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Would You Share? Examining How Knowledge Type and Communication Channel Influence Knowledge Sharing

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ABSTRACT

Due to recent advances in computer-mediated communication technologies, individuals are able to communicate through a variety of channels to exchange knowledge. This paper extends prior research to include a comparison of knowledge exchange through face-to-face and computer-mediated communication environments (e-mail, electronic community, and electronic knowledge repository) for different knowledge types (computer program and expertise). Using social exchange theory, hypotheses are proposed based on the degree of an individual's expectations of reciprocity and how this influences an individual's knowledge sharing decision. Using vignettes adapted from prior empirical research, this study determines whether individuals adjust their knowledge sharing behaviors based on the different types of knowledge and the communication channel used. Results suggest that electronic knowledge repository and face-to-face are the preferred environments for sharing expertise and electronic knowledge repositories are preferred for sharing a computer program.

Keywords: Knowledge exchange, Knowledge type, CMC, Vignette, Virtual community, Reciprocity

INTRODUCTION

Advances in information and communication technologies have created new avenues of communication for workers to interact and share knowledge. Organizations are increasingly investing in e-mail, electronic communities, and electronic knowledge repositories to help workers reach beyond the traditional face-to-face (F2F) environments to support intra-organizational knowledge sharing. These technologies enable knowledge sharing regardless of location and personal interaction history (Constant, Sproull and Kiesler, 1996; Rice, King, Malhotra, Ba and Majchrzak, 2000). Consequently, these computer-mediated communication technologies (CMC) present new areas of research into the knowledge sharing field.

Knowledge sharing occurs when an information possessor willingly provides knowledge to an information seeker when requested (Constant, Kiesler and Sproull, 1994; Jarvenpaa and Staples, 2001). Prior research suggests that workers engage in knowledge sharing for several reasons. An individual shares based on individual motivations (Wasko and Faraj, 2005), potential benefits or rewards (Kankanhalli, Tan and Wei, 2005), costs of contribution (Thorn and Connolly, 1987), perceptions of ownership and knowledge type (Constant, et al., 1994; Jarvenpaa and Staples, 2001), trust (Jarvenpaa, Shaw and Staples, 2004; Nicolaou and McKnight, 2006), and relational ties (Constant, et al., 1996; Levin, Whitener and Cross, 2006). Yet research examining the combination of knowledge type and the specific communication channel, and how this combination impacts an individual's decision to share knowledge has not been fully examined.

Research on knowledge sharing has been extensive in F2F environments (Constant, et al., 1994); however, considerably less is known about how CMC influences the how and why individuals share knowledge. Consequently, the research question guiding this study examines the likelihood of individuals to engage in knowledge sharing when expectations about reciprocity underlying the exchange are less defined. CMC environments present new challenges to knowledge workers because as CMC extends the potential "reach" between a knowledge seeker and source, the environment potentially reduces the "richness" of the exchange relationship, introducing a factor of the unknown to the exchange (Chiu, Hsu and Wang, 2006; Constant, et al., 1996; Daft, Lengel and Trevino, 1987). As opposed to F2F environments, CMCs often do not possess assurances of direct reciprocal behavior from the original information seeker (Constant, et al., 1996). As a result, different costs and benefits may be obtained when individuals share in different exchange environments. For instance, an individual that provides knowledge to a seeker in an electronic community does not necessarily expect to receive a reciprocal exchange from the seeker; rather an expectation of a generalized reciprocation is expected (Wasko and Faraj, 2005).

In addition, F2F and CMC environments differ in terms of the costs associated with sharing. F2F communications are considered the "richest" form of communication, due to their ability to convey multiple cues, immediate feedback, personalization and language variety, which lessens the likelihood of knowledge being misunderstood (Daft, et al., 1987). CMCs are "leaner" forms of communication, which may impose additional costs to the information provider for engaging in knowledge sharing (Daft and Lengel, 1986; Daft, et al., 1987). Furthermore, the codification of knowledge into a tangible form for easy transferability can be difficult and time-consuming – especially for knowledge that is more tacit (Nonaka and Takeuchi, 1995). In addition to codifying the knowledge, an individual engaging in knowledge sharing via CMC may perceive greater risks associated with the exchange (Nicolaou and McKnight, 2006).

The purpose of this study is to examine an individual's likelihood of engaging in knowledge sharing under different exchange environments (F2F and CMC) with different types of knowledge (expertise and information). Using social exchange theory as a foundation, the next section develops a research framework for knowledge sharing in F2F and CMC environments and suggests that different costs/benefits are associated with each type of exchange. Hypotheses are proposed based upon the combination of the communication channel and type of knowledge being shared to minimize costs and maximize benefits. A case-based vignette methodology, adapted from Constant et al. (1994), is used with data gathered from sixty-one MBA students. The paper concludes with a discussion of limitations and future directions of research and the contributions of this study.

KNOWLEDGE SHARING AS SOCIAL EXCHANGE

Social exchange theory provides a theoretical approach for examining knowledge sharing. Social exchange theory focuses on describing socially related behaviors as a form of economic exchange, such as why an individual shares knowledge with another (Blau, 1964). Exchange occurs when at least two individuals are involved - an information seeker and an information provider (Constant, et al., 1994). The information seeker requests knowledge from a specific individual (the information provider), or requests knowledge from a group of individuals in the hope that someone will respond with the needed knowledge. The information provider then shares this knowledge with the seeker in exchange for a future benefit/reward to be given either by the original information seeker or another member of the group in which the exchange has occurred (Constant, et al., 1996).

Blau (1964) suggests that social exchange explains how human behaviors are different than traditional economic exchanges (Kankanhalli, et al., 2005). Specifically, social exchange behaviors can be found when obligations of exchange are not clearly defined, making it difficult to attribute economic value (Kankanhalli, et al., 2005). Social exchange assumes the expectation of a long-term relationship of reciprocal exchanges rather than a single exchange transaction (Kankanhalli, et al., 2005). Thus, reciprocal behavior is a central tenet of social exchange theory and should influence an individual's decision to engage in knowledge sharing. Table 1 depicts the research framework guiding the development of the hypotheses for this study.

Communication Channel	Knowledge Type: Computer Program	Knowledge Type: Expertise
Face-to-face	Reciprocity: Highest (Direct-Interpersonal) Costs: Mixed (High Reputation/Low Codification Time) Benefits: Low (Reputation/Audience Exposure)	Reciprocity: Highest (Direct-Interpersonal) Costs: High (Reputation/Codification Time) Benefits: High (Reputation/Audience Exposure)
E-mail	Reciprocity: High (Direct-Interpersonal) Costs: Low (Reputation/Codification Time) Benefits: Low (Reputation/Audience Exposure)	Reciprocity: High (Direct-Interpersonal) Costs: High (Reputation/Codification Time) Benefits: Mixed (High Reputation/Low Audience Exposure)
Electronic Community	Reciprocity: Medium (Indirect-Generalized) Costs: Low (Reputation/Codification Time) Benefits: Low (Reputation/Audience Exposure)	Reciprocity: Medium (Indirect-Generalized) Costs: High (Reputation/Codification Time) Benefits: High (Reputation/Audience Exposure)
Electronic Knowledge Repository	Reciprocity: None (No Reciprocity) Costs: Low (Reputation/Codification Time) Benefits: Low (Reputation/Audience Exposure)	Reciprocity: None (No Reciprocity) Costs: High (Reputation/Codification Time) Benefits: High (Reputation/Audience Exposure)

Table 1. Research Framework

In both CMC and F2F, the expectation of reciprocity is essential for knowledge sharing (Wasko and Faraj, 2005); however, electronic forms of sharing vary from the traditional settings. F2F exchanges are facilitated by interpersonal relationships, which create and enforce social norms and expectations of direct reciprocity. While CMC environments can be classified into three main forms of reciprocity expectations: direct-interpersonal, indirect-generalized, and no reciprocity. Direct-interpersonal reciprocal environments are those in which an individual exchanges knowledge directly with a specific individual, such as e-mail (Constant, et al., 1994; Constant, et al., 1996). In these environments, the information possessor expects a reciprocal exchange to be made by the information seeker at a future date. E-mail can also be considered an indirect-generalized form of exchange when an information requestor submits a request via an e-mail listserv or electronic community (e.g., Constant et al., 1996). Indirect-generalized environments are those in which an individual seeks knowledge within a community or group-based environment from an unknown individual (Wasko and Faraj, 2000). Additionally, an environment can allow individuals to share knowledge not with an individual or group of individuals, but an electronic knowledge repository (EKR) or similar structure that retains the information for unknown individuals to retrieve and use (Kankanhalli, et al., 2005). An EKR is an electronic system that stores and disseminates knowledge to a large population without a direct or indirect expectation of reciprocity.

In addition to expectations of reciprocity, costs of knowledge sharing influence an individual's likelihood of sharing. Prior research has focused on the concepts of knowledge codification, reputation and power loss, loss of unique value, and opportunity costs associated with engaging in knowledge sharing rather than other activities (Kankanhalli, et al., 2005; Thorn and Connolly, 1987). Opportunity costs represent the forgone rewards individuals would receive if an alternative choice was made to providing the knowledge (Thorn and Connolly (1987). Knowledge that is exchanged via CMC is easily transferable to other unknown individuals, which may increase the perceived risks/costs associated with sharing. These findings imply that depending upon the perceived costs associated with contributing a type of knowledge through a certain channel, an individual will have a greater or lesser likelihood of engaging in knowledge sharing.

There are also differential benefits to sharing knowledge in CMC and F2F environments. For example, individuals that choose to share in an electronic community could enhance their reputation within the organization and be seen as an expert in a specific area due to the scope and reach of the communication medium. Direct-interpersonal exchange environments may increase status or reputation with a single individual, while indirect-generalized exchange environments may increase status or reputation within a group of individuals.

Knowledge Type

Knowledge type affects an individual's decision to engage in knowledge sharing (Constant, et al., 1994; Constant, et al., 1996; Jarvenpaa and Staples, 2001; Kankanhalli, et al., 2005). The duality of knowledge type has been classified along several dimensions: explicit/tacit (Hislop, 2002; Nonaka and Takeuchi, 1995) and information as product versus information as expertise (Constant, et al., 1994; Jarvenpaa and Staples, 2001). These classifications distinguish between explicit knowledge, which is considered easily codified, and tacit knowledge, which consists of that which is known but difficult to articulate, making it considerably more difficult to codify and share. Tacit knowledge may take the form of an individual's personal intuitions, experiences, or expertise that is ingrained within the individual and difficult to share with another individual that may not have similar experiences

(Polanyi, 1966). Explicit knowledge is a more declarative form of knowledge in which the knowledge can be shared with minimal explanation. Collectively, this suggests that the costs of codifying different types of knowledge may influence an individual's knowledge sharing decision.

Prior empirical research used a computer program to represent explicit knowledge because it codifies the knowledge used to produce a specified outcome and presented the user with a pre-packaged set of rules and inputs to process (e.g., Constant et al., 1994). Similarly, we used a computer program created by the subject to represent explicit knowledge. For example, sharing a computer program may be less costly to exchange since the program is already codified, requires little additional explanation, and is easily transferable to another individual. Providing expertise to another individual has higher costs due to codification time, additional explanation requirements, and additional risks associated with sharing advice to others that if perceived negatively would result in reputation loss. Computer expertise represents difficult to codify knowledge that is more costly to share. Prior empirical research used computer expertise to represent tacit knowledge that is embedded within the individual and is difficult to share (e.g., Constant et al., 1994). Additionally, individuals may feel that contributing advice reduces their unique value which increases their personal costs.

HYPOTHESES

Based on prior literature, hypotheses are developed concerning the interaction of knowledge type and exchange environment. Expertise can be considered a more tacit form of knowledge where an information possessor wishing to share must absorb costs to codify the knowledge prior to transmission through electronic means. Expertise sharing can also have considerably larger rewards than explicit knowledge because expertise represents one's experiences and intuitions about a subject, increasing the potential benefits to an individual's reputation if a positive outcome arises (Thorn and Connolly, 1987; Zand, 1972). F2F environments provide an individual with the ability to judge whether the information seeker understands the expertise or requires further explanation to ensure a positive outcome. Thus, an individual wishing to share expertise should be more likely to want to share in F2F environments where the costs of codification are lower and expectations of reciprocity are more direct than in CMC environments with less direct recognition for one's contribution. Therefore,

H1: An individual is more likely to share expertise via face-to-face.

Kankanhalli et al. (2005) suggest that individuals consider the codification time and potential opportunity costs with their decision to share knowledge in one environment over another. CMC environments can be composed of unknown individuals or groups, which potentially increase the risks for an individual to share expertise. Additionally, since expertise is a tacit form of knowledge (Polanyi, 1966), the codification time required to ensure the expertise is not misunderstood and/or misused is higher due to a CMC's "leaner" communication medium (Daft and Lengel, 1986). Conversely, explicit knowledge can be easily shared via "leaner" communication mediums and potentially increases the reputation benefits gained through sharing with larger audiences in a CMC environment. This would suggest that when choosing to engage in knowledge sharing, an individual would choose to share explicit knowledge in a CMC environment. Thus,

H2: An individual is more likely to share a computer program in a CMC environment.

There are several forms of reciprocity in different exchange relationships: direct, indirect, and no reciprocity. Based on codification time and costs of the varying knowledge types, an individual should be more likely to invest in such activity when a stronger degree of reciprocity is present (Constant, et al., 1996; Kankanhalli, et al., 2005). Based on the three types of reciprocal exchange discussed earlier, when an individual can identify a specific individual who will reciprocate, the individual will choose to share knowledge because of the reward opportunity (Chiu, et al., 2006). For example, Chiu et al. (2006) found that a norm of reciprocity increased the likelihood of an individual sharing knowledge. Therefore,

H3: An individual is more likely to share both types of knowledge when there is a greater likelihood of direct reciprocity.

Reputation benefits are likely to accrue as the scope of interactions with others increases. Contributing to an electronic community or EKR increases an individual's ability to appeal to a wider audience which enhances an individual's status and reputation. For example, research has consistently suggested that reputation exerts a powerful social influence on individual behavior in electronic communities which have been described as a "gift" culture where status is determined not by what you have but what you give away (Mauss, 1950; Raymond, 1999). In electronic communities, individuals gain status by posting messages frequently and thoughtfully (Lakhani and

von Hippel, 2003). Since sharing knowledge electronically incurs the same costs of codification, regardless if it is shared with one person or thousands of people, CMC channels such as electronic communities and EKRs expand the scope of the potential audience, increasing an individual's reputation and status. Thus,

> *H4: When communicating electronically, an individual is more likely to contribute both types of knowledge through electronic channels that offer the greatest benefits to reputation.*

METHODOLOGY

We conducted an experiment using a series of vignettes adapted from Constant el al. (1994) to examine the research hypotheses. A case-based vignette design allows the researchers to manipulate specific contextual variables while controlling for external sources of influence. The experiment uses a within-subjects design where subjects were given a series of vignettes based on knowledge type (computer program and expertise) and exchange environment (F2F, e-mail, electronic community, and EKR) to determine individual knowledge sharing behavior. The case-based vignettes used a 7-point Likert scale ranging from Very Unlikely to Very Likely with a mid-point of Neither Likely nor Unlikely to assess knowledge sharing behavior.

The subjects assumed they possessed the relevant knowledge needed by an information seeker and indicated their likelihood of sharing. Subjects were asked to assume the role of a computer programmer and were provided with pre-specified background information consisting of the development of a computer program or attending an advanced programming course. Subjects were then presented a series of manipulations for sharing based on knowledge type and communication channel. Each communication channel incorporated the type of reciprocity expected. All of the theoretical constructs and measures are included in appendix A, which contains our survey instrument. We collected demographic data on age, work experience, and a propensity to share measure adapted from Jarvenpaa et al. (1998). We also included perceptions about the extent to which students felt that they would have to engage in ongoing support if they did contribute knowledge – assuming that individuals would be less likely to share should they perceive additional ongoing support costs.

Sixty-one MBA students enrolled in a graduate information technology course at a large southeastern university participated in the study. The subjects in this study had a mean age and work experience of 24.78 and 3.8 years, respectively. Student-based experiments have drawn criticism due to the concern for generalizability (Chowdhury, 2005). However, prior literature suggests the use of students is acceptable when studying behavioral phenomenon because students exhibit general attitudes found in society (Kruglanski, 1975). Furthermore, MBA students are traditionally employed full-time and generally participate in the activities in this study in their work environments. The unit of analysis is the individual level. The hypotheses were assessed using repeated measures ANOVAs to test the relationships between knowledge type and exchange environment on knowledge sharing. Repeated measures ANOVA examines the equality of means when all subjects are measured under a number of different manipulations.

RESULTS

A factor analysis using Varimax rotation (Table 2) was performed to determine convergent validity on the propensity to share items which loaded appropriately. However, the reliability of this construct was 0.515 indicating poor reliability; thus propensity to share was included in the analysis as single-item measures. Furthermore, we included the exchange environment variables to investigate if these items represented higher-order constructs reflecting how individuals perceive knowledge sharing through different media.

	1	2	3	4	5
Propensity to Share 1	0.683				
Propensity to Share 2	0.725				
Propensity to Share 3	0.631				
Info Share F2F		0.659			
Info Share E-mail		0.828			
Info Share EC		0.629	0.490		
Info Share EKR			0.878		
Exp Share EKR			0.775		
Exp Share F2F				0.841	
Exp Share E-mail				0.823	
Exp Share EC		0.437		0.635	
Exp Share Extent Support					0.852
Info Share Extent Support					0.880

Table 2. Factor Analysis with Varimax Rotation

The results of the factor analysis suggest that subjects perceived the environments in terms of information (computer program) and expertise sharing for both e-mail and F2F environments (Direct-Interpersonal) and somewhat reasonably for the electronic community (Indirect-Generalized). However, subjects perceived the EKR environment (No Reciprocity) as a distinct environment irrespective of knowledge type. Based on our theoretical perspective, all environments except EKR possessed some form of reciprocal behavior which may explain why EKR was seen as a distinct, no reciprocity environment. Descriptive statistics and bivariate correlations are provided in Table 3. Strong correlations were found between F2F and e-mail environments indicating support for the similar categorization of these environments (Direct-Interpersonal). Additionally, strong correlation between computer program and expertise perceived extent to support was found as well as sharing a computer program or expertise in an EKR providing support for their distinct factor classification identified in Table 2.

	Mean	Std. Dev.	Age	Work	P2S1	P2S2	P2S3	Info Share F2F	Info Share E-mail	Info Share EC	Info Share EKR	Info Share Extent Suppor	Exp Share F2F	Exp Share E-mail	Exp Share EC	Exp Share EKR
Age	24.787	4.499														
Work	3.817	4.256	**0.798*****													
P2S1	4.733	1.483	-0.028	-0.160												
P2S2	4.267	1.483	-0.105	-0.024	**0.280***											
P2S3	5.400	1.182	-0.111	-0.139	**0.333****	0.180										
Info Share F2F	4.050	1.751	0.053	0.063	0.025	0.230	0.056									
Info Share E-mail	3.767	1.789	0.197	0.229	0.078	-0.123	-0.027	**0.448*****								
Info Share EC	3.433	1.817	**0.280***	0.088	0.207	-0.062	0.107	**0.281***	**0.564*****							
Info Share EKR	5.467	1.282	0.238	0.160	0.076	0.014	-0.069	0.095	0.167	**0.363****						
Info Share Extent Support	2.733	1.793	0.187	0.221	0.005	-0.005	-0.045	-0.055	0.123	0.161	-0.129					
Exp Share F2F	5.250	1.694	0.073	0.043	-0.169	0.088	-0.169	0.219	0.154	0.157	0.148	-0.061				
Exp Share E-mail	4.800	1.675	0.075	0.070	-0.233	-0.026	-0.216	0.136	**0.312***	0.207	0.076	0.146	**0.723*****			
Exp Share EC	4.200	1.725	0.127	0.066	-0.118	0.052	0.002	**0.350****	**0.400****	**0.368****	0.133	0.083	**0.528*****	**0.618*****		
Exp Share EKR	5.017	1.584	0.205	0.134	0.070	-0.002	-0.050	0.164	**0.376****	**0.381****	**0.592*****	-0.047	**0.330***	**0.435*****	**0.397****	
Exp Share Extent Support	3.103	1.917	0.068	0.133	0.065	0.034	0.181	-0.086	0.149	0.051	0.037	**0.592*****	-0.107	0.027	0.007	-0.066

Table 3. Descriptive Statistics and Correlations (* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001)

Hypothesis 1 was tested using repeated measures ANOVA with covariates of the propensity to share, age, work experience, and perceived extent to support shared expertise. Mauchly's Test of Sphericity yielded an insignificant difference ($p = 0.121$). Pairwise comparisons compared the means across the exchange environments (F2F, e-mail, electronic community, and EKR). The mean comparisons for sharing expertise are reported in Table 4. Significant differences were found for two of the CMC environments compared to F2F partially supporting Hypothesis 1. Individuals were significantly more likely to share expertise in F2F environments ($\overline{x} = 5.250$) than e-mail ($\overline{x} = 4.800$, $p = 0.015$) and electronic communities ($\overline{x} = 4.200$, $p = 0.001$). Interestingly, EKR was not statistically different from F2F environments, suggesting that individuals were just as likely to contribute to an EKR as in F2F environment. However, e-mail was not statistically different from EKR ($p = 0.639$). As suggested earlier, individuals perceived EKRs as a distinct exchange environment compared to the other three communication channels (See Table 2) possibly explaining EKRs placement. Surprisingly, electronic community was significantly different from all environments and possessed the lowest likelihood of an individual sharing expertise.

Expertise			
(I) Environment	(J) Environment	Mean Difference (I-J)	Sig.
F2F	E-mail	0.446	0.015*
	EC	1.071	0.000***
	EKR	0.339	0.184
E-mail	F2F	-0.446	0.015*
	EC	0.625	0.004**
	EKR	-0.107	0.639
EC	F2F	-1.071	0.000***
	E-mail	-0.625	0.004**
	EKR	-0.732	0.005**
EKR	F2F	-0.339	0.184
	E-mail	0.107	0.639
	EC	0.732	0.005**

Table 4. Expertise Sharing Results (* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001)

Hypothesis 2 suggested individuals would be more likely to share a computer program in a CMC environment rather than F2F. Mauchly's Test of Sphericity was insignificant (p = 0.113) and the omnibus F test suggested significant differences between environments (p = 0.032). Table 5 presents the pairwise comparisons for computer program sharing. Significant differences were found for two of the CMC environments compared to F2F partially supporting Hypothesis 2. EKR ($\overline{x}$ = 5.467, p = 0.000) was significantly more likely to receive a computer program than all other communication channels. Additionally, F2F ($\overline{x}$ = 4.050, p = 0.001) was statistically different from an electronic community ($\overline{x}$ = 3.433, p = 0.035), but not different from e-mail ($\overline{x}$ = 3.767, p = 0.277) suggesting that individuals were more likely to share a computer program F2F than with an electronic community. Thus, partial support was found suggesting a computer program was more likely to be shared via CMC. Interestingly, electronic community was again significantly different from all environments and possessed the lowest likelihood of an individual engaging in knowledge sharing.

Computer Program			
(I) Environment	(J) Environment	Mean Difference (I-J)	Sig.
F2F	E-mail	0.254	0.277
	EC	0.576	0.035*
	EKR	-1.424	0.000***
E-mail	F2F	-0.254	0.277
	EC	0.322	0.136
	EKR	-1.678	0.000***
EC	F2F	-0.576	0.035*
	E-mail	-0.322	0.136
	EKR	-2.000	0.000***
EKR	F2F	1.424	0.000***
	E-mail	1.678	0.000***
	EC	2.000	0.000***

Table 5. Computer Program Sharing Results (* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001)

Hypothesis 3 suggests an individual will be more likely to share either knowledge type based upon the environment's degree of reciprocity. An individual should be more likely to share knowledge in the following order: F2F (Direct-Interpersonal), e-mail (Direct-Interpersonal), electronic community (Indirect-Generalized), and EKR (No Reciprocity). We found partial support for Hypothesis 3. F2F and EKR were more likely to receive expertise indicating mixed support for reciprocity environments. As stated earlier, EKR was found to be a distinct factor compared to the other communication channels (See Table 2) which may provide some explanation for its placement in our findings. It appears that when examining communication channels based on the degree of reciprocity, interpersonal and generalized reciprocity can be compared directly, but not environments that have no expectation of reciprocity. Additionally, an individual was more likely to share expertise in both F2F and e-mail (Direct-Interpersonal) than in an electronic community (Indirect-Generalized), partially supporting the degree of reciprocity hypothesis.

For sharing a computer program, an individual was more likely to share in a no reciprocity environment rather than direct or indirect environment indicating no support for Hypothesis 3. However, individuals were more likely to share a computer program in a direct F2F or e-mail than an indirect environment electronic community providing some support for the degree of reciprocity hypothesis. For sharing expertise, the results partially support individuals followed the reciprocity norms of direct to indirect reciprocity which decreases the likelihood of sharing expertise, but not for no reciprocity environments.

Hypothesis 4 suggested that individuals would be more likely to share in CMC environments, due to the greater opportunity for enhancing reputation regardless of knowledge type. The results of pairwise comparisons are presented in Tables 4 and 5, and suggest that an individual is more likely to share a computer program within an EKR than e-mail or electronic community ($p = 0.001$). However, contrary to expectations, individuals were not significantly more likely to share a computer program when comparing e-mail and electronic community environments ($p = 0.136$).

Individuals were more likely to share expertise via e-mail than via electronic community ($p = 0.004$) and there was no significant difference between email and EKR ($p = 0.639$). Additionally, individuals were more likely to share expertise with an EKR than an electronic community ($p = 0.005$). Thus, Hypothesis 4 received partial support for sharing a computer program and expertise based upon the potential reputation gains.

Limitations and Future Research

All research is not void of limitations. First, vignettes present hypothetical situations in which an individual assesses the likelihood of sharing knowledge with another (Constant et al., 1994). This study specifically selected a subject pool that was likely to experience similar concerns in their work environment, and that was likely to be able to leverage past experiences and views on knowledge sharing. Additionally, we attempted to control for a subject's propensity to share to mitigate individual differences. Future studies may be able to use real-world environments similar to the Constant et al. (1996) design using an action-driven survey to validate this study's results.

In all experimental designs, concerns about common method bias must be addressed (Podsakoff, MacKenzie, Lee and Podsakoff, 2003). The main concern is having subjects responding to both independent and dependent variables during the same point in time. In this experimental setting, the independent variables served as direct manipulations which did not require the collection of values. The case-based vignettes design followed prior literature (e.g., Constant, et al., 1994; Constant, et al., 1996; Jarvenpaa and Staples, 2001) where the independent variable values have been pre-determined and subjects indicated their likelihood of engaging in knowledge sharing. Future studies should assess the individual's perception of the costs and rewards associated with exchanging different knowledge types in different environments in a real-world setting.

Third, the operationalization of knowledge types also potentially limits the generalizability to alternative explicit and tacit knowledge types. This study operationalized knowledge type using a computer program and expertise as measures of explicit and tacit knowledge based on prior empirical research (Constant et al., 1994). However, an argument can be made that a computer program represents a unique type of explicit knowledge and may be difficult to generalize the results of this study to alternative forms of explicit knowledge. Future research should examine alternative examples of explicit and tacit knowledge. Additionally, we operationalized the exchange environments based on empirical literature on knowledge sharing. Future research should examine newer, Web 2.0 environments that have further broadened the knowledge sharing opportunities for workers. Web 2.0 environments such as blogs and wikis that provide an opportunity for collaborative knowledge sharing should also be examined.

Finally, the vignettes portrayed subjects as computer programmers. Constant et al. (1994) suggest that characteristics of the programming job may result in different responses from subjects. Subjects may have an increased perceived value of the costs associated with sharing these knowledge types due to their perspective as information systems professionals. This study used MBA students from a variety of disciplines and holds general knowledge of information systems to minimize this bias. Future research should examine different employment roles and their perception of the costs / benefits of different knowledge types and exchange environments.

CONCLUSIONS

This study represents an initial inquiry into how the combination of different environments and knowledge types impact an individual's decision to share. Several contributions to the exchange literature can be derived.

First, this study extends Constant et al. (1994) by examining different environments beyond F2F that may affect an individual's sharing decision simultaneously. Prior studies have empirically examined knowledge sharing behavior by comparing F2F and one or two CMC environments. This study compared three commonly used CMC environments to F2F. Our findings suggest an individual's knowledge sharing decision may be more complex than prior research has suggested. Our paper asserts that the expectation of reciprocity within different types of environments will play a key role in an individual's decision to participate in knowledge exchange and in what form, low codification-low risk or high codification-high risk knowledge type. The advancement of CMC environments as new avenues for knowledge sharing allows individuals to leverage not only their own knowledge, but the knowledge possessed by others within the organization. This has altered an individual's expectation of reciprocity depending on the exchange environment (Kankanhalli, et al., 2005).

Second, this study extends the current literature on knowledge sharing by identifying what knowledge types are more likely to be shared through different channels. Surprisingly, individuals were more likely to share either knowledge type in an EKR environment and least likely in an electronic community. In general, we found support for the degree of reciprocity influencing knowledge sharing behavior. Interestingly, the subjects of this study viewed e-mail, electronic communities, and F2F environments as similar, but viewed EKR's as a different type of medium. Combined with our theoretical perspective, EKR was the only environment without any expectation of reciprocity which may explain its distinctive difference in comparison with the other environments.

Third, prior research on sharing a computer program or expertise was based on the individual's perception of ownership, while in this study the focus was on the value assessment an individual will place on the computer program or expertise depending on the exchange environment. Expertise was more likely to be shared via F2F than CMC environments. Interestingly, individuals were more likely to share their expertise in an EKR or e-mail within the CMC environments. This suggests that individuals may view EKR and e-mail environments as the greatest potential to expand their reputation within the organization with the least costs. A computer program, which can be easily transmitted via either medium, was more likely to be shared in an EKR environment, but F2F still remained the preferred exchange environment over electronic communities and e-mail. This would suggest that individuals view EKRs and F2F environments as having the largest potential benefits, trading off between expectations of reciprocity and increased reputation.

Finally, the role of risks and rewards associated with engaging in knowledge exchange in different environments suggests that rewards are considered more than risks when sharing knowledge in CMC environments. While each environment examined may be perceived as having differential risks associated with sharing due to the potential audience differences in CMC environments and the individual's concern for personal loss; it appears that the rewards for sharing outweigh their costs. It is possible that awareness of the costs/benefits of sharing knowledge in each of these environments were not salient to the subjects making the knowledge sharing decision. Future research may wish to manipulate these variables to determine whether highly risky or highly beneficial knowledge sharing opportunities may alter an individual's sharing decision.

Based on social exchange theory and the results of this study, we suggest that the introduction of CMC environments presents new areas for researchers examining knowledge sharing decision-making. This study examined an individual's decision to share knowledge with another individual based on the communication channel and knowledge type. Prior research fails to examine how knowledge can be perceived as incurring risks and costs under different environmental contexts, and how that influences an individual's ability to benefit from knowledge sharing. This paper provides an initial step towards examining these dimensions and hopes to provide insight into how to provide an environment that is conducive to knowledge sharing, by asking the question – would you share?

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APPENDIX A

Control Variables:

Age:

How old are you in years?

Work Experience:

How much work experience do you have in years?

Propensity to Share (Adapted from Jarvenpaa et al. (1998))

7-point Likert scale: (Strongly Agree – Agree – Somewhat Agree – Neither Agree nor Disagree – Somewhat Disagree – Disagree – Strongly Disagree)

1. One should be very cautious when sharing knowledge with others.
2. Most individuals share knowledge when they have the needed expertise.
3. Most individuals can be counted on to share knowledge with others.
4. Most individuals share knowledge when asked personally.

Perceived Extent to Support Shared Knowledge:

7-point Likert scale: (To a Very Small Extent – To a Small Extent – To a Somewhat Small Extent – To a Moderate Extent – To a Somewhat Large Extent – To a Large Extent – To a Very Large Extent)

1. To what extent was your decision influenced by a belief that you would have to provide continued support for the software to John or others?
2. To what extent was your decision influenced by a belief that you would have to provide continued support for your expertise to John or others?

Case-Based Vignettes: (Adapted from Constant et al. (1994))

Experiment One: (Information Sharing - Computer Program)

7-point Likert scale: (Very Unlikely – Unlikely – Somewhat Unlikely – Neither Likely nor Unlikely – Somewhat Likely – Likely - Very Likely)

Background. You and John are junior-level computer programmers in a high-tech company. You and John are in the same department and are assigned to the same programming project.

Information Sharing – Face-to-face: *Current Situation.* You have just put 40 hours of work into a particularly difficult computer program to be used in your project. Now, John would love to have a copy of the program for his own work and asks for a copy.

1. What is the likelihood you would give a copy of the program to John?

Information Sharing – E-mail: *Now assume that John is assigned to the same project, but works in another office and asks for a copy via email.*

2. What is the likelihood you would give a copy of the program to John?

Information Sharing – Electronic Community: *Now assume that John is a stranger who has sent a request for this type of program to the organization's online community bulletin board.*

3. What is the likelihood you would give a copy of the program to John?

Information Sharing – Electronic Knowledge Repository: *Now assume that your organization has a knowledge repository system and encourages employees to voluntarily contribute best work practices.*

4. What is the likelihood that you would post a copy of the program to your organization's knowledge management repository system?

Experiment Two: (Expertise Sharing)

7-point Likert scale: (Very Unlikely – Unlikely – Somewhat Unlikely – Neither Likely nor Unlikely – Somewhat Likely – Likely - Very Likely)

Background. On your own initiative, you have spent 40 hours of your own time attending an advanced programming course. You hope this will benefit the quality of your work.

Expertise Sharing – Face-to-face: *Current Situation.* John asks you to review some of his work to see if he used correctly the techniques you learned in the course.

1. What is the likelihood you would share your expertise with John?

Expertise Sharing – E-mail: *Now assume that John is assigned to the same project, but works in another office and asks for your expertise via email.*

2. What is the likelihood you would share your expertise with John?

Expertise Sharing –Electronic Community: *Now assume that John is a stranger who has sent a request for someone to review if he correctly used the programming techniques to the organization's online community bulletin board.*

3. What is the likelihood you would share your expertise with John?

Expertise Sharing – Electronic Knowledge Repository: *Now assume that your organization has a knowledge repository system and encourages employees to voluntarily contribute best work practices.*

4. What is the likelihood that you would share your expertise by posting key insights from the programming course to your organization's knowledge management repository system?