others may be likewise contributing. Conversely, when weak pro-sharing norms prevail, knowledge contributors tend to be aware of and hindered by the effort required to codify knowledge for EKRs (Orlikowski 1993). Therefore, knowledge contributors may be deterred by codification effort when pro-sharing norms are weak.

H2b: Codification effort is negatively related to EKR usage by knowledge contributors under conditions of weak pro-sharing norms.

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Further, codification effort may be negatively related to EKR usage by knowledge contributors contingent on identification. When identification is strong, collective concerns may dominate over certain costs and benefits since collective interests merge with the individual's own interests (Johnson et al. 1999). In such situations, knowledge contributors may not be concerned about their codification effort in the presence of the collective need for contributing knowledge to EKRs. Conversely, when identification is weak, codification effort may become a deterrent to knowledge contribution.

H2c: Codification effort is negatively related to EKR usage by knowledge contributors under conditions of weak identification.

3.3   *Organizational reward*

To encourage EKR usage by knowledge contributors, organizations may provide various forms of organizational reward such as increased pay, bonuses, job security, or career advancement (Ba et al. 2001; Beer and Nohria 2000; Hall 2001). The American Productivity Quality Center website provides examples of reward schemes for encouraging knowledge sharing in organizations (APQC 2001). Several consulting companies have made knowledge sharing a basic criterion for employee performance evaluation (Davenport and Prusak 1998). There are also instances where employees enjoy better job security as a result of contributing knowledge (Hall 2001).

Although the discussion above suggests a positive relationship between organizational reward and EKR usage by knowledge contributors, this relationship is likely to be contingent on pro-sharing norms. When norms of teamwork and collaboration are strong, people may not require external incentives to share knowledge (Nahapiet and Ghoshal 1998). Such a climate can remove the need for organizational reward because knowledge contributors may contribute their knowledge to EKRs even when such rewards are not available. Conversely, weak pro-sharing norms can make organizational reward a salient motivator for knowledge contribution.

H3a: Organizational reward is positively related to EKR usage by knowledge contributors under conditions of weak pro-sharing norms.

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Further, organizational reward may be positively related to EKR usage by knowledge contributors contingent on identification. When identification is strong, the interests of employees and the interests of the organization merge (Johnson et al. 1999). In such situations, collective concerns tend to dominate over certain costs and benefits. Therefore under conditions of strong identification, knowledge contributors may not require organizational reward to motivate them. Even when organizational reward is absent, people may still contribute knowledge to EKRs. Conversely, weak identification can make organizational reward a salient motivator for knowledge contributors.

H3b: Organizational reward is positively related to EKR usage by knowledge contributors under conditions of weak identification.

3.4 Image

In most organizations today, the importance of reputation is increasing as traditional contracts between organizations and employees based on length of service erode (Ba et al. 2001; Davenport et al. 1998). In such working environments, knowledge contributors can benefit from showing to others that they possess valuable expertise (Ba et al. 2001). This earns them respect from others (Constant et al. 1994) and a better image (Constant et al. 1996). Therefore, knowledge contributors can benefit from improved self-concept when they contribute their knowledge (Hall 2001; Kollock 1999). Employees have been found to share their best practice due to a desire to be recognized by their peers as experts (O'Dell and Grayson 1998). People who provided high quality technical knowledge have been found to enjoy better prestige in the workplace (Kollock 1999).

While the above discussion suggests a positive relationship between image and EKR usage by knowledge contributors, this relationship may be contingent on pro-sharing norms. When strong teamwork and collaboration norms prevail, knowledge contributors may not require extrinsic benefits (Nahapiet and Ghoshal 1998) such as image in order to contribute knowledge. Under such conditions, knowledge contributors are likely to contribute their knowledge to EKRs even if benefit in the form of improved image is

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absent. Conversely, weak pro-sharing norms can make image a salient motivator for knowledge contribution.

H4: Image is positively related to EKR usage by knowledge contributors under conditions of weak pro-sharing norms.

3.5   Reciprocity

Reciprocity has been highlighted as a benefit for individuals to engage in social exchange (Blau 1964). It can serve as a motivational mechanism for people to contribute to discretionary databases (Connolly and Thorn 1990). Reciprocity can act as a benefit for knowledge contributors because they expect future help from others in lieu of their contributions[4] (Connolly and Thorn 1990; Kollock 1999). Prior research suggests that people who share knowledge in online communities believe in reciprocity (Wasko and Faraj 2000). Further, researchers have observed that people who regularly helped others in virtual communities seemed to receive help more quickly when they asked for it (Rheingold 2000).

The above arguments suggest a positive relationship between reciprocity and EKR usage by knowledge contributors, but this relationship may be contingent on pro-sharing norms. When pro-sharing norms are strong, knowledge contributors may share their knowledge without need for extrinsic benefits (Nahapiet and Ghoshal 1998) such as reciprocity. In such a climate, knowledge contributors are likely to contribute their knowledge to EKRs even in the absence of reciprocity benefits. Conversely, when pro-sharing norms are weak, reciprocity may be a salient motivator for knowledge contributors.

H5: Reciprocity is positively related to EKR usage by knowledge contributors under conditions of weak pro-sharing norms.

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[4] Reciprocity refers to the expectation of knowledge contributors that their current contribution will lead to their future request for knowledge being met. This is different from pro-sharing norms, which describe a climate to facilitate knowledge sharing whereby sharing may take place with little consideration for the costs and extrinsic benefits (including reciprocity) of doing so.

3.6   Knowledge Self-Efficacy

Self-efficacy relates to the perception of people about what they can do with the skills they possess (Bandura 1986). When people share their expertise that is useful to the organization, they gain confidence in terms of what they can do and this brings the benefit of increased self-efficacy (Constant et al. 1994). This belief can serve as a self-motivational force for knowledge contributors to contribute knowledge to EKRs (Bock and Kim 2002; Kalman 1999). Knowledge self-efficacy is typically manifested in the form of people believing that their knowledge can help to solve job-related problems (Constant et al. 1996), improve work efficiency (Ba et al. 2001), or make a difference to their organization (Kollock 1999; Wasko and Faraj 2000). Conversely, if people feel that they lack knowledge that is useful to the organization, they may decline from contributing knowledge to EKRs because they believe that their contribution cannot make a positive impact for the organization. The effect of knowledge self-efficacy on EKR usage is not likely to be contingent on generalized trust, pro-sharing norms, or identification.

H6: Knowledge self-efficacy is positively related to EKR usage by knowledge contributors.

3.7   Enjoyment in Helping Others

This benefit is derived from the concept of altruism. Altruism exists when people derive intrinsic enjoyment from helping others without expecting anything in return (Krebs 1975; Smith 1981). Although there may be very few instances of absolute altruism (involving absolute lack of self-concern in the motivation for an act), relative altruism (where self-concern plays a minor role in motivating an act) is more prevalent (Smith 1981). Knowledge contributors may be motivated by relative altruism based on their desire to help others (Davenport and Prusak 1998). Prior research shows that knowledge contributors gain satisfaction by demonstrating their altruistic behavior (Wasko and Faraj 2000). Such satisfaction stems from their intrinsic enjoyment in helping others (Ba et al. 2001; Constant et al. 1994; Constant et al. 1996). Knowledge contributors who derive enjoyment in helping others may be more inclined to contribute knowledge to EKRs. The

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effect of enjoyment in helping others on EKR usage is not likely to be contingent on generalized trust, pro-sharing norms, or identification.

H7: Enjoyment in helping others is positively related to EKR usage by knowledge contributors.

4. Research Methodology

The survey methodology was used to collect data for testing the research hypotheses. This methodology was chosen because it enhances generalizability of results (Dooley 2001).

Construct (Abbreviation)	Definition
Loss of knowledge power (LOKP)	The perception of power and unique value lost due to knowledge contributed to EKR (Gray 2001)
Codification effort (CEFF)	The time and effort required to codify and input knowledge into EKR (Markus 2001)
Organizational reward (OREW)	The importance of economic incentives provided for knowledge contribution to EKR (Ba et al 2001; Hall 2001)
Image (IMAG)	The perception of increase in reputation due to contributing knowledge to EKR (Constant et al 1996; Kollock 1999)
Reciprocity (RECP)	The belief that current contribution to EKR would lead to future request for knowledge being met (Davenport and Prusak 1998)
Knowledge self-efficacy (KSEF)	The confidence in one's ability to provide knowledge that is valuable to the organization via EKR (Constant et al. 1996; Kalman 1999)
Enjoyment in helping others (EHLP)	The perception of pleasure obtained from helping others through knowledge contributed to EKR (Wasko and Faraj 2000)
Generalized trust (GTRU)	The belief in the good intent, competence, and reliability of employees with respect to contributing and reusing knowledge (Mishra 1996; Putnam 1993)
Pro-sharing norms (PSNM)	The prevalence of norms that are intended to facilitate knowledge sharing in the organization (Orlikowski 1993; Nahapiet and Ghoshal 1998)
Identification (IDEN)	The perception of similarity of values, membership, and loyalty with the organization (Johnson et al 1999; Patchen 1970)
EKR usage (EUSG)	The degree of EKR usage to contribute knowledge (Davis 1989)

Table 1 - Formal Definitions of Constructs

4.1 Operationalization of Constructs

Table 1 provides formal definitions of the constructs. Where available, these constructs were measured using questions adapted from prior studies to enhance validity (Stone 1978). Elsewhere, new questions were developed based on a review of the previous KM and information systems literature. One question for EKR usage by knowledge contributors (the dependent construct) measured the frequency of EKR usage[5]. The

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[5] We have to be mindful of the limitation that self-reported EKR usage may be inflated.

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remaining 50 questions in the instrument were measured using 7-point scales anchored from Strongly Disagree to Strongly Agree (see Appendix).

4.2 Conceptual Validation

Given that the questions for measuring the constructs were adapted from various sources or developed for this study, all the questions were subjected to a two-stage conceptual validation exercise, based on procedures prescribed by Moore and Benbasat (1991). Four graduate students participated in the first stage (unstructured sorting) as sorters. Each sorter was given the 51 questions printed on cards and mixed up. They had to sort the questions by placing related questions together and giving a label to each set of related questions (which made up a construct). This process helped to identify ambiguously worded questions. The labels given by all the four sorters for the constructs corresponded very closely to the names of the actual constructs. Overall, the four sorters correctly placed more than 86% of the questions onto the intended constructs (see Table 2). One question each for image (IMAG5) and pro-sharing norms (PSNM3) and two questions for identification (IDEN3 and IDEN5) were dropped because the sorters felt that these questions were ambiguous or did not fit in with the other questions.

Target Category	Actual Category												Total Qs	Hit Rate (%)
	LOKP	CEFF	OREW	IMAG	RECP	KSEF	EHLP	GTRU	PSNM	IDEN	EUSG	Other		
LOKP	12			2								2	16	75
CEFF		15									1	4	20	75
OREW			20										20	100
IMAG			2	14					1			3	20	70
RECP					6							2	8	75
KSEF						14		1				1	16	87.50
EHLP							16						16	100
GTRU								16					16	100
PSNM								1	20			3	24	83.33
IDEN									1	31		4	36	86.11
EUSG											12		12	100
Average														86.54

Table 2 - Results of Unstructured Sorting Exercise

Another four graduate students participated in the second stage (structured sorting) as sorters. Each sorter was given the 47 reworded questions printed on cards and mixed up. Unlike the previous stage, they were given the names and definitions of the constructs. They had to sort the questions by placing each question into a construct category or an

"Other" (no fit) category. Apart from two image questions (IMAG3 and IMAG4) that were placed in the "Other" category, all sorters correctly placed all the questions onto the intended constructs (see Table 3). These two questions were reworded based on suggestions from the sorters. Two additional questions for reciprocity (RECP3 and RECP4) were added based on suggestions from the sorters. Given that it is desirable to have a minimum of three questions per construct (Kim and Mueller 1981), these additional questions helped to improve measurement properties for reciprocity. All 49 questions were then consolidated into an instrument for survey administration.

4.3   Survey Administration

The field study was conducted in Singapore, over a period of 6 months, from mid to late 2002. Singapore is a developed country where a number of public organizations are in the process of embarking on KM initiatives. Interviews were conducted with key personnel in charge of KM initiatives in these organizations. Altogether, senior KM executives from 17 public organizations were interviewed.

Target Category	Actual Category												Total Qs	Hit Rate (%)
	LOKP	CEFF	OREW	IMAG	RECP	KSEF	EHLP	GTRU	PSNM	IDEN	EUSG	Other		
LOKP	16												16	100
CEFF		20											20	100
OREW			20										20	100
IMAG				14								2	16	87.5
RECP					8								8	100
KSEF						16							16	100
EHLP							16						16	100
GTRU								16					16	100
PSNM									20				20	100
IDEN										28			28	100
EUSG											12		12	100
Average														98.86

Table 3 - Results of Structured Sorting Exercise

Of the 17 public organizations contacted, 10 organizations (covering seven industries) were willing to participate in the survey. The organizations were offered a report of our findings as an incentive to participate. A senior KM executive from each organization helped to identify and distribute the survey to colleagues who had used EKRs as knowledge contributors in the course of their work. Hence, all respondents of this survey

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were KM practitioners who were familiar with EKR usage from the perspective of knowledge contribution. Among the 400 surveys distributed in these organizations, 150 responses were obtained yielding a response rate of 37.5% (see Table 4). Completed surveys were returned to the authors by the respondents using envelopes with pre-paid postage.

Industry	Number of Responses	Percentage of Responses
Defense	23	15.3%
Education	11	7.3%
Information Technology	61	40.7%
Library	6	4.0%
Real Estate and Construction	17	11.3%
Rehabilitation	8	5.3%
Research and Development	24	16.0%
Total	150	100.0%

Table 4 - Characteristics of Participating Organizations

Most of the 150 respondents were males (57.3%) and in the age group of 21-29 years (50.7%). Majority of the respondents had university degrees (86.7%), with the rest having high school education. Their work covered functional areas such as information systems (33.3%), corporate services (10%), marketing (8.7%), strategic planning (8.7%), human resource (7.3%), and research and development (7.3%). On average, the respondents had work experience of 7.5 years and had been using EKRs as knowledge contributors for 2.5 years. They used information technology extensively in the course of their work.

All organizations surveyed used EKRs as a critical component of their KM initiative. For instance one organization in the education sector used a Lotus Notes based EKR to store student counseling case studies and project reviews. Another organization in the real estate sector used their Lotus Notes based system for storing case studies, project reviews, and lessons learned (after action reviews). All EKRs studied were mainly used to store project reviews, case studies, lessons learned and best practices. The contents of the EKRs were in the form of documents (word or pdf format) and presentations (ppt format). Keywords and other metadata were used to index and retrieve the content. Therefore the contents were fairly structured. The number of EKR users in these organizations varied from about 120 to 2000 while the organization sizes ranged from about 250 to 2500. All organizations provided KM training and incentives for knowledge

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sharing. There was also top management support for KM initiatives. However, there were no explicit mandates for employees to use EKRs (or other KM systems) i.e., EKR usage was voluntary. Information obtained and observations of EKRs during interviews revealed that all the 10 organizations that participated in this survey were comparable in terms of their EKR capabilities and organizational mechanisms surrounding their KM initiatives. These similarities allowed the responses from the 10 organizations to be pooled for data analysis.

5.   Data Analysis and Results

The constructs were first assessed for reliability and validity. After ascertaining that the constructs could meet parametric requirements of the regression test, the hypotheses were tested using moderated multiple regression analysis. All statistical tests were carried out at a 5% level of significance.

5.1   Reliability and Validity

The constructs were assessed for reliability using Cronbach's alpha (Cronbach 1951). Nunnally (1978) suggested that a value of at least 0.7 indicated adequate reliability. A question each was omitted from organizational reward (OREW1), reciprocity (RECP1), pro-sharing norms (PSNM5), and identification (IDEN6) to improve the reliabilities of the corresponding constructs. Subsequently, all the constructs had adequate reliability (see Table 5).

Construct	Number of Questions	Cronbach's Alpha
Loss of knowledge power (LOKP)	4	0.95
Codification effort (CEFF)	5	0.85
Organizational reward (OREW)	4	0.96
Image (IMAG)	4	0.89
Reciprocity (RECP)	3	0.85
Knowledge self-efficacy (KSEF)	4	0.96
Enjoyment in helping others (EHLP)	4	0.96
Generalized trust (GTRU)	4	0.85
Pro-sharing norms (PSNM)	4	0.93
Identification (IDEN)	6	0.96
EKR usage (EUSG)	3	0.85

Table 5 - Reliability of Constructs

Question	Factor (Construct)										
	1	2	3	4	5	6	7	8	9	10	11
LOKP1	-0.08	-0.20	0.03	-0.15	**0.87**	0.01	-0.06	0.00	-0.05	-0.02	-0.08
LOKP2	-0.16	-0.23	0.00	-0.13	**0.90**	-0.04	0.04	-0.04	-0.04	0.00	0.00
LOKP3	-0.13	-0.17	0.01	-0.08	**0.90**	0.00	0.00	-0.09	-0.11	-0.06	-0.04
LOKP4	-0.16	-0.23	0.09	-0.10	**0.87**	0.03	0.03	-0.11	-0.09	0.00	-0.03
CEFF1	-0.13	-0.15	0.06	0.01	0.09	-0.05	-0.06	**0.85**	-0.15	-0.19	-0.09
CEFF2	-0.19	-0.14	-0.08	-0.08	0.10	0.00	-0.17	**0.89**	-0.10	-0.04	-0.04
CEFF3	-0.14	0.00	-0.07	-0.11	0.04	0.04	-0.15	**0.90**	-0.12	-0.02	-0.08
CEFF4	-0.08	-0.10	-0.13	-0.09	0.14	-0.07	-0.12	0.40	-0.11	-0.15	**-0.42**
CEFF5	-0.06	-0.09	-0.15	-0.12	0.16	-0.09	-0.11	0.39	-0.10	-0.13	**-0.43**
OREW2	0.03	0.03	**0.88**	0.11	0.01	0.28	0.04	0.01	0.09	0.10	0.14
OREW3	0.07	0.00	**0.91**	0.06	0.06	0.24	0.06	-0.02	0.12	0.11	0.09
OREW4	0.07	0.05	**0.92**	0.08	0.08	0.20	0.04	-0.01	0.07	0.11	0.11
OREW5	0.07	0.03	**0.89**	-0.05	-0.01	0.13	0.01	0.10	0.04	0.11	0.01
IMAG1	0.13	0.21	0.37	-0.08	-0.05	**0.69**	0.09	0.03	-0.11	0.18	0.07
IMAG2	0.03	0.03	0.19	0.00	0.18	**0.82**	0.03	-0.01	0.25	0.10	0.05
IMAG3	0.12	0.22	0.26	0.04	-0.07	**0.78**	0.13	-0.02	-0.09	0.18	0.04
IMAG4	0.07	0.15	0.24	0.01	-0.08	**0.86**	0.04	0.02	-0.04	0.13	0.07
RECP2	0.19	0.16	0.13	0.10	-0.08	0.10	-0.03	0.15	0.33	**0.71**	0.15
RECP3	-0.01	0.09	0.21	0.03	0.02	0.21	0.02	0.03	0.01	**0.87**	0.02
RECP4	0.10	0.01	0.13	0.07	0.01	0.18	-0.02	0.11	0.07	**0.88**	0.04
KSEF1	0.16	0.21	0.01	**0.87**	-0.11	-0.04	0.10	0.04	0.02	0.00	0.09
KSEF2	0.10	0.19	0.01	**0.89**	-0.11	0.03	0.11	0.07	0.08	0.07	0.15
KSEF3	0.06	0.09	0.07	**0.92**	-0.13	0.04	0.08	0.04	0.05	0.09	0.12
KSEF4	0.03	0.11	0.05	**0.91**	-0.11	-0.03	0.06	0.04	0.03	0.04	0.11
EHLP1	0.15	**0.82**	-0.02	0.16	-0.24	0.16	0.03	0.18	0.08	0.11	0.15
EHLP2	0.18	**0.86**	-0.02	0.18	-0.27	0.14	0.04	0.11	0.12	0.08	0.12
EHLP3	0.22	**0.84**	0.08	0.14	-0.26	0.15	0.04	0.04	0.12	0.03	0.08
EHLP4	0.16	**0.81**	0.08	0.24	-0.27	0.15	0.08	0.02	0.07	0.05	0.08
GTRU1	0.37	0.00	0.20	0.05	-0.11	-0.01	0.25	0.18	**0.58**	0.09	0.11
GTRU2	0.23	0.16	0.09	0.00	-0.15	-0.02	0.18	0.12	**0.74**	0.17	-0.06
GTRU3	0.29	0.19	0.07	0.10	-0.06	0.08	0.19	0.09	**0.79**	0.08	0.04
GTRU4	0.31	0.01	0.05	0.09	-0.08	-0.05	0.37	0.17	**0.63**	0.02	0.02
PSNM1	0.36	0.04	0.03	0.14	-0.08	0.11	**0.81**	0.08	0.24	-0.07	0.01
PSNM2	0.35	0.07	0.05	0.18	-0.06	0.10	**0.82**	0.10	0.19	-0.05	0.03
PSNM3	0.42	0.09	0.03	0.08	0.01	0.06	**0.70**	0.20	0.25	0.05	0.09
PSNM4	0.43	0.01	0.09	0.07	0.04	0.09	**0.66**	0.24	0.25	0.08	0.15
IDEN1	**0.80**	0.16	0.10	0.02	-0.15	0.06	0.22	0.11	0.07	0.09	0.12
IDEN2	**0.86**	0.16	0.13	0.05	-0.13	0.03	0.16	0.11	0.13	0.07	0.08
IDEN3	**0.84**	0.15	0.11	0.05	-0.08	0.09	0.19	0.07	0.15	0.04	-0.03
IDEN4	**0.87**	0.16	0.03	0.07	-0.14	0.05	0.19	0.13	0.16	0.06	-0.04
IDEN5	**0.82**	0.04	-0.01	0.06	-0.09	0.07	0.18	0.13	0.27	0.02	0.02
IDEN7	**0.85**	0.10	-0.06	0.17	-0.08	0.06	0.15	0.01	0.15	0.04	0.10
EUSG1	-0.04	-0.03	0.06	0.23	-0.04	0.11	0.13	0.10	0.05	-0.05	**0.82**
EUSG2	0.18	0.38	0.25	0.19	-0.06	0.07	0.04	0.09	0.03	0.23	**0.63**
EUSG3	0.21	0.42	0.21	0.20	-0.10	0.05	0.00	0.08	-0.04	0.17	**0.62**
Eigenvalue	5.70	3.98	3.85	3.76	3.67	2.97	2.87	2.69	2.66	2.41	1.67
Variance explained (%)	13.16	9.27	8.96	8.75	8.54	6.92	6.68	6.27	6.19	5.59	3.88
Cumulative variance (%)	13.16	22.43	31.39	40.14	48.68	55.60	62.28	68.55	74.74	80.33	84.21

Table 6 - Validity of Questions

The questions were tested for validity using factor analysis with principal components analysis and varimax rotation. Convergent validity was assessed by checking loadings to

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see if items within the same construct correlate highly amongst themselves. Discriminant validity was assessed by examining the factor loadings to see if questions loaded more highly on their intended constructs than on other constructs (Cook and Campbell 1979). Loadings of 0.45 to 0.54 are considered fair, 0.55 to 0.62 are considered good, 0.63 to 0.70 are considered very good, and above 0.71 are considered excellent (Comrey 1973).

Factor analysis yielded 11 components with eigenvalues above 1 (see Table 6). These 11 components corresponded to the 11 constructs. Two questions for codification effort (CEFF4 and CEFF5) tapped onto other constructs and were omitted. All other questions had at least good loadings on their intended constructs. After omitting the two questions, the reliability of the codification effort construct improved to 0.91.

5.2 Hypotheses Tests

Studies in information systems (e.g., McKeen et al. 1994; Weill and Olson 1989) and in other disciplines (e.g., Jehn et al. 1999) have used moderated multiple regression to test interaction effects. Moderated multiple regression is a hierarchical procedure that first tests the relationship between independent constructs and the dependent construct, and then tests the relationship between interaction terms and the dependent construct (Sharma et al. 1981; Stone and Hollenbeck 1984). Interaction terms are computed by multiplying two independent constructs. A significant change in explanatory power between the two steps, which can be assessed by looking at the significance of the change in F value, indicates the presence of moderating effects.

In this study, the independent constructs were entered in the first step of regression and the interaction terms were added in the second step. All interaction terms were assessed simultaneously so that their effects could be seen in the context of the overall model (i.e., in the presence of other main and interaction effects). To alleviate possible collinearity problems, the values of all constructs were centered (mean subtracted) during regression (Aiken and West 1991). The R^2 value of 0.52 and adjusted R^2 value of 0.45 (F = 7.72, p < 0.001) indicated that the overall model was more than satisfactory in explaining the

variance in EKR usage by knowledge contributors[6]. The change in R^2 value between the two steps of regression was 0.08 (change in F = 3.23, p < 0.01), indicating that the outcome of the second step (i.e., testing of interaction terms) could be interpreted (see Table 7).

	Standardized Coefficient	Hypothesis Test
Step 1: Main Effects		
Loss of knowledge power (LOKP)	0.05	
Codification effort (CEFF)	-0.07	
Organizational reward (OREW)	0.22**	
Image (IMAG)	-0.05	
Reciprocity (RECP)	0.11	
Knowledge self-efficacy (KSEF)	0.25***	H6 was supported
Enjoyment in helping others (EHLP)	0.43***	H7 was supported
Generalized trust (GTRU)	-0.13	
Pro-sharing norms (PSNM)	0.04	
Identification (IDEN)	0.04	
R^2	0.44	
Adjusted R^2	0.38	
F	10.95***	
Step 2: Interaction Terms		
LOKP*PSNM	-0.11	H1 was not supported
CEFF*GTRU	-0.18*	H2a was supported
CEFF*PSNM	0.01	H2b was not supported
CEFF*IDEN	0.07	H2c was not supported
OREW*PSNM	-0.17	H3a was not supported
OREW*IDEN	0.23**	H3b was not supported
IMAG*PSNM	0.12	H4 was not supported
RECP*PSNM	-0.18*	H5 was supported
R^2	0.52	
Adjusted R^2	0.45	
F	7.72***	
R^2 change	0.08	
F change	3.23**	

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 7 - Results of Hypotheses Tests

Table 7 summarizes the results of hypotheses tests. Loss of knowledge power had no significant relationship with EKR usage even under conditions of weak pro-sharing norms i.e., H1 was not supported. Codification effort had a significant negative relationship with EKR usage under conditions of weak generalized trust but not under

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[6] Falk and Miller (1992) indicate that explanatory power (R^2 value) greater than 10% is acceptable.

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conditions of weak pro-sharing norms and weak identification i.e., H2a was supported but H2b and H2c were not supported. Organizational reward had a significant positive relationship with EKR usage, not under conditions of weak pro-sharing norms but under conditions of strong identification (this was opposite to the prediction of hypothesis H3b) i.e., H3a and H3b were not supported. Image had no significant relationship with EKR usage even under conditions of weak pro-sharing norms. Hence, H4 was not supported. Reciprocity had a significant positive relationship with EKR usage under conditions of weak pro-sharing norms i.e., H5 was supported. Knowledge self-efficacy and enjoyment in helping others had significant positive relationships with EKR usage i.e., H6 and H7 were supported.

The standardized coefficients in Table 7 indicate that, relatively, enjoyment in helping others had the strongest impact on EKR usage by knowledge contributors followed by knowledge self-efficacy and organizational rewards (both directly and moderated by identification). Codification effort moderated by generalized trust and reciprocity moderated by pro-sharing norms had the least impact among the significant determinants of EKR usage by knowledge contributors.

5.3   *Control Variables*

Further analysis was carried out to make sure the significant results were not due to covariation with control variables. Previous literature suggests that gender (Jarvenpaa and Staples 2000), age (Jarvenpaa and Staples 2000), work experience (Constant et al. 1994), and education (Constant et al. 1994) may affect knowledge contribution behavior. EKR user community size may also influence EKR usage. These control variables (age, gender, education, work experience, and community size) were included in a moderated multiple regression model together with the 11 original constructs. Results demonstrated that the significant main effects and interaction terms remained the same as in Table 7. All the control variables did not significantly impact EKR usage. Also, the inclusion of the control variables did not significantly increase the variance explained. Therefore, the results of hypotheses tests (see Table 7) appeared to be stable and independent of control variables.

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6.   Discussion and Implications

Based on our findings, loss of knowledge power did not significantly affect EKR usage by knowledge contributors, not even under conditions of weak pro-sharing norms. This may be due to the fact that knowledge contribution is voluntary in the organizations surveyed in this study. Under such circumstances, knowledge contributors can decide what to contribute to EKRs. Hence, they need not fear that their knowledge contribution would render them less valuable to the organization. The respondents of this survey are actively participating in the creation or acquisition of new knowledge in the course of their work. Thus, they can remain valuable to the organization even after contributing knowledge to EKRs. Another plausible explanation for this result is self-selection among the survey respondents. Knowledge contributors who responded to this survey may also be those who are more likely to contribute their knowledge to EKRs. These knowledge contributors may tend to be less concerned about the loss of knowledge power.

The relationship between codification effort and EKR usage by knowledge contributors was contingent on generalized trust. As hypothesized, when generalized trust is strong, codification effort may not be a deterrent for EKR usage by knowledge contributors. However, the relationship between codification effort and EKR usage by knowledge contributors was not contingent on pro-sharing norms and identification. Therefore, even when there are norms of collaboration and cooperation or when the interests of people are aligned with those of the organization, such contextual factors do not impact the relationship between codification effort and EKR usage by knowledge contributors. The existing literature (Ba et al. 2001; Goodman and Darr 1998) has discussed the deterrent effect of codification effort on knowledge contribution. The findings of this study extend the previous literature by revealing that the relationship between codification effort and knowledge contribution to EKRs is salient when generalized trust is weak.

The relationship between organizational reward and EKR usage by knowledge contributors was both direct and contingent on identification. Contrary to hypothesis H3b, this relationship appears to be stronger when identification is strong i.e., when knowledge contributors to EKR share the same interests as the organization, they tend to

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be more motivated by organizational rewards. It appears that if knowledge contributors do not share the interests of the organization, even organizational reward may less motivate them to contribute their knowledge to EKRs. The relationship between organizational reward and EKR usage was not contingent on pro-sharing norms. Several organizations have used organizational reward (Ba et al. 2001; Beer and Nohria 2000; Hall 2001) to build up pro-sharing norms among their employees. Being used to obtaining organizational reward, knowledge contributors may continue to expect such organizational rewards for knowledge contribution to EKRs even after pro-sharing norms have developed. The findings of this study extend prior literature by revealing that the relationship between organizational reward and EKR usage by knowledge contributors is most significant when identification is strong.

Image did not significantly affect EKR usage by knowledge contributors, not even under conditions of weak pro-sharing norms. This may be due to dual effects of pro-sharing norms. On one hand, strong teamwork and collaboration norms may reduce the need for improved image as a motivator for knowledge contribution to EKRs. On the other hand, strong error tolerance and diversity norms may enhance the need for this benefit since risks of making mistakes during contribution are lessened. The converse dual effects may occur when pro-sharing norms are weak. Prior literature suggests that increased recognition by colleagues or the organizational community can be an important motivator for employees to contribute their knowledge (Constant et al. 1994; Hall 2001; Kollock 1999; O'Dell and Grayson 1998). However, our findings suggest that future research may want to further examine the role of pro-sharing norms in relation to image as a motivator for knowledge contribution.

The relationship between reciprocity and EKR usage by knowledge contributors was contingent on pro-sharing norms. As hypothesized, when pro-sharing norms are strong and there is a climate of collaboration and cooperation, knowledge contributors do not look for reciprocity when contributing their knowledge to EKRs. However, when pro-sharing norms are weak, reciprocity benefit is a motivator for knowledge contribution to EKRs. This finding extends prior literature (Connolly and Thorn 1990; Kollock 1999) by

indicating that the relationship between reciprocity and EKR usage by knowledge contributors is significant when pro-sharing norms are weak.

Knowledge self-efficacy significantly impacted EKR usage by knowledge contributors. As hypothesized, when people are confident of their ability to contribute knowledge that would be useful to the organization, they tend to be more motivated to do so through EKRs. This result is consistent with previous KM experiments (Constant et al. 1996) and conceptual articles (Ba et al. 2001). Enjoyment in helping others also significantly affected EKR usage by knowledge contributors. As hypothesized, when people feel good about contributing knowledge to help others, they tend to be more motivated to do so through EKRs. Again, this result is consistent with previous KM conceptual (Ba et al. 2001) and case study literature (Davenport and Prusak 1998) highlighting altruism as a motivator for knowledge sharing.
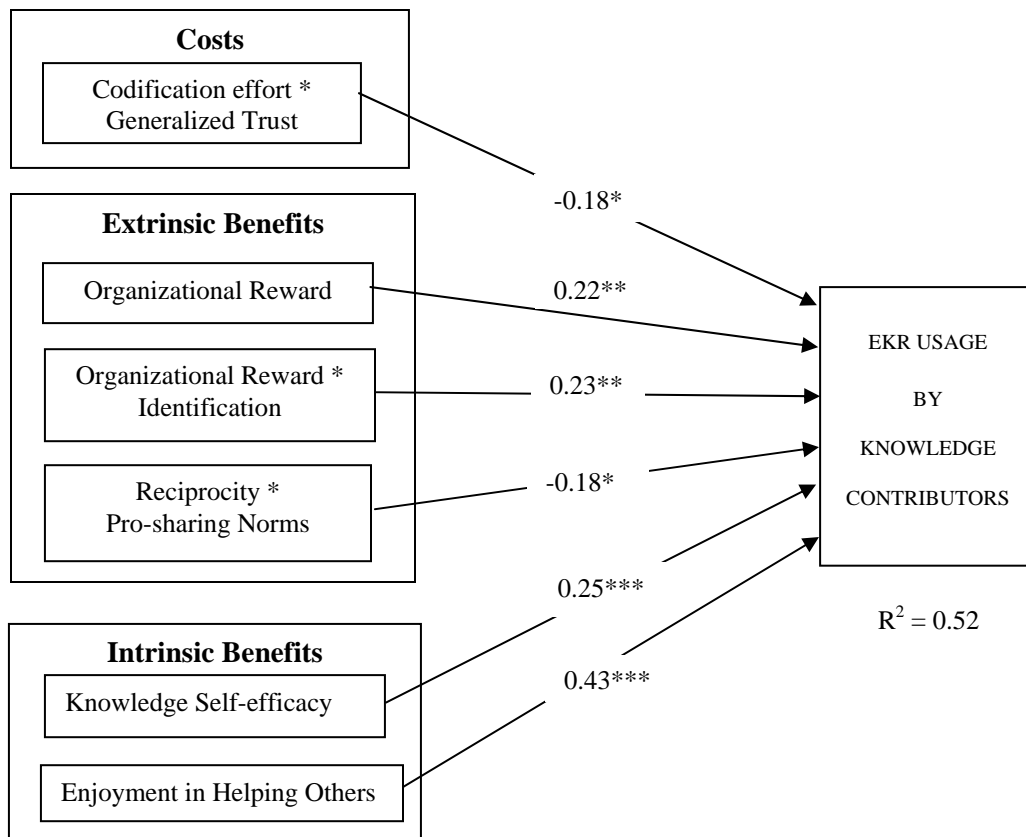
* p < 0.05, ** p < 0.01, ***p < 0.001

Figure 2 - The Revised Research Model

6.1 *Implications for Theory*

This study advances theoretical development in the area of KM in general and EKRs in particular. It demonstrates that cost and benefit factors derived from social exchange theory moderated by contextual factors derived from social capital theory can predict EKR usage by knowledge contributors. Based on the findings of this study, we refine our original research model (see Figure 1) and propose an alternative research model that can better account for EKR usage by knowledge contributors (see Figure 2). The explanatory power of the revised research model demonstrates the value of using social exchange theory and social capital theory to predict usage of collective technologies such as EKRs.

Results of this study shed light on how extrinsic or intrinsic benefits may differ in terms of their impact on EKR usage by knowledge contributors. The impacts of extrinsic benefits (organizational rewards and reciprocity) appear to be moderated by contextual factors (identification and pro-sharing norms, respectively). This indicates that the provision of extrinsic benefits alone may not be adequate motivators of knowledge contribution to EKRs, unless these extrinsic benefits are provided in appropriate contexts. For example, organizational reward seems to work best when identification is strong while reciprocity seems to be most effective when pro-sharing norms are weak. However the effects of intrinsic benefits (knowledge self-efficacy and enjoyment in helping others) appear to be direct. Given that intrinsic benefits are sought as ends desired by people, contextual factors do not play a significant role in influencing the value of these benefits to knowledge contributors. The fostering of intrinsic benefits alone may be sufficient to motivate knowledge contributors to contribute their knowledge to EKRs, in many contexts (different combinations of contextual factors). The impact of cost factors (codification effort) appears to be moderated by contextual factors (generalized trust). This implies that measures to alleviate costs of knowledge contribution to EKRs may only be necessary in specific contexts. For example, it may be useful to reduce codification effort when generalized trust is weak but it may not be necessary to do this when generalized trust is strong. In summary, three contextual factors that have been found to be important are generalized trust, pro-sharing norms, and identification.

Apart from identifying factors that determine EKR usage by knowledge contributors, this study also contributes to theory by unveiling factors that do not appear to impact EKR usage by knowledge contributors. For example, the loss of knowledge power is thought to be a barrier to knowledge contribution. However in our study this is not a significant concern for knowledge contributors to EKR. As another example, image is considered as a motivator for knowledge contribution. However our findings show that knowledge contributors to EKR may not be concerned about the image associated with knowledge contribution. These results suggest that future research should take a closer look at how power and image are perceived by knowledge contributors. Besides identifying the constructs that can or cannot predict EKR usage by knowledge contributors, this study also undertakes a rigorous conceptual and empirical process to develop measures for each of these constructs.

6.2   *Implications for Practice*

Collectively, the results of this study indicate the circumstances under which organizational measures to promote knowledge contribution to EKRs may be more effective. These results offer suggestions to management about how to promote EKR usage by knowledge contributors. First, management can raise the perceptions of knowledge self-efficacy among valued knowledge contributors by indicating to them that their knowledge contribution makes a significant difference to the organization. This can be done by highlighting the improved organizational performance arising from their knowledge contributions. Organizations such as Amazon.com regularly recognize their top reviewers, serving as a way to enhance the self-efficacy of these knowledge contributors.

Second, management can attempt to raise the level of enjoyment that knowledge contributors experience as they help others. This may be done by connecting knowledge contributors and knowledge recipients in order to allow recipients to express their appreciation for the knowledge received. The realization that their colleagues have benefited from their knowledge contribution can increase the feeling of altruism among knowledge contributors (Davenport and Prusak 1998). As a way of motivating

knowledge contributors, knowledge seekers can be rewarded for finding solutions from EKRs and acknowledging the sources of the solutions. The Most Valuable Professionals Program at Microsoft Corporation is an example of an initiative that raises altruism (and community spirit) in this way. Through this program, people who have provided useful technical assistance to other users of Microsoft technology are identified and informed that they have helped others (Microsoft 2002).

Third, organizational reward (such as better work assignment, promotion incentive, salary incentive, bonus incentive, or job security) seems to be effective for encouraging EKR usage by knowledge contributors. Organizations have used various forms of organizational reward to encourage employees to contribute their knowledge to EKRs. For example, IBM Global Services introduced schemes to identify and reward specific instances of knowledge contribution (Berry 2000). Organizational reward appears to be particularly effective under conditions of strong identification. Thus, to build a critical mass of knowledge contributors, management can offer organizational reward and publicize such reward first among employees, groups, or business units whose interests are known to align with those of the organization.

Fourth, management can raise the perceptions of reciprocity benefit among knowledge workers by highlighting situations where requests for help from knowledge contributors have been promptly answered. Valued knowledge contributors can be asked to testify in KM events about how they have also benefited from the knowledge contribution of others in return. Reciprocity appears to be particularly important when pro-sharing norms are weak. Alternatively, management can strengthen pro-sharing norms to reduce the necessity of reciprocity benefit for knowledge contributors to EKR. Organizations have successfully promoted pro-sharing norms through a variety of means. For example, at British Petroleum open office spaces helped employees to more easily consult each other (Chiem 2001). General Electric transfers its employees between departments to promote pro-sharing norms (Dzinkowski 2001).

Last, management can reduce codification effort by deploying KM systems (including EKRs) that facilitate entry of knowledge and thereby reduce the time and effort needed to codify knowledge. Commercially available KM systems provide capabilities that prompt for knowledge and automatically organize the knowledge captured to reduce codification effort. Examples are taxonomy generators, classifiers, and clustering engines available from companies such as Autonomy and Verity. KM systems may be designed to allow more natural forms of knowledge contribution (e.g., audio or video) as opposed to purely text contribution. Besides trying to reduce the time and effort needed to codify knowledge, management can also allocate time for employees to share knowledge by integrating this activity into regular work processes. Such a practice has been common in consultancy firms, like Accenture (Hansen et al. 1999). Codification effort appears to be a salient barrier when generalized trust is weak. Hence, when it is difficult to deploy KM systems that facilitate codification effort, management can raise the level of generalized trust. This can be done by giving due credit for knowledge contribution and ensuring appropriate usage of other's knowledge. Such practices are adhered to in exemplar KM organizations such as Buckman Laboratories (Buckman 2004).

The fact that enjoyment in helping others is the most important motivator for contributors to EKRs followed by knowledge self-efficacy and organizational rewards (both directly and moderated by identification) implies a priority for the managerial recommendations outlined above. For example, measures to increase enjoyment in helping others may be more effective in terms of encouraging EKR contributors than organizational rewards and therefore should be given higher priority. Similarly, the measures to increase reciprocity benefits and reduce codification effort may be of lower priority in motivating contributions to EKRs.

6.3   Limitations and Future Studies

Results of this study must be interpreted in the context of its limitations. First, the use of cross-sectional data and regression analysis do not allow the possibility of bi-directional (feedback) effects to be explored. For instance, the effects of EKR usage on subsequent perceptions of cost and benefit factors by knowledge contributors has been recognized

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but cannot be examined. Future studies can collect longitudinal data to assess such bi-directional (feedback) effects.

Second, based on a sample of 150 respondents, several significant results have been obtained. However, a larger sample that brings more statistical power would have allowed more sophisticated statistical analysis. With such samples, future studies can test a second-order model using structural equation modeling techniques. Cost and benefit can be modeled as second-order constructs with the various cost and benefit factors as formative indicators. Such a model would allow a more rigorous test of the constructs from social exchange theory.

Third, our research model was empirically tested based on the responses of knowledge contributors from 10 public organizations in Singapore. Since the manner of operation and culture of public and private (for-profit) organizations in Singapore is not substantially different, the results of our study are potentially generalizable to private organizations with KM initiatives. However caution must be exercised when attempting to generalize the results across a range of organizations operating in varied contexts. Future studies can replicate this study using our revised research model (see Figure 2) in other contexts. For example, a similar research approach can be used to investigate EKR usage by knowledge seekers. Other forms of KM systems (such as those supporting the personalization strategy) can also be studied in a similar way. In addition, our revised research model can be tested with respondents from different organizational settings to assess the external validity of the results.

Fourth, future research can extend our revised theoretical model (see Figure 2) to account for the remaining unexplained variance in EKR usage by knowledge contributors. To extend the revised theoretical model, additional theoretical perspectives such as the technology acceptance model (Davis 1989) and the task-technology fit model (Goodhue and Thompson 1995) may be incorporated. The technology acceptance model can help to better account for the ease of use and usefulness of EKRs. The task-technology fit model can help to better explain the effects of knowledge type on knowledge contribution to

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EKRs. Additionally, the use of concepts from the organizational memory information systems literature (e.g., Stein and Zwass 1995) may enable researchers to investigate specific sub-systems of EKRs as well as the KM activities associated with these sub-systems.

7. Conclusion

This study develops and tests a theoretical model that explains how cost and benefit factors can impact EKR usage by knowledge contributors, and the contexts under which these effects may operate. By encompassing individual level (cost and benefit) factors and community level (contextual) factors, this model has improved explanatory power as compared to previous studies. In a broader sense, this study demonstrates the value of using social exchange theory and social capital theory to account for the usage of collective technologies (which include EKRs as well as other KM systems). Besides contributing to theory building in the area of KM in general and EKRs in particular, the results of this study offer useful implications to KM practitioners.

In a future characterized by volatile environments, effective leverage of organizational knowledge would be a factor differentiating more successful from less successful organizations. As a step towards facilitating knowledge leverage, knowledge contributions to EKRs need to be encouraged. As organizations invest more resources in KM initiatives, it is imperative that research on KM initiatives and KM systems, such as this study, continue to generate findings that inform practice.

8. References

Adler, P. S. (2001). "Market, Hierarchy, and Trust: The Knowledge Economy and the Future of Capitalism." *Organization Science* **12**(2): 215-234.

Agarwal, R. (2000). Individual Acceptance of Information Technologies. *Framing the domains of IT management: Projecting the future through the past.* R. W. Zmud (Ed.) Cincinnati, Ohio, Pinnaflex: 85-104.

Aiken, L. S., and West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park, CA, Sage.

Alavi, M. (2000). Managing organizational knowledge. In R. W. Zmud (Ed.), *Framing the domains of IT management* (pp. 15-28). Cincinnati, OH: Pinnaflex Education Resources.

Alavi, M., and Leidner, D. E. (1999). "Knowledge Management Systems: Issues, Challenges and Benefits." *Communications of AIS* **1**: 1-37.

Alavi, M., and Leidner, D. E. (2001). "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues." *MIS Quarterly* **25**(1): 107-136.

APQC (2001). Developing Rewards and Recognition for Knowledge Sharing. http://www.apqc.org/portal/ apqc/ksn/Rewards%20and%20Recognition.pdf?paf_gear_id=contentgearhome&paf_dm=full&pagesel ect=contentitem&docid=106982

Ba, S., Stallaert, J., and Whinston, A. B. (2001). "Research commentary: Introducing a third dimension in information systems design - the case for incentive alignment." *Information Systems Research* **12**(3): 225-239.

Babcock, P. (2004). "Shedding Light on Knowledge Management." *HR Magazine* **49**(5): 46-50.

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, N.J., Prentice-Hall.

Baumeister, R.F. (1982) "A Self-Presentational View of Social Phenomena," *Psychological Bulletin* **91**(1): 3-26.

Beer, M., and Nohria, N. (2000). "Cracking the Code of Change." *Harvard Business Review* **78**(3): 133-141.

Berry, J. (2000). Employees Cash In On KM -- Knowledge management programs pay rewards to share ideas. *Internetweek*. **814:** 45-46.

Blau, P. M. (1964). *Exchange and Power in Social Life*. New York, J. Wiley.

Bock, G. W., and Kim, Y. G. (2002). "Breaking the Myths of Rewards: An Exploratory Study of Attitudes about Knowledge Sharing." *Information Resource Management Journal* **15**(2): 14-21.

Bock, G.W., Kim, Y.G., Lee, J.N., and Zmud, B. (2003). "Determinants of the Individual's Knowledge Sharing Behavior: From The Theory of Reasoned Action Perspective," *Proceedings of Minnesota Symposium on Knowledge Management*.

Brown, J. S., and Duguid, P. (1991). "Organizational Learning and Communities of Practice." *Organization Science* **2**(1): 40-57.

Buckman, R. H. (2004). *Building a knowledge-driven organization*. New York, McGraw Hill.

Cheney, G. (1983). "On the Various and Changing Meanings of Organizational Membership: A Field Study of Organizational Identification." *Communication Monographs* **50**: 342-362.

Chiem, P. X. (2001). "Form Follows Strategy." *Knowledge Management Magazine*. http://www.destinationkm.com/articles/default.asp?ArticleID=369

Cohen, D., and Prusak, L. (2001). *In Good Company: How Social Capital Makes Organizations Work*. Boston, MA, Harvard Business School Press.

Coleman, J. (1990). *Foundations of Social Theory*. Cambridge, MA, Harvard University Press.

Comrey, A.L. (1973). *A first course in factor analysis*, Academic Press, New York, 1973.

Connolly, T., and Thorn, B. K. (1990). Discretionary databases: Theory, data, and implications.

Organizations and communication technology. J. Fulk and C. Steinfield (Eds.) Newbury Park, Sage: 219-233.

Constant, D., Kiesler, S., and Sproull, L. (1994). "What's Mine Is Ours or Is It? A Study of Attitudes about Information Sharing." *Information Systems Research* **5**(4): 400-421.

Constant, D., Sproull, L., and Kiesler, S. (1996). "The kindness of strangers: The usefulness of electronic weak ties for technical advice." *Organization Science* **7**(2): 119-135.

Cook, M., and Campbell, D. T. (1979). *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston, MA, Houghton Mifflin.

Cronbach, L. J. (1951). "Coefficient alpha and the internal structure of tests." *Psychometrika* **16**: 297-334.

Cross, R., and Baird, L. (2000). "Technology is Not Enough: Improving Performance by Building Organizational Memory." *Sloan Management Review* **41**(3): 69.

Davenport, T. H., De Long, D. W., and Beers, M. C. (1998). "Successful Knowledge Management Projects." *Sloan Management Review* **39**(2): 43-57.

Davenport, T. H., and Prusak, L. (1998). *Working knowledge: how organizations manage what they know*. Boston, MA, Harvard Business School Press.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease Of Use, And User Acceptance of Information Technology." *MIS Quarterly* **13**(3): 319-341.

Deci, E. L., and Ryan, R. M. (1980). The Empirical Exploration of Intrinsic Motivational Processes. *Advances in Experimental Social Psychology*. L. Berkowitz (Ed.) New York, Academic Press: 39-80.

Dooley, D. (2001). *Social Research Methods*. Upper Saddle River, NJ, Prentice Hall.

Dzinkowski, R. (2001). "Removing Boundaries to Learning." *Knowledge Management Magazine*. http://www.destinationkm.com/articles/default.asp?ArticleID=240

Falk, R. F., and Miller, N. B. (1992). *A Primer for Soft Modeling*. Akron, Ohio, Univ. of Akron Press.

Fulk, J., Flanagin, A., Kalman, M., Monge, P. R., and Ryan, T. (1996). "Connective and communal public goods in interactive communication systems." *Communication Theory* **6**(1): 60-87.

Goodman, P. S., and Darr, E. D. (1998). "Computer-aided systems and communities: Mechanisms for organizational learning in distributed environments." *MIS Quarterly* **22**(4): 417-440.

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

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

Green, G. I. (1989). "Perceived Importance of Systems Analyst's Job Skills, Roles and Non-Salary Incentives." *MIS Quarterly* **13**(2): 115-133.

Grover, V., and Davenport, T. H. (2001). "General Perspectives on Knowledge Management: Fostering a Research Agenda." *Journal of Management Information Systems* **18**(1): 5-21.

Hall, H. (2001). *Social Exchange for Knowledge Exchange*. International Conference on Managing Knowledge, University of Leicester. http://www.soc.napier.ac.uk/publication/op/getpublication/

publicationid/ 321908

Hansen, M. T., Nohria, N., and Tierney, T. (1999). "What's Your Strategy for Managing Knowledge?" *Harvard Business Review* **77**(2): 106-116.

Hargadon, A. B. (1998). "Firms as Knowledge Brokers: Lessons in Pursuing Continuous Innovation." *California Management Review* **40**(3): 209-227.

Hickson, D. J., Hinings, C. R., Lee, C. A., Schenk, R. E., and Pennings, J. M. (1971). "A Strategic Contingencies Theory of Interorganizational Power." *Administrative Sciences Quarterly* **16**: 216-229.

Igbaria, M., Parasraman, S., and Baroudi, J. J. (1996). "A Motivational Model of Microcomputer Usage." *Journal of Management Information Systems* **13**(1): 127-143.

Jarvenpaa, S. L., and Staples, D. S. (2000). "The use of collaborative electronic media for information sharing: an exploratory study of determinants." *Journal of strategic information systems* **9**(2-3): 129-154.

Jehn, K. A., Northcraft, G. B., and Neale, M. A. (1999). "Why Differences Make a Difference: A Field Study of Diversity, Conflict, and Performance in Workgroups." *Administrative Science Quarterly* **44**: 741-763.

Johnson, W. L., Johnson, A. M., and Heimberg, F. (1999). "A Primary and Second Order Component Analysis of the Organizational Identification Questionnaire." *Educational and Psychological Measurement* **59**(1): 159-170.

Kalman, M. E. (1999). The Effects of Organizational Commitment and Expected Outcomes on the Motivation to Share Discretionary Information in a Collaborative Database: Communication Dilemmas and Other Serious Games. Ph.D. Thesis, Los Angeles, CA, University of Southern California.

Kim, J., and Mueller, C. W. (1981). *Factor Analysis: Statistical Methods and Practical Issues*. CA, Sage.

Kollock, P. (1999). The Economies of Online Cooperation: Gifts and Public Goods in Cyberspace. *Communities in Cyberspace*. M. Smith and P. Kollock (Eds.) New York, Routledge**:** 220-239.

Krebs, D.L. (1975) "Empathy and Altruism," *Journal of Personality and Social Psychology* **32**(6): 1132-1146.

Leonard-Barton, D. (1995). *Wellsprings of Knowledge: Building and Sustaining the Source of Innovation*, HBS Press.

Liebowitz, J., and Beckman, T. (1998). *Knowledge Organizations: What Every Manager Should Know*. Boca Raton, FL, CRC Press.

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

McDermott, R. (1999). "Why Information Technology Inspired but Cannot Deliver Knowledge Management." *California Management Review* **41**(4): 103-117.

McKeen, J. D., Guimaraes, T., and Wetherbe, J. C. (1994). "The Relationship between User Participation and User Satisfaction: An Investigation of Four Contingency Factors." *MIS Quarterly* **18**: 427-451.

McKnight, D. H., Cummings, L. L., and Chervany, N. L. (1998). "Initial Trust Formation in New Organizational Relationships." *Academy of Management Review* **23**(3): 473-490.

Microsoft (2002). Expanded MVP Program Puts Knowledge, Real-life Experience to Work for Microsoft Customers Worldwide. http://www.microsoft.com/presspass/features/2002/Oct02/10-23mvp.asp

Mintzberg, H. (1973). *The Nature of Managerial Work.* New York, Harper & Row.

Mishra, A. K. (1996). Organizational Responses to Crisis: The Centrality of Trust. *Trust in organizations: frontiers of theory and research.* R. M. Kramer and T. R. Tyler (Eds.) Thousand Oaks, CA, Sage: 261-287.

Mistzal, B. A. (1996). *Trust in Modern Societies*. Cambridge, Polity Press.

Molm, L. D. (1997). *Coercive Power in Social Exchange*. NY, Cambridge University Press.

Moore, G. C., and Benbasat, I. (1991). "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation." *Information Systems Research* **2**(3): 173-191.

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

Nunally, J. C. (1978). *Psychometric Theory*. New York, McGraw-Hill.

O'Dell, C., and Grayson, C. J. (1998). "If only we knew what we know: Identification and transfer of internal best practices." *California Management Review* **40**(3): 154-174.

O'Reilly, C., and Chatman, J. (1986). "Organizational Commitment and Psychological Attachment: The Effects of Compliance, Identification, and Internalization on Prosocial Behavior." *Journal of Applied Psychology* **71**(3): 492-499.

Orlikowski, W. J. (1993). "Learning from notes: Organizational issues in groupware implementation." *Information Society* **9**(3): 237-251.

Osterloh, M., and Frey, B. S. (2000). "Motivation, Knowledge Transfer, and Organizational Forms." *Organization Science* **11**(5): 538-550.

Patchen, M. (1970). *Participation, Achievement, and Involvement on the Job*. Englewood Cliffs, NJ, Prentice Hall.

Pfeffer, J. (1992). *Managing with Power: Politics and Influence in Organizations*. Boston, MA, Harvard Business School Press.

Putnam, R. D. (1993). "The Prosperous Community." *The American Prospect* **4**(13). http://www.prospect.org/print/V4/13/putnam-r.html

Rheingold, H. (2000). *The virtual community: homesteading on the electronic frontier*. Cambridge, MA, MIT Press.

Ruggles, R. (1998). "The State of the Notion: Knowledge Management in Practice." *California Management Review* **40**(3): 80-89.

Ruppel, C.P., and Harrington, S.J. (2001) "Spreading Knowledge through Intranets: An Analysis of the Organizational Culture Leading to Intranet Adoption and Use." *IEEE Transactions on Professional Communications* **44**(1): 37-52.

Schultze, U., and Leidner, D.E. (2002). *"*Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions." *MIS Quarterly* **26**(3): 213-242.

Sharma, S., Durand, R. M., and Gur Arie, O. (1981). "Identification and Analysis of Moderator Variables." *Journal of Marketing Research* **18**: 291-300.

Smith, D. H. (1981). "Altruism, Volunteers, and Volunteerism." *Journal of Voluntary Action Research* **10**(1): 21-36.

Starbuck, W. H. (1992). "Learning by Knowledge-Intensive Firms." *Journal of Management Studies* **29**(6): 713-740.

Stein, E. W., and Zwass, V. (1995). "Actualizing Organizational Memory with Information Systems." *Information Systems Research*, **6**(2): 85-117.

Stone, E. F. (1978). *Research Methods in Organizational Behavior*. Santa Monica, CA, Goodyear.

Stone, E. F., and Hollenbeck, J. R. (1984). "Some Issues Associated with the Use of Moderated Regression." *Organizational Behavior and Human Performance* **34**: 195-213.

Thibaut, J. W., and Kelley, H. H. (1986). *The Social Psychology of Groups*. New Brunswick, Transaction Books.

Tsai, W., and Ghoshal, S. (1998). "Social Capital and Value Creation." *Academy of Management Journal* **41**(4): 464-476.

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

Venkatesh, V., and Davis, F. D. (2000). "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." *Management Science* **46**(2): 186-204.

Wasko, M. M., and Faraj, S. (2000). ""It is what one does": why people participate and help others in electronic communities of practice." *The Journal of Strategic Information Systems* **9**(2-3): 155-173.

Wasko, M. M., and Faraj, S. (2003). "Why Should I Share? Examining Knowledge Contribution in Networks of Practice." *Proceedings of Minnesota Symposium on Knowledge Management*.

Weill, P., and Olson, M. H. (1989). "An Assessment of the Contingency Theory of Management Information Systems." *Journal of Management Information Systems* **6**: 59-85.

Williamson, O. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. New York, Free Press.

Yamagishi, T., and Cook, K. S. (1993). "Generalized Exchange and Social Dilemmas." *Social Psychology Quarterly* **56**: 235-248.

Zack, M. H. (1999). "Managing codified knowledge." *Sloan Management Review* **40**(4): 45-58.

9. Appendix

Construct	Item Wording and Code	Source
Loss of Knowledge Power (LOKP)	• Sharing my knowledge through EKRs makes me lose my unique value in the organization (LOKP1) • Sharing my knowledge through EKRs makes me lose my power base in the organization (LOKP2) • Sharing my knowledge through EKRs makes me lose my knowledge that makes me stand out with respect to others (LOKP3) • Sharing my knowledge through EKRs makes me lose my knowledge that no one else has (LOKP4)	• Developed based on (Thibaut and Kelley 1986) • Developed based on (Orlikowski 1993) • Developed based on (Orlikowski 1993) • Developed based on (Orlikowski 1993)
Codification Effort (CEFF)	• I do not have the time to enter my knowledge into EKRs (CEFF1) • It is laborious to codify my knowledge into EKRs (CEFF2) • The effort is high for me to codify my knowledge into EKRs (CEFF3) • I am worried that if I share my knowledge through EKRs, I will have to spend additional time answering follow up questions (CEFF4) • I am afraid that my submission to EKRs will evoke additional clarifications or requests for assistance (CEFF5)	• Developed based on (Orlikowski 1993) • Developed based on (Orlikowski 1993) • Developed based on (Orlikowski 1993) • Developed based on (Goodman and Darr 1998) • Developed based on (Goodman and Darr 1998)
Organizational reward (OREW)	• It is important to get a better work assignment when I share my knowledge through EKRs (OREW1) • It is important to be promoted when I share my knowledge through EKRs (OREW2) • It is important to get a higher salary when I share my knowledge through EKRs (OREW3) • It is important to get a higher bonus when I share my knowledge through EKRs (OREW4) • It is important to get more job security when I share my knowledge through EKRs (OREW5)	• Adapted from (Kalman 1999) • Developed based on (Hargadon 1998) • Developed based on (Hall 2001) • Developed based on (Hall 2001) • Developed based on (Davenport and Prusak 1998)
Image (IMAG)	• Sharing my knowledge through EKRs improves my image within the organization (IMAG1) • People in the organization who share their knowledge through EKRs have more prestige than those who do not (IMAG2) • Sharing my knowledge through EKRs improves others recognition of me (IMAG3) • When I share my knowledge through EKRs, the people I work with respect me (IMAG4) • When I share my knowledge through EKRs, my superiors praise me (IMAG5)	• Adapted from (Moore and Benbasat 1991) • Adapted from (Moore and Benbasat 1991) • Adapted from (Green 1989) • Adapted from (Kalman 1999) • Adapted from (Kalman 1999)
Reciprocity (RECP)	• When I share my knowledge through EKRs, I believe that I will get an answer for giving an answer (RECP1) • When I share my knowledge through EKRs, I expect somebody to respond when I'm in need (RECP2) • When I contribute knowledge to EKRs, I expect to get back knowledge when I need it (RECP3) • When I share my knowledge through EKRs, I believe that my queries for knowledge will be answered in future (RECP4)	• Developed based on (Wasko and Faraj 2000) • Developed based on (Yamagishi and Cook 1993) • Developed based on feedback from sorters • Developed based on feedback from sorters
Knowledge Self-Efficacy (KSEF)	• I have confidence in my ability to provide knowledge that others in my organization consider valuable (KSEF1) • I have the expertise needed to provide valuable knowledge for my organization (KSEF2) • It doesn't really make any difference whether I add to the knowledge others are likely to share through EKRs (KSEF3) • Most other employees can provide more valuable knowledge than I can (KSEF4)	• Adapted from (Kalman 1999) • Adapted from (Kalman 1999) • Adapted from (Kalman 1999) • Adapted from (Kalman 1999)

Construct	Item Wording and Code	Source
Enjoyment in Helping Others (EHLP)	• I enjoy sharing my knowledge with others through EKRs (EHLP1)	• Developed based on (Wasko and Faraj 2000)
	• I enjoy helping others by sharing my knowledge through EKRs (EHLP2)	• Developed based on (Wasko and Faraj 2000)
	• It feels good to help someone else by sharing my knowledge through EKRs (EHLP3)	• Developed based on (Wasko and Faraj 2000)
	• Sharing my knowledge with others through EKRs gives me pleasure (EHLP4)	• Developed based on (Wasko and Faraj 2000)
Generalized Trust (GTRU)	• I believe that people in my organization give credit for other's knowledge where it is due (GTRU1)	• Developed based on (Mishra 1996)
	• I believe that people in my organization do not use unauthorized knowledge (GTRU2)	• Developed based on (Mishra 1996)
	• I believe that people in my organization use other's knowledge appropriately (GTRU3)	• Developed based on (Mishra 1996)
	• I believe that people in my organization share the best knowledge that they have (GTRU4)	• Developed based on (Mishra 1996)
Pro-Sharing Norms (PSNM)	• There is a norm of cooperation in my organization (PSNM1)	• Developed based on (Goodman and Darr 1998)
	• There is a norm of collaboration in my organization (PSNM2)	• Developed based on (Goodman and Darr 1998)
	• There is a norm of teamwork in my organization (PSNM3)	• Developed based on (Starbuck 1992)
	• There is a willingness to value and respond to diversity in my organization (PSNM4)	• Developed based on (Leonard-Barton 1995)
	• There is a norm of openness to conflicting views in my organization (PSNM5)	• Developed based on (Leonard-Barton 1995)
	• There is a norm of tolerance of mistakes in my organization (PSNM6)	• Developed based on (Leonard-Barton 1995)
Identification (IDEN)	• I am glad I chose to work for this organization rather than another company (IDEN1)	• Adapted from (Cheney 1983)
	• I talk of this organization to my friends as a great company to work for (IDEN2)	• Adapted from (Cheney 1983)
	• I am willing to put in a great deal of effort beyond that normally expected to help my organization to be successful (IDEN3)	• Adapted from (Cheney 1983)
	• I find that my values and my organization's values are very similar (IDEN4)	• Adapted from (Cheney 1983)
	• In general the people employed by my organization are working toward the same goal (IDEN5)	• Adapted from (Cheney 1983)
	• I find it easy to identify myself with my organization (IDEN6)	• Adapted from (Cheney 1983)
	• I feel that my organization cares about me (IDEN7)	• Adapted from (Cheney 1983)
	• I feel a sense of belonging towards my organization (IDEN8)	• Adapted from (Cheney 1983)
	• I am proud to be an employee of this organization (IDEN9)	• Adapted from (Cheney 1983)
EKR Usage (EUSG)	• What is your frequency of usage of EKRs to contribute knowledge? (EUSG1)	• Adapted from (Igbaria et al. 1996)
	• I often use EKRs to contribute my knowledge in my work. (EUSG2)	• Adapted from (Davis 1989)
	• I regularly use EKRs to contribute my knowledge in my work. (EUSG3)	• Adapted from (Davis 1989)