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USING ELECTRONIC MEDIA FOR INFORMATION SHARING ACTIVITIES: A REPLICATION AND EXTENSION

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Abstract

This article reports a replication and extension of a study that explored individual perceptions of factors that underlie the use of electronic media (electronic mail, world-wide-web, list serves, and other collaborative systems). The original study was conducted in a single Australian university. The study was replicated in a Canadian university. The replication allowed testing of the enlarged research model that involves organizational culture variables as well as attitudes toward information policies. Overall, the expanded research model includes culture variables, task and technology related variables, as well as individual attitudes and beliefs. We found that task and technology related variables explained more of the use of electronic media for sharing than culture related variables or the individual attitudes and beliefs. Specifically, task interdependence, perceived information usefulness and the user's computer comfort were most strongly associated with the person's use of electronic media. Two dimensions, employee orientation and need for achievement, of organizational culture had a significant influence on the use of electronic media for information sharing activities although less strongly than the task and technology related variables. Of the individual attitudes and beliefs, attitudes about information policies had a significant influence on the use of electronic media for information sharing activities. Besides the value of replication of a research model in another culture, the study contributed to the information systems literature by developing initial scales for two new constructs: attitudes about information policies and information culture.

1. INTRODUCTION

Over the past several years, the topic of knowledge management has grown rapidly in importance for information systems practitioners. At the heart of organizational knowledge management is an employee's willingness to share information and knowledge assets (Davenport and Prusak 1998). According to Nonaka and Takeuchi (1995), the process of organizational knowledge creation is contingent upon individuals sharing their information, insights, and wisdom with others. Building on the writings of a Nobel economist, Kim and Mauborgne (1998, p. 323) wrote, "Creating and sharing knowledge are intangible activities that can neither be supervised nor forced out of people....Without individual's voluntary will to cooperate, firms cannot effectively build their collective wisdom that is critical to succeed in this knowledge economy." We extend this argument to apply to information assets as well. Individuals create and acquire both information and knowledge assets and the sharing of them remains within the discretion of an individual. Davenport (1995) maintained that volition distinguishes information sharing from involuntary information reporting.

Information technology has enabled information and knowledge flows to become more fluid and abundant within and outside the organizational unit such as a department or a work unit. Internal and external communication now can be almost instantaneous through the use of electronic media. However, few researchers have sought to understand the determinants of information technology use for information sharing (Finholt and Sproull 1990; Constant et al. 1994, 1996). Our goal in conducting this study was to add to the understanding of the use of electronic media for conducting information sharing activities.

We initially developed a research model that incorporated individual attitudes and beliefs and task and technology related variables as antecedents of the use of electronic media. We collected data from one large Australian university to test the model. By use of electronic media, we refer to the use of computer-based systems to accomplish information activities such as accessing, searching, sharing, storing, and publishing information in a computer network. The results of this analysis are reported in a forthcoming paper (Jarvenpaa and Staples 2000). Additional data was then collected from a Canadian university. The original study was carried out in Australia in late 1998 and was replicated in Canada in early 2000. The current paper presents the analysis of both the Australian and Canadian data. By combining the data, we are able to extend the original research model to include organizational culture as a possible determinant of the use of electronic media for information sharing activities, as well as replicate the original study in another organizational setting. Organizational culture is suggested to be an important determinant of information sharing by Ruggles (1998), so it was desirable to include it in our model.

Accordingly, this paper is structured as follows. First, the support for the research model, presented in Figure 1, is described and associated hypotheses are developed. Analysis of this model follows which is done with the combined datasets so that organizational culture can be included (i.e., we could not include organizational culture in our original research model since the data was collected from within one organization / one organizational culture). A subset of the research model is then tested for each dataset (i.e., organizational culture is removed for this analysis). The purpose of doing this is to examine the relationships between the constructs in two separate organizations (i.e., this replicates Jarvenpaa and Staples). The potential influences of gender, work experience, and job type on the hypotheses are then explored via post-hoc analysis. The final section discusses our results.

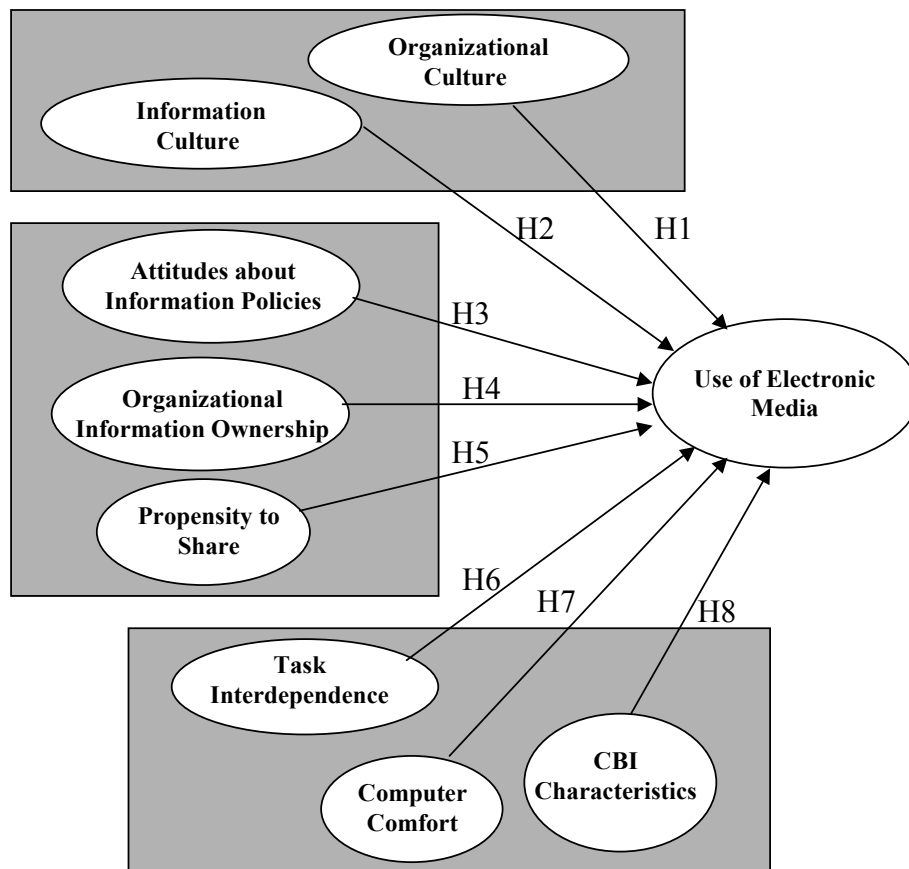


Figure 1. The Research Model

2. DEVELOPMENT OF THE RESEARCH MODEL AND HYPOTHESES

There is a large body of literature on information and knowledge sharing across a number of disciplines. Our reading of the literature suggests that three sets of factors are likely to influence individuals' sharing behaviors in organizations:

1. **Motivating Sharing via Cultural Norms:** Organization and information cultures can promote sharing activities through cultural norms, at the departmental and/or organizational level.
2. **Motivating Sharing via Individually-held Attitudes and Beliefs:** An organization can hire people that hold attitudes and beliefs that influence if an individual will share information.
3. **Motivating Sharing by Needing to Use Technology that Fits the Task:** Sharing activities will occur if people have task needs that require sharing and are given technology appropriate to their needs and have the ability to use the technology effectively.

Some researchers place an almost exclusive emphasis on the individual attitudes and beliefs (Constant et al. 1994). Others stress the characteristics of the situation and context (Davenport 1997). However, all three sets of factors can be used together in an expanded model that allows their relative influence to be measured. We next describe variables within each set of factors and advance hypotheses.

2.1 School 1: Motivating Sharing via Cultural Norms

Organizations often find that technology alone does not motivate sharing (Davenport 1994, 1997; Orlikowski 1992). "People issues" and particularly organizational culture are cited as the biggest impediments to information sharing (Ruggles 1998). Alavi and Leidner (1997) argue that organizations that do not have a supportive organizational culture will face difficulties in integrating knowledge-based systems into their organizations. Organization culture is supportive when it facilitates information sharing. Besides supportive organizational culture, an implicit assumption in much of the writings on electronic media and knowledge management is that organizations have to have a supportive information culture where information is viewed as an organizational resource that should be shared openly and freely without regard to hierarchy, job function, or class. We investigate both organizational culture and information culture in our study.

2.1.1 Organizational Culture

Organizational culture refers to the shared values and attitudes that members of an organization hold about human relationships in an organization (Trice and Beyer 1993). Here we will focus on dimensions that address how people relate to each other and their organizations. Goffee and Jones (1996) defined and developed measures for two dimensions of corporate culture that relate to producing and maintaining the well-being and the integrity of other coworkers as well as the organization at large: sociability and solidarity. Sociability is a measure of sincere friendliness among members of a community. Solidarity is a measure of a community's ability to pursue shared objectives quickly and effectively, regardless of social ties. Hofstede et al. (1990) proposed a related dimension of employee-oriented (concern for people) versus job-oriented (concern for getting the job done). Hofstede et al. also identified a dimension of democracy and Scholz (1990) a need for achievement. Democracy emphasizes empowerment. Need for achievement focuses on the importance of advancement and prestige.

It is known from past research that the nature and pattern of individual behavior is influenced by the strength of the relationship between individuals as well as the persons' commitment to their organizations (O'Reilly and Chatman 1986). The more committed the individuals are to the organizational goals (high on solidarity and job orientation), the more they might be willing to share the products of their labor (information and knowledge) with others. Also, in an organization where social ties (i.e., solidarity) are stronger, beliefs of organizational ownership may be also stronger. Many (e.g., Szulanski 1996) emphasize the need for intimacy or closer interpersonal relationships in organizations for transfer activities to take place. We also know that individuals' cooperative behavior is influenced by their evaluations of organizational fairness (Tyler 1999). Democratic culture might engender fairness and fairness might promote information sharing. An organization with a culture reinforcing the need for achievement might breed stronger organizational commitment and pride and increase the likelihood that an individual takes the time to behave in the organization's best interest by sharing information that is beneficial to others. Hence, we hypothesize:

- Hypothesis 1: An organization culture that has high solidarity, sociability, employee orientation, need for achievement and democraticness will be positively associated with the use of electronic media.

2.1.2 Information Culture

Information culture represents values and attitudes toward information and what “to do” and “not to do” related to information processing, publishing, and communication. Davenport (1997) makes a compelling case for how information culture can affect information sharing. If the information culture norms encourage open flow of information, then users would be expected to deploy the technology to enact the norm. Following this, we might expect open and organic information cultures to increase the use of electronic media. Open describes the degree to which members can get access to information and information flows without any restriction imposed by the organization or its members. Organic refers to the lack of formal structures and order for processing and sharing information (Scholz 1990).¹ Therefore, we hypothesize:

Hypothesis 2: Open and organic information cultures will be associated with greater use of electronic media for sharing information.

2.2 School of Thought 2: Motivate Sharing via Individually-held Attitudes and Beliefs

Conventional wisdom blames motivational factors more than the other factors for the lack of sharing in organizations (Szulanski 1996). Individuals might be reluctant to share information for fear of losing ownership and power or they may be unwilling to engage in sharing activities that consume time and resources. Lack of motivation can result in information pathologies (passivity, secrecy, blockage, withholding information, distortion, etc.). Hence, people have to be willing to make an exchange in order for information sharing to take place. Their attitudes and beliefs relevant to information sharing might reflect their level of willingness.

2.2.1 Attitudes Toward Information Policies

Davenport (1997) suggests a number of organizational information policies for encouraging people to share information. These include assigning responsibility for addressing information use issues, clarifying the organization’s objectives for using and sharing information, and communicating what information should or should not be shared. Others are not as supportive of such policies and show how policies can reinforce the old notions of vertical information flows and control (e.g., Zuboff 1988). While suggestions in the literature are inconclusive, we follow Davenport’s suggestions that appropriate information policies can stimulate sharing. Frequent users of electronic media are highly dependent on well-functioning networks and, therefore, have less tolerance of decentralized or *laissez faire* management approaches (which were more appropriate for standalone tools of the past). Heavy users might want to have their information accessible to them and feel more procedures would facilitate this.

In our study, we only capture attitudes about organizational policies toward information sharing, not policies themselves. The reason is that the organizations that participated in the study had no formal information policies (beyond basic security access policies) at the organizational levels or departmental levels. Hence, we could only gauge to what extent the users of electronic media had internalized an attitude about policies at their departmental level and how such policies might have a motivational effect on the use of electronic media. Thus we hypothesized:

Hypothesis 3: The more a person feels that the flow of information should be managed via organizational policies, the more likely they are to use electronic media.

2.2.2 Beliefs About the Ownership of Information

Constant et al. (1994) proposed that information sharing is affected by organizational norms of what is the property of a person versus an organization. If information belongs to the organization, then it follows that employees should be ready to share it with others. Constant et al. (1994) found that people associated expertise less as an organizational possession and more as a personal property than an information product. Somewhat counter intuitive, people were more willing to share expertise than the information product with others. Constant et al. (1994) explained the result by suggesting that people are more likely to share something that is theirs than an organizational product because sharing what they possess makes them feel needed and appreciated. Sharing is part of a person’s identity and helps their self-esteem because sharing gives them a sense of competence, power, or control of their environment. Therefore, we expect that when people hold beliefs that they own information/knowledge, they are

¹Scholz uses different labels (“frankness” and “order”) but the definitions are equivalent.

more willing to share it. By extension, we then expect the opposite when people hold beliefs that information/knowledge is owned by the organization. Hence, we hypothesize that:

Hypothesis 4a: Beliefs that expertise is owned by an employee's organization will be negatively associated with the use of electronic media for information sharing activities.

Hypothesis 4b: Beliefs that an information product is owned by an employee's organization will be positively associated with the use of electronic media.

2.2.3 Propensity to Share

Propensity to share information is a prosocial attitude related to information sharing. Constant et al. (1994) proposed that one's propensity to share affects information sharing behavior, independent of personal feelings about his or her coworkers. Prosocial attitudes capture the general tendency of people wishing for good outcomes not only for themselves but also for other employees or the organization (Brief and Motowidlo 1986, p. 710). Altruism has been long associated with information sharing. For example, a study of information sharing among Maine lobstermen found a form of reciprocal altruism (Palmer 1991). We expect the propensity to share to be positively associated with the use of electronic media for information sharing activities:

Hypothesis 5: Greater levels of the propensity to share information will be positively associated with the use of electronic media.

2.3 School of Thought 3: Need for Using Technology that Fits the Task

The third school posits that sharing occurs when a need exists and the technology to meet that need coexists within the organization. The need for information may trigger the search for a source for information and for technology that allows the sharing of that information. Once the need and the technology are identified, then their fit becomes of issue. Constant et al. (1994) recognized that factors that reduce personal cost and increase personal benefit to share could promote information sharing.

2.3.1 Task Interdependence

The task-technology fit theory suggests costs of using technology decrease as the capabilities more closely match the tasks at hand. The theory advocates that the greater the congruence between the characteristics of the technology and tasks, the lower the cognitive information processing costs and the greater the satisfaction and favorable outcomes toward achieving individual and organizational goals (Goodhue and Thompson 1995; Vessey 1991). Support is found consistently in the IS literature for the effect of task-technology fit (e.g., Goodhue and Thompson 1995; Jarvenpaa 1989).

The task-technology fit theory implies that those whose work involves tasks that are interdependent of others should have a need and hence should be motivated to use the (networked) technology more than those who act alone (Goodhue and Thompson 1995). Apart from the organizational culture that might promote sharing and a person's own propensity to share, pure rational self-interest suggests that benefits of reciprocity from communicating and sharing with others are increased when the person's work is dependent on the efforts of other people in and outside of their organization. Hence, we hypothesize:

Hypothesis 6: Greater task interdependence with others will be positively associated with the use of electronic media.

2.3.2 Computer Comfort

Attitudes toward technology that can help meet the need might also affect sharing. Those with more positive attitudes feel more inclined to initially try technology as well as explore its capabilities over time. It is also likely that those who use the technology develop positive attitudes toward it. Attitudes about computers have consistently been found to be a significant determinant of adoption and use (Davis et al. 1989), although some studies have found the relationship to weaken as users gain experience with the technology (Thompson et al. 1994). Webster and Martocchio (1992) found that those who were playful with computers had more positive attitudes about computers. We extrapolate from this that those who are most comfortable using computers are most likely to use electronic media to share information. Hence, we hypothesize:

Hypothesis 7: Greater comfort with using computers will be positively associated with the use of electronic media.

2.3.3 Characteristics of Computer-Based Information

An important influence on whether the technology will meet the need is the perception of its accessibility and quality of output. Whether or not the perception reflects reality matters little, because perceptions, not objective properties, affect organizational behavior (Szulanski 1996). Kraemer et al. (1993) argue that people have the underlying expectation that information technology provides people with higher quality information and greater accessibility to data. People who do not hold positive perceptions of computer-based information are unlikely to use electronic media, independent of organizational culture, information culture, or their task interdependence. To them, the use of these systems only entails cost without corresponding benefit. Hence, we hypothesize:

Hypothesis 8: Positive perceptions of the characteristics of computer-based information will be positively associated with the use of electronic media.

We now describe how the research model, summarized in Figure 1, was tested.

3. METHOD

This section describes the sampling method, construct measures, and analysis methods employed.

3.1 Sample

Two universities were chosen for receiving the questionnaire used to collect data. One university was in Australia and the other one was in Canada. In terms of their national cultures, Australians and Canadians are rated close to each other (Hofstede 1991). Universities are often characterized as knowledge organizations (Goffee and Jones 1996). In both universities, virtually all office-based staff (faculty and administrative staff) had PCs with network connections. In our study, the unit of analysis was an employee in a department.

In both universities, questionnaires were sent to all academic staff and all general/administrative staff who had administrative duties that regularly involved using personal computers. At the Australian university, 4,253 employees received the questionnaire; 3,165 employees received the questionnaire at the Canadian university (which was somewhat smaller). A total of 1,935 completed questionnaires were returned (1,125 from the Australian university; 810 questionnaires from the Canadian university), equating to a 26% response rate. Use of the procedure suggested by Armstrong and Overton (1977) indicated no significant differences between respondents and non-respondents on a variety of demographic variables included in the questionnaire. Table 1 summarizes the demographic characteristics of the respondents.

3.2 Construct Measurement

The questionnaire contained multiple measurement items relating to each of the constructs in the research model. A pre-test, using faculty, graduate students trained in questionnaire design, and administrative staff, was carried out as suggested by Dillman (1978). Where possible, scales that had demonstrated good psychometric properties in previous studies were employed. Appendix A lists the questionnaire items used to measure each construct and their sources.

Following the work of Constant et al. (1994), propensities to share as well as organizational ownership of information were assessed in this study through vignettes. Vignettes are used to elicit social judgments on subjects that are sensitive and difficult to observe (i.e., susceptible to socially-desirable responses). A vignette provides a “short, concrete story to which the subject responds in a variety of formats” assuming a role of a fictitious character (p. 403).

Table 1. Sample Demographics

		Australian University		Canadian University	
		Count	Column %	Count	Column %
AGE	30 or younger	293	26.2%	89	11.2%
	31 to 40	360	32.1%	227	28.5%
	41 to 50	288	25.7%	288	36.2%
	51 to 60	165	14.7%	162	20.4%
	61 or older	14	1.3%	30	3.8%
GENDER	Male	475	42.4%	313	39.4%
	Female	645	57.6%	482	60.6%
EDUCATIONAL BACKGROUND	Secondary or High School	83	7.4%	99	12.4%
	Diploma/Certificate	92	8.2%	159	19.9%
	Undergraduate Degree	255	22.8%	152	19.0%
	Postgraduate Diploma	178	15.9%	na	
	Graduate Degree	511	45.7%	389	48.7%
TIME WITH UNIVERSITY	Less than 1 year	158	14.1%	79	9.9%
	1 - 5 years	481	42.9%	209	26.2%
	6 - 10 years	255	22.8%	140	17.5%
	11 - 20 years	156	13.9%	196	24.5%
	Over 20 years	70	6.3%	175	21.9%
TIME IN PRESENT POSITION	Less than 1 year	293	26.2%	143	17.9%
	1 - 2 years	304	27.2%	137	17.1%
	3 - 5 years	266	23.8%	162	20.3%
	Over 5 years	256	22.9%	356	44.6%

3.3 Analysis

A structural equation modeling technique called partial least squares (PLS) was chosen for analyzing the research model (Wold 1985). PLS is a technique that uses a combination of principal components analysis, path analysis, and regression to simultaneously evaluate theory and data (Pedhazur 1982; Wold 1985). The impact of all the exogenous variables is determined together on the endogenous variable. The path coefficients in a PLS structural model are standardized regression coefficients, while the loadings can be interpreted as factor loadings. Statistical significance of the path coefficients was determined with a bootstrapping technique (Chin 1998). The objective of a PLS analysis is to explain variance in the endogenous constructs, rather than to replicate the observed covariance matrix as is the case with covariance structure techniques (such as LISREL). One consequence of using a variance-minimization objective is the absence of overall fit statistics for PLS models (Hulland 1999). A detailed discussion of the implementation of PLS in an information systems context is provided by Barclay et al. (1995), who also compare PLS and LISREL.

4. RESULTS

As is standard in structural equation modeling, the results of the measurement model analyses are presented first. This is followed by a formal test of the hypotheses.

4.1 Measurement Model Assessment

Two separate analyses were performed. An initial PLS run was carried out to identify items that were weak and should be discarded. This was done to ensure that the measurement model was adequate before proceeding with assessment of the structural

model. Items that had either weak loadings (i.e., generally less than .50) or showed poor discriminant validity were discarded. We felt that it was reasonable to relax the rule of thumb of accepting items with loadings of .70 or better, due to the exploratory nature of the work. Factor loadings in excess of 0.45 can be considered fair and loadings in excess of 0.55 can be considered good, according to Comrey (1973). The trimmed model was rerun and re-assessed.

Fourteen items of the original 98 items were identified as being weak and were dropped from the initial analysis (Appendix A lists the items used in the final analysis). Also, loadings of the Information Culture items indicated two potential factors so this construct was split into two. Table 2 reports the resulting number of items per construct, internal consistency values, and average variance extracted (a measure used to assess discriminant validity). Table 3 presents the inter-correlations of constructs. In addition to assessing the discriminant validity of the constructs via Table 3, the cross-loadings of each item on all constructs were examined to ensure that each item always loaded highest on its target construct. All the constructs had acceptable reliability and validity.

Table 2. Internal Consistency of the Constructs

Construct	Number of Items	Internal Consistency ^a	Cronbach's Alpha	Average Variance Extracted
Use of Electronic Media	12	.90	.87	.42
Organizational Culture -Solidarity	5	.85	.78	.54
Organizational Culture - Sociability	4	.84	.75	.57
Organizational Culture - Employee orientation	3	.84	.71	.64
Organizational Culture - Need for achievement	3	.76	.56	.52
Organizational Culture - Democraticness	3	.70	.59	.47
Open Information Culture	3	.85	.79	.65
Organic Information Culture	4	.80	.68	.51
Attitudes toward information policies	5	.85	.77	.52
Organizational Ownership of Information Expertise	4	.86	.83	.61
Organizational Ownership of Information Products	4	.77	.63	.46
Propensity to Share Expertise	6	.86	.80	.50
Propensity to Share Information Products	6	.86	.81	.50
Task Interdependence	6	.86	.80	.47
Computer Comfort	8	.86	.80	.43
Characteristics of Computer-Based Information	8	.91	.89	.57

^aInternal consistency is assessed using the Fornell and Larcker (1981) measure. The Fornell and Larcker internal consistency value is preferred for PLS analyses since it uses the observed loadings to more accurately reflect the relative importance of each of the underlying measures. Also, it is calculated independently of the number of items employed for a construct, resulting in a more robust assessment of internal consistency. Cronbach's alpha values are presented for comparison. A value of 0.70 or larger for both Cronbach's alpha and the Fornell and Larcker measure indicates adequate internal consistency. Three constructs had somewhat lower Cronbach's alphas; however, each of them had acceptable internal consistency values as per the Fornell and Larcker measure. Since use of the Fornell and Larcker internal consistency values is preferred, it was concluded that all of the constructs had acceptable internal consistency.

4.2 Assessment of the Structural Model

Assessment of the structural model was done in two steps. The predictive power of the model was assessed first, followed by an analysis of the hypothesized relationships among the constructs. The results are summarized Table 4.

The model explained 33.6% of the variance in the use of electronic media construct. Overall, the amount of variance explained by the model appeared reasonable. Table 4 contains a summary of the hypotheses, the path coefficients obtained from the PLS analysis of the entire dataset, and the *t*-statistic values for each path. Eight of the 15 paths were statistically significant. Seven of these significant paths were in the directions hypothesized, supporting the associated hypotheses.

Table 3. Discriminant Validity Analysis

Construct	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Use of Electronic Media	0.646															
2. Org. Culture -Solidarity	0.085	0.733														
3. Org. Culture - Sociability	0.085	0.454	0.753													
4. Org. Culture - Employee orientation	0.094	0.357	0.266	0.801												
5. Org. Culture - Need for achievement	0.118	0.154	0.100	-0.066	0.722											
6. Org. Culture - Democraticness	0.085	-0.052	-0.030	-0.052	-0.093	0.683										
7. Open Information Culture	0.036	0.444	0.294	-0.307	-0.052	0.013	0.807									
8. Organic Information Culture	0.070	0.269	0.199	0.417	-0.030	0.061	0.312	0.711								
9. Attitudes toward information policies	-0.102	-0.040	0.015	0.056	-0.095	-0.073	0.017	0.075	0.724							
10. Organizational Ownership of Information Expertise	0.061	0.108	0.117	0.015	-0.099	0.017	0.104	0.011	-0.173	0.784						
11. Organizational Ownership of Information Products	0.090	0.187	0.074	0.088	-0.004	-0.040	0.095	-0.004	-0.188	0.452	0.677					
12. Propensity to Share Expertise	0.066	0.087	0.085	0.073	0.012	0.042	0.051	0.050	-0.008	0.204	0.190	0.705				
13. Propensity to Share Information Products	0.113	0.061	0.055	0.040	-0.060	0.040	0.051	0.043	-0.007	0.092	0.242	0.603	0.707			
14. Task Interdependence	0.377	0.139	0.092	0.073	0.060	0.096	0.053	0.051	-0.123	0.131	0.113	0.085	0.071	0.684		
15. Computer Comfort	0.302	0.080	0.131	0.061	0.106	0.026	0.060	0.008	-0.060	0.071	0.033	0.088	0.064	0.098	0.657	
16. Characteristics of CBI	0.455	0.58	0.064	0.033	0.095	0.079	0.078	0.046	-0.021	0.051	0.058	0.072	0.086	0.175	0.329	0.751

The bold diagonal elements are the square root of the variance shared between the constructs and their measures (i.e., the square root of the average variance extracted). Off diagonal elements are the correlations between constructs. For discriminant validity, the diagonal elements should be larger than any other corresponding row or column entry. Since this is the case for all of the constructs, discriminant validity of the measurement model is satisfactory.

Table 4. Summary of Path Coefficients and Significance Levels

Hypotheses and Corresponding Path(s)	Expected Sign	Path Coefficient	t-value (df = 500)	Support for H? (p < .05)
H ₁ : Organizational culture to the use of electronic media				
H _{1a} : Organizational Culture - Solidarity	+	-.012	-0.45	NO
H _{1b} : Organizational Culture - Sociability	+	.009	0.43	NO
H _{1c} : Organizational Culture - Employee orientation	+	.061	2.75**	YES
H _{1d} : Organizational Culture - Need for achievement	+	.062	3.14**	YES
H _{1e} : Organizational Culture - Democraticness	+	.019	0.97	NO
H ₂ : Information culture to the use of electronic media	0			
H _{2a} : Open Information Culture		-.046	-1.44	NO
H _{2b} : Organic Information Culture		.033	1.59	NO
H ₃ : Attitudes about information policies to the use of electronic media	-	-.048	-2.46*	YES
H ₄ : Attitudes about the organizational ownership of information to the use of electronic media	-	-.024	-0.98	NO
H _{4a} : Ownership of expertise-based information	+	.026	1.12	NO
H _{4b} : Ownership of product-based information				
H ₅ : Propensity to share (PTS) information to the use of electronic media	0			
H _{5a} : PTS expertise-based information		-.051	-2.10*	NO
H _{5b} : PTS product-based information		.081	3.07**	YES
H ₆ : Task interdependence to the use of electronic media	0	.287	14.53***	YES
H ₇ : Computer comfort to the use of electronic media	0	.150	6.41***	YES
H ₈ : Characteristics about computer-based information to the use of electronic media	0	.343	15.20***	YES

+ p < .10; * p < .05; ** p < .01; *** p < .001 (2 tailed test)

To examine the differences in results across the two universities (i.e., replicate the restricted model in two organizations), the data was split to two subgroups by the university and the research model was re-run (see Table 5). Results were generally consistent across both datasets. Hypotheses 3, 6, 7, and 8 were supported in both datasets.

4.3 Post Hoc Analyses: Examining the Effect of Gender, Work Experience , Job Type

Educational level, status, and tenure have been suggested to affect prosocial attitudes and behavior (Brief and Motowidlo 1986). The higher the education level, status, and tenure of a person, the more likely they might value social reciprocity so these factors could influence the relationships hypothesized above and sharing behaviour. Constant et al. (1994) also found that work experience and years of schooling significantly correlated with the belief of organizational ownership of information. Women are sometimes stereotyped as having higher need for affiliation and identification than men. Assuming that prosocial behaviors partly occur because of individuals’ need to maintain their social identities, perhaps women might be more likely to use electronic media for sharing activities. To examine the effect of gender, work experience, and job type, the dataset was split three different ways and the research model re-analyzed for the resulting six sub-groups. Table 6 indicates whether the resulting path coefficients were statistically significant or not and in what direction the paths were (for the statistically significant paths). The variance explained by each model analysis is also indicated.

5. DISCUSSION

This study explored what influences the use of electronic media in an organization. The strongest support was found for the task-technology related factors (hypotheses 6 to 8), consistent with the findings of Jarvenpaa and Staples (2000). All three constructs

Table 5. A Comparison of the Path Coefficients and Significance Levels at the Two Different Universities

Hypotheses and Corresponding Path(s)	Australian University (R ² = .305)		Canadian University (R ² = .382)	
	Path Coefficient	t-value (df = 500)	Path Coefficient	t-value (df = 500)
H ₂ : Information culture to the use of electronic media H _{2a} : Open Information Culture H _{2b} : Organic Information Culture	-.091 .038	-1.58 1.13	-.005 .059	-0.19 1.81+
H ₃ : Attitudes about information policies to the use of electronic media	-.049	-2.10*	-.059	-1.98*
H ₄ : Attitudes about the organizational ownership of information to the use of electronic media H _{4a} : Ownership of expertise-based information H _{4b} : Ownership of product-based information	-.027 .053	-0.71 1.62	-.023 -.004	-0.72 0.13
H ₅ : Propensity to share (PTS) information to the use of electronic media H _{5a} : PTS expertise-based information H _{5b} : PTS product-based information	-.001 .053	-0.02 1.23	.037 .044	1.11 1.29
H ₆ : Task interdependence to the use of electronic media	.275	10.10***	.289	9.77***
H ₇ : Computer comfort to the use of electronic media	.181	5.88***	.118	3.32***
H ₈ : Characteristics about computer-based information to the use of electronic media	.318	10.72***	.401	12.50***

+ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$ (2 tailed test)

in this group (i.e., task interdependence, computer comfort, and characteristics of computer-based information (CBI)) were significantly, positively related to use of electronic media in all the analyses. The results suggest that managers could potentially stimulate the use of electronic media by increasing positive perceptions of CBI, ensuring employees are comfortable using the technology available, and making technology available that fits the employees' task needs. This would include training and designing web sites and systems such that the effort to use them was minimized, and the content in them was managed to keep its quality high.

The test of hypotheses 3 supports the association of individual attitudes and beliefs with the use of electronic media (consistent with the results of Jarvenpaa and Staples). As suggested by Davenport (1997), respondents that believed that their department should have policies in place that help clarify information sharing activities used electronic media for sharing activities to a greater degree than those respondents who wanted no policies. For practitioners, this suggests that implementing policies that structure information sharing could have a positive effect on the amount of sharing in an organization.

Propensity to share product-based information was significantly associated with media use, lending support to the importance of attitudes. Interestingly, the association between propensity to share expertise-based information and media use was negative. Non-significant associations were found between ownership of both expertise and products and media use. These results are inconsistent with those of Jarvenpaa and Staples, who found a significant negative relationship between views of organizational ownership of information and media use and a positive relationship between propensity to share and media use. Possibly the differences are due to differences in operationalizing the constructs (Jarvenpaa and Staples did not look at organizational ownership or propensity to share separately for products and expertise). Although not statistically significant, our results do lend support to Constant et al.'s (1994) suggestions that people who feel organizations own expertise tend to share it less and people that feel organizations own products tend to share them more. Clearly more research is needed to establish these relationships and, assuming future support is found for them, investigate how managers can manipulate perceptions of information ownership.

Two of the five organizational culture dimensions were significantly associated with media use. These were employee orientation and need for achievement implying that organizations that value their employees and involve them in decision making and change will create an atmosphere that is associated with using media for sharing information. The amount of variance explained in media

Table 6. Summary of the Statistical Significance of the Path Coefficients and Directions for the Various Splits of the Dataset

Path from the Independent Variable, listed below to the Use of Electronic Media	All data (n=1934)	Job Type		Gender		Work Experience	
		Faculty (n= 748)	Admin (n=1145)	Men (n = 788)	Women (n=1127)	< 1 year in org. (n = 237)	>20 years in org. (n = 245)
Organizational Culture - Solidarity	N	N	N	N	N	N	N
Organizational Culture - Sociability	N	Y (+)	N	N	N	N	N
Organizational Culture - Employee orientation	Y (+)	N	Y (+)	N	Y (+)	N	N
Organizational Culture - Need for achievement	Y (+)	Y (+)	Y(+)	N	Y (+)	N	N* (+)
Organizational Culture - Democraticness	N	N	N	N	N	N	N
Open Information Culture	N	N	N	N	N	N	N
Organic Information Culture	N	N	N	N	N	N	N
Attitudes toward information policies	Y (-)	N	Y (-)	Y (-)	Y (-)	N	N
Organizational Ownership of Information Expertise	N	N	N	N	N	N	N
Organizational Ownership of Information Products	N	N	N	N	N	N	N
Propensity to Share Expertise	Y (-)	N	N	N	N	N	N
Propensity to Share Information Products	Y (+)	N	Y (+)	N	Y (+)	N	N
Task Interdependence	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)
Computer Comfort	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)
Characteristics of Computer-Based Information	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)	Y (+)
Variance explained	33.6%	38.1%	32.5%	30.8%	36.6%	32.7%	48.5%

Y = yes, the path coefficient was statistically significant via bootstrapping (i.e., $p \leq 0.05$); N* = the path was marginally significant ($0.10 \leq p < 0.05$); N = no, the path coefficient was not statistically significant ($p > 0.10$). Degrees of freedom = 500.

use when the organizational culture dimensions were included was 34%, which is fairly similar to that explained without the organizational culture dimensions (Table 5: 31% and 38%). The fairly weak association of organizational culture with media use for sharing activities could lead one to think that it is not an important determinant of information sharing. However, we feel it is premature to conclude this for several reasons. First, the nature of our sample could have contributed to this finding. Studying universities had advantages in terms of tapping into knowledge enterprises, but large universities may not have very homogeneous organizational cultures due to differences in departments or there may not be a well-perceived view of organizational culture. Second, we examined the association of organizational culture with media use for sharing activities, not on sharing activities directly. Possibly when sharing was investigated directly, organizational culture could be found to have a stronger impact, as suggested in the literature. Third, as with any finding, the results could be due to methodological issues. We chose dimensions of organizational culture that we thought were relevant to the issues we were studying. Replication of our study using other operationalizations of this construct should be done in order to examine the generalizability of our findings.

The results of the *post hoc* analysis showed no major differences due to the length of time the respondents had been with the organization. Some differences between faculty and administrative staff were found, although the most noticeable difference was found between men and women. Organizational culture was only significantly associated with electronic media use for the

women, suggesting that actions to involve employees in decision-making and change and to create a positive perception of valuing employees will have a larger positive impact on women's use of electronic media for sharing information than it will on men. In all cases, strong support was found for the task-technology related hypotheses.

As far as we were able to tell, our efforts to measure attitudes about information policies and information culture are the first time these constructs have been operationalized. In general, all our measures did well across different cultures and across respondents with different characteristics. A variety of different types of people in universities responded and the measures still held, thereby arguing for their robustness. We hope future researchers find this of value and build on our work.

6. LIMITATIONS AND CONCLUSIONS

Our findings need to be replicated across other settings and over time in order to establish the extent of the generalizability of the findings. The cross-sectional nature of our survey design certainly limits our ability to draw causal inferences. Future research efforts to help understand why the relationships exist (e.g., in-depth case studies) would be valuable to expand our current understanding of information sharing and the role of the various constructs. Our study also relies on individual perceptions. One consequence of using self-report data is that a common response bias across constructs may be introduced. Although our empirical results suggest that these constructs can be discriminated from one another empirically, the use of alternative methods of data collection in future studies would also increase the validity of our findings.

In conclusion, we found that task interdependence, perceived information usefulness, and the user's computer comfort were most strongly associated with the person's use of electronic media, supporting the rationale that sharing activities will occur if people have needs and are given technology appropriate to their needs and have the ability to use the technology effectively. A need to use the media, seeing value in the information provided through the media, and having a reasonable level of comfort in doing so are all important in potentially leading to more usage and sharing. Organizational culture and attitudes about information policies also were significantly associated with the use of electronic media for information sharing activities. Organizational policies on information behavior should be considered because those who were in favor of them used the electronic media the most. If implemented appropriately, they may have an important role in improving access to information. We hope that firms that are trying to become knowledge-based organizations can use our results to focus their efforts on activities that will have the greatest impact on increasing the sharing of information. Our results should also be useful to focus future research efforts on fruitful areas, including examining why the relationships exist.

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Appendix A

Questionnaire Items

Item Wording

USE OF ELECTRONIC MEDIA—Source: Developed for this study (a 1 - 5 Likert scale was used with the anchors ranging from “Never or almost never” to “Daily”)

I use my computer-based information systems to:

- Search for information **within my** department/work unit
- Search for information **within my** university (outside of my department)
- Gather information (e.g., download) **within my** department/work unit
- Gather information **within my** university (outside of my department)
- Publish information that will be of use to members of **my department**/work unit
- Publish information that will be of use to **other departments** at my university
- Store information in the network for general access **in my department**
- Store information in the network for general access **in my university**
- Search for information from sites **outside** of my university
- Gather information from sites **outside** of my university
- Publish information that will be of use to people **outside** my university
- Store information in the network for general access by people from **outside** my university

Note, prior to this question in the questionnaire, respondents were asked what types of computer-based information systems they used to contact people and access or receive information and the frequency they used the CBIS. Categories of responses offered were e-mail, www browser, list serves, and other such as Lotus Notes. They were then asked how often they used the CBIS that they had to do the tasks above.

ORGANIZATIONAL CULTURE—SOLIDARITY—Source: Goffee and Jones (1996) (a 1 - 7 Likert scale was used for all the organizational culture measures with the anchors ranging from “Strongly Disagree” to “Strongly Agree”)

- “The organization thinks and plans ahead”
 - “Employees are told when a good job is done”
 - “Our group takes strong action to address poor performance”
 - “Members of our department share the same business objectives”
 - “Our collective will to win is high “
-

ORGANIZATIONAL CULTURE—SOCIABILITY—Source: Goffee and Jones (1996)

- “When people leave our group, we stay in touch”
 - “People here do favors for others because they like one another”
 - “People in our group often socialize outside the office”
 - “People here try to make friends and try to keep their relationships strong”
-

ORGANIZATIONAL CULTURE—EMPLOYEE-ORIENTATION—Source: Hofstede et al. (1990)

- “The organization is only interested in the work we do” (reverse coded)
 - “Decision-making is centralized at the top” (reverse coded)
 - “Changes are imposed by management decree” (reverse coded)
-

ORGANIZATIONAL CULTURE—NEED FOR ACHIEVEMENT—Source: Hofstede et al. (1990) and Scholz (1990)

- “The opportunity for advancement is important to me”
 - “Working for a prestigious organization is important to me”
 - “Individual search for excellence has top priority”
-

ORGANIZATIONAL CULTURE—DEMOCRATICNESS—Source: Hofstede et al. (1990)

- “Management authority should be questioned”
 - “I prefer a consultative manager”
 - “It is undesirable that authority be questioned” (reverse coded)
-

Item Wording

OPEN INFORMATION CULTURE—Source: Scholz (1990) and Davenport (1995)

The instructions given to respondents were: “How would you describe the attitudes and behavior relative to information in general (i.e., all types) **in your department?** (circle one number in each line)” A scale, ranging from 1 to 7, was positioned between the two anchor labels, with 4 being labeled “neutral” so respondents indicated, by circling one number, where they felt their department was on the scale.

Closed versus open information behavior
Rumor- and intuition-based versus factually-oriented
Suspicious versus confident

ORGANIC INFORMATION CULTURE—Source: Scholz (1990) and Davenport (1995)

Internally focused vs. externally focused
Controlling vs. empowering
Centralized vs. decentralized
Hierarchic vs. non

ATTITUDES TOWARD INFORMATION POLICIES—Source: Davenport (1997) (A 1 to 7 Likert scale was used with the anchors ranging from “Strongly Disagree” to “Strongly Agree”)

The use of electronic information should be left for an individual without any department rules or procedures
The department should clarify individuals’ responsibility for using and sharing information electronically (reverse coded)
The department should clarify the organization’s objectives for using and sharing information electronically (reverse coded)
In our department, there should be standardized procedures and processes for dealing with electronic information (reverse coded)
Our department should not get involved with how individuals deal with electronic information

ORGANIZATIONAL OWNERSHIP OF INFORMATION—Source: Constant et al. (1994)

Four vignettes (i.e., short stories) were developed and participants were asked their views of the ownership of the information/knowledge in these four situations. Two scenarios dealt with sharing expertise and two dealt with sharing an information product (explicit/codified knowledge). For each scenario, respondents were asked to indicate their degree of agreement with three statements: that the material/knowledge belongs to themselves, that the material/knowledge belongs to their department/task force, and that the material/knowledge belongs to their university/professional body. For both the organizational ownership constructs, four items that loaded adequately together were used.

PROPENSITY TO SHARE—Source: Constant et al. (1994)

The four vignettes described above were used to assess propensity to share. The three questions below were asked for each vignette. Items from the two vignettes dealing with expertise were used to measure the propensity to share expertise construct. The other items from the vignettes about sharing information products were used to measure the propensity to share information products construct.

How appropriate is it for Leslie to ask you for a copy of your report notes/help?
How justified would you be in refusing to give Leslie a copy of the report/help? (reverse coded)
All told, what is the likelihood you would give a copy of the report/help to Leslie?

TASK INTERDEPENDENCE—Source: Developed for this study. (A 1 to 7 Likert scale was used with the anchors ranging from “Strongly Disagree” to “Strongly Agree”)

My work is often completed with staff from other departments
My work often involves sharing information with other departments
The results of my work are dependent on the efforts of people from within my department
The information I need is often subject to change
My work often involves using information from other departments
The results of my work are dependent on the efforts of people from other departments

Item Wording

COMPUTER COMFORT—Source: Compeau (1992) and Webster and Martocchio (1992) (A 1 to 7 Likert scale was used with the anchors ranging from “Strongly Disagree” to “Strongly Agree”)

- It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key (reverse coded)
 - I hesitate to use a computer for fear of making mistakes that I cannot correct (reverse coded)
 - I feel apprehensive about using computers (reverse coded)
 - Computers are somewhat intimidating to me (reverse coded)
 - Computers make work more interesting
 - I enjoy interacting with computers
 - I use computers for fun
 - Working with computers is fun
-

CHARACTERISTICS OF COMPUTER-BASED INFORMATION—Source: Kraemer et al. (1993) (A 1 to 4 scale was used with the anchors ranging from “Almost Never True” to “Nearly Always True”)

- Computer-based information systems (CBIS) provide me with more up-to-date information than that available in manual files
 - CBIS make new information available to me that was not previously available
 - CBIS save me time in looking for information
 - CBIS have made it easier for me to get the information I need that was previously available but hard to find
 - CBIS provide me with more up-to-date information from outside my university than that available in manual files
 - CBIS make new information available to me from outside my university that was not previously available
 - CBIS save me time in looking for information from outside my university
 - CBIS have made it easier for me to get the information I need from outside my university
-