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Knowledge Management in Organizational Settings: The Effect of Normative Influence and Technological Support on Knowledge Creation and Transfer

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INTRODUCTION

One of the emerging themes in recent organization theory and strategic management research has been the central role that knowledge plays in organizational performance. Grant (2001), for example, looks at the advantages of a knowledge-based perspective in organization theory, focusing on knowledge as the critical resource in the production of goods and services. Similarly, Teece (2001:125), notes an "increasing recognition that the competitive advantage of firms depends on their ability to create, transfer, utilize and protect difficult to imitate knowledge assets." Nonaka, Toyama, and Konno (2001) claim that continuously creating knowledge is the reason for a firm's existence, noting the widespread acceptance of the view that the ability to create and utilize knowledge is the most important source of a firm's sustainable competitive advantage.

Related to this emphasis on knowledge as a central organizational resource is the growing interest in knowledge management and knowledge management systems – information systems designed to support creation and transfer of knowledge in organizations. In their review of knowledge management and knowledge management systems, Alavi and Leidner (2001) develop a framework for analyzing knowledge management processes and the role that information technology may play in supporting them. The framework provides a foundation for exploring successful deployment of information technology in support of knowledge creation and transfer.

The purpose of this study is to explore the extent to which knowledge management activities are performed in organizational settings, the extent to which they are supported by information technology, and whether information technology support has a positive impact on knowledge management activity. The study is designed to apply to a variety of organizational settings, including for-profit and non-profit organizations.

The first section of the paper describes the framework used to identify activities that are part of the organizational knowledge management process. The second section reviews research related to factors that may encourage or impede knowledge management activity and presents a causal model relating these factors to knowledge management activity levels. The third section summarizes the research questions addressed by the present study and the methodology used in data collection and analysis. The paper concludes with a discussion of the results of data analysis and directions for future research.

FRAMEWORK FOR ANALYSIS OF KNOWLEDGE MANAGEMENT ACTIVITIES

In order to explore the relationship between knowledge management and improved organizational performance, it would be useful to have a framework that would assist in recognizing and describing the various activities encountered in an active knowledge creation and sharing environment. In their review of knowledge management and knowledge management systems, Alavi and Leidner (2001) outline the types of knowledge involved in knowledge management and the knowledge creation and transfer activities that are used to distribute and apply the knowledge in organizational settings. As an aid to understanding what might be encountered in a knowledge management environment, we have developed a composite model depicting the knowledge management elements found in Alavi and Leidner's paper. The resulting framework is presented in Figure 1. The framework delineates various types of knowledge, knowledge creation activities, and knowledge transfer activities. Each is described in the discussion that follows.

Knowledge

Individual knowledge is classified as either tacit or explicit. Tacit knowledge is unformulated knowledge that consists of an individual's mental models (e.g., beliefs, paradigms, and mental maps) as well as "know-how" that may be applied to particular tasks or problems (Polanyi, 1959; Nonaka and Konno, 1998; Alavi and Leidner, 2001). Explicit knowledge is public, objectified knowledge that has been articulated, codified or communicated to others, perhaps even in symbolic form (Polanyi, 1959; Nonaka and Konno, 1998; Alavi and Leidner, 2001).

Organizational knowledge (also referred to as organizational memory) includes written documents, structured information, codified knowledge, documented procedures and processes, as well as tacit knowledge retained by individuals and networks of individuals who are part of the organization (Alavi and Leidner, 2001; Tan et al., 1998; Stein and Zwass, 1995). Stein and Zwass (1995:89) define organizational memory as "the means by which knowledge from the past is brought to bear on present activities" and note that it may be classified as semantic or episodic. Semantic memory consists of generalized knowledge rather than memories of specific events. Episodic memory is context-specific, consisting of memories of individual experiences, including the time and

context in which the events occurred (Alavi and Leidner, 2001; El Sawy et al., 1996; Stein and Zwass, 1995; Tulving, 1983).

Knowledge Creation Activities

Socialization involves sharing of individual tacit knowledge through social interaction and shared experience. Nonaka and Konno (1998) note that socialization involves being in close proximity, as would be typical, for example, in an apprenticeship assignment (Alavi and Leidner, 2001; Nonaka and Konno, 1998; Nonaka, 1994).

Externalization involves articulation of tacit knowledge and translation into forms that can be understood by others. This would include dialogue with others and may make use of words, concepts, figurative language, and visual aids (Alavi and Leidner, 2001; Nonaka and Konno, 1998; Nonaka, 1994).

Combination involves converting explicit knowledge into more complex articulated knowledge through communication, diffusion, and systemization. Nonaka and Konno (1998) note that combination involves three processes: (1) capturing and integrating externalized knowledge (e.g., public data), (2) dissemination through such means as presentations and meetings (thus a direct transfer of knowledge), and (3) editing or processing explicit knowledge to make it more usable (e.g., by creating documents like plans and reports) (Alavi and Leidner, 2001; Nonaka and Konno, 1998; Nonaka, 1994). .

Internalization involves conversion of explicit knowledge into tacit knowledge. This requires that the individual identify what is personally relevant within the organization's knowledge and put the knowledge into practice (Alavi and Leidner, 2001; Nonaka and Konno, 1998; Nonaka, 1994).

Knowledge Transfer Activities

Application includes integrating specialist's knowledge into the execution of organizational tasks. Grant (1996, 2001) outlines four mechanisms for integrating specialists' knowledge to produce goods and services: (1) Rules and directives: rules, standards, procedures, and instructions used to communicate specialists' tacit knowledge to non-specialists; (2) Sequencing of tasks: sequences that define the order in which each specialist's knowledge is to be applied; (3) Organizational routines: task performance and coordination patterns, interaction protocols, and process specifications; and (4) Joint problem solving: used for tasks whose uncertainty and complexity prevent specifying directives and routines.

Learning involves the knowledge creation that occurs when individuals apply knowledge to a situation and develop new understandings by observing the results they achieve (Alavi and Leidner, 2001).

Organizational memory storage/retrieval involves storage of and retrieval from explicit knowledge residing in forms like written documentation, electronic databases, email messages, pictures, images, video, and music (Alavi and Leidner, 2001).

Sharing across groups involves sharing group knowledge between groups, whether internal or external to the organization**,** including importing information from external sources through dialogue, retrieval of written documentation, and access of external databases (Alavi and Leidner, 2001).

CONTEXTUAL ELEMENTS INFLUENCING KNOWLEDGE MANAGEMENT ACTIVITY

Structural, cultural, and technological infrastructure have been identified as significant contextual elements that characterize and influence the environment in which knowledge management processes are embedded (Grover and Davenport, 2001; Gold, Malhotra, and Segars, 2001). Each of these contextual elements is expected to have an effect on the extent to which knowledge creation and transfer activities are carried out within the organization. Higher levels of knowledge management activity are expected to result in improved organizational performance (e.g., Grant, 2001; Nonaka, Toyama, and Konno, 2001; Teece, 2001).

Structural infrastructure, which includes the organization's system of rewards and incentives (e.g., incentives to generate new knowledge and to share knowledge with others), is expected to have a significant effect on the extent of organizational knowledge management activity (Gold, Malhotra and Segars, 2001). This is consistent with observations made by others who have noted the need for organizational incentives to encourage knowledge management participation (Markus, 2001; Hall, 2001; Ba, Stallaert and Whinston, 2001, Stein and Zwass, 1995). Hall (2001) has identified various extrinsic and intrinsic rewards that may be important in motivating knowledge management activity. These include economic rewards like salary increases and bonuses; access to information and knowledge; career advancement; job security; reputation enhancement; and personal satisfaction.

Technological infrastructure includes access to a comprehensive information and communication system that supports knowledge management activities (Gold, Malhotra and Segars, 2001). Teece (2001:130) notes that a "combination of IT [information technology] and co-aligned organizational processes can significantly enhance learning and competitive advantage." Access to relevant information technology and higher levels of technology use would be expected to contribute to a higher degree of knowledge management activity within the organization.

Cultural infrastructure, which includes corporate vision and values, is also expected to have a significant effect on knowledge management activity (Gold, Malhotra and Segars, 2001). Similarly, organizational norms concerning knowledge creation and sharing are expected to affect the extent of knowledge creation and transfer (Alavi and Leidner, 2001; Markus, 2001). Drawing from the existing TAM (technology acceptance) research, norms encouraging technology use would be expected to have a positive effect on technology use (Venkatesh and Morris, 2000; Green, 1998; Taylor and Todd, 1995), which in turn would be expected to result in higher knowledge management activity levels (Gold, Malhotra and Segars, 2001).

RESEARCH MODEL AND METHODOLOGY

The general model guiding our study is found in Figure 2. Figure 2 shows expected relationships between contextual elements (i.e., structural, cultural, and technological infrastructure), knowledge management activity, and organizational performance. The specific research questions addressed in the present study focus on cultural and technological influences on the extent of knowledge management activity. Subsequent stages of the research project will examine the influence that rewards, incentives, and additional cultural factors have on the extent of knowledge management activity, as well as the effect of knowledge management activity on organizational performance.

Research Design

The data for this phase of the project were gathered by means of a survey questionnaire administered to 30 professionals who work in country club management, real estate, and social services counseling. Of the 30 subjects included in the study, 19 worked in for-profit organizations and 11 worked in non-profit organizations. Twenty of the respondents were female and 8 were male (2 did not respond to the question). Six of the respondents were in their twenties, 10 in their thirties, 10 in their forties, and 3 in their fifties. The survey instrument included questions designed to measure the dependent and independent variables described below.

Dependent Variable

Extent of knowledge management activity

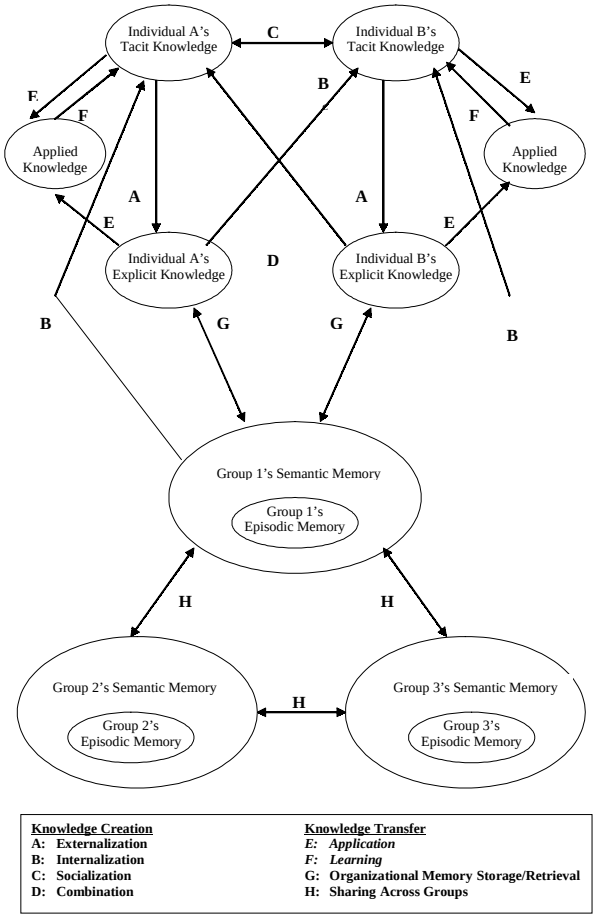
The extent of the subjects' knowledge management activities was measured on a 5-point scale using seven questions drawn from the knowledge creation and transfer activities described in the literature above (i.e., activities A-D and G-H shown in Figure 1):

I often document my ideas at work by writing them down for my own reference.

I often incorporate my co-workers' written and/or documented ideas as a basis for forming or improving my own ideas or knowledge.

I often use co-workers' ideas (information conveyed in conversation or informal communication) as a springboard to enhance my own ideas or knowledge.

Figure 1 Framework for Analysis of Knowledge Management Activities



I often merge or incorporate information documented by my workgroup or department into my own knowledge base.
I often formally document what I have learned for work or job-process improvement so that others who may do my job in the future may learn from my experience.
I often research organizational, workgroup, or industry records to enhance my workgroup's productivity.
My workgroup often meets with other workgroups within my organization to share information.

Independent Variables

Information technology use norm

The information technology use norm was measured using a series of questions based on the subjective norm measures used by Ajzen and Fishbein, (1980) and Venkatesh and Davis (2000) (Cronbach's alpha = .88). The subjective norm was measured on a 7-point scale using the following questions:

People who influence my behavior think that I should use computer systems in my work.
People who are important to me think that I should use computer systems in my work.
My coworkers think that I should use computer systems in my work.
The people with whom I work most closely think that I should use computer systems in my work.

Extent of information technology use for knowledge management

The extent of the subjects' use of information technology for each area of knowledge management (i.e., activities A-D and G-H shown in Figure 1) was measured on a 5-point scale, with 1 = never, 2 = rarely, 3 = occasionally, 4 = frequently, and 5 = always.

Control Variables

Information technology accessibility

Since use of information technology might be lessened if the technology is not accessible to knowledge workers, a measure of information technology accessibility was included in the study as a control variable (Cronbach's alpha = .71). Accessibility was measured on a 7-point scale using the following questions:

I have very limited access to the computer systems that I would like to use to do my work
I have adequate access to the computer systems that I would like to use do my work.
The computer systems available to me at work are adequate for performing my work in an effective manner.

Voluntariness of information technology use

Management policies that make information system use mandatory may also have an influence on information technology use, causing employees to increase their usage despite their own preferences to the contrary. The voluntariness measure used by Venkatesh and Davis (2000) was used to control for an increase in use based on mandatory usage policies (Cronbach's alpha = .83).

RESULTS

The means, standard deviations, and correlations of all variables included in the analysis are presented in Table 1. The information technology use norm was significantly correlated with information technology accessibility ($r = .44$, $p < .05$) and voluntariness of use ($r = -.36$, $p < .05$). This would be consistent with a commitment to provide information technology resources in organizations that want to develop an environment that encourages technology use. The inverse relationship between the IT use norm and voluntariness of use may indicate that organizations lacking positive IT use norms turn to mandatory usage policies to achieve acceptable levels of use. As expected in the model, there was a significant relationship between IT usage and the IT use norm ($r = .45$, $p < .05$) and between IT usage and the extent of knowledge management activity ($r = .66$, $p < .01$).

Multiple regression analyses were used to test the expected relationships between the variables illustrated in Figure 2. Two regression models were tested. Results of these regressions are reported in Table 1. The first model tested the effects of accessibility, voluntariness, and

Figure 2 Effect of Information Technology Use and Norms on Knowledge Management Activity and Organizational Performance

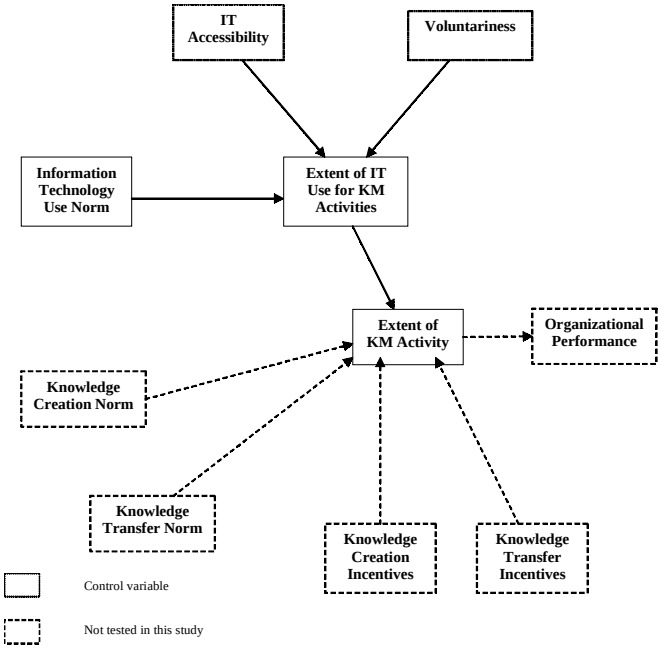


Table 1 Multiple Regression Results

	Mean	SD	Accessibility	Voluntariness	Norm	IT_Use
Accessibility	14.4	5.0				
Voluntariness	5.7	4.2	-.33			
Norm	22.8	5.7	.44**	-.36**		
IT_Use	21.1	5.4	-.03	.00	.45**	
KM_Activity	25.9	4.4	-.22	-.21	.31	.66*

Regression 1	Incremental R^2	Coefficient
Dependent:		
IT_Use		
Independent:		
Accessibility	.00	-.27
Voluntariness	.00	.18
Norm	.29*	.58*
Multiple R^2	.29	
Adjusted R^2	.29	
F	3.51*	

Regression 2	Incremental R^2	Coefficient
Dependent:		
KM_Activity		
Independent:		
Accessibility	.05	-.28**
Voluntariness	.09	-.31
Norm	.15	.05
IT_Use	.28*	.51*
Multiple R^2	.57	
Adjusted R^2	.39	
F	8.17*	

*$p<.01$
**$p<.05$

IT use norm on the extent of use of information technology. The result was a significant model ($F = 3.51$, $p < .05$) explaining 29% of the variance in IT usage (multiple $R^2 = .29$, adjusted $R^2 = .29$). The IT use norm was the only significant independent variable in the model (incremental $R^2 = .29$, $p < .01$). The second model tested the effects of accessibility, voluntariness, IT use norm and IT usage on the extent of knowledge management activity. The result was a significant model ($F = 8.17$, $p < .01$) explaining 39% of the variance in the extent of knowledge management activity (multiple $R^2 = .57$, adjusted $R^2 = .39$). As expected, IT usage had a significant effect on the extent of knowledge management activity (incremental $R^2 = .28$, $p < .01$). Accessibility was also a significant variable in the regression model, but the magnitude of its impact was very small (incremental $R^2 = .05$, $p < .05$).

DISCUSSION

The study undertaken in this phase of our knowledge management project focused on the relationships between IT usage norms, IT usage extent, and knowledge management activity. The results provide support for the portion of the model (Figure 2) that deals with these constructs. The results of the analysis of the subjects' responses supported the expected positive relationships between IT usage norms and IT usage levels and between IT usage levels and knowledge management activity levels. Given the small size of the sample and the limited relationships explored in this study, caution is necessary in drawing conclusions from the analysis. The results of the study suggest that organizations that want to see more knowledge management activity should encourage the development of organizational norms favoring the use of information technology. Actually creating that sort of environment may require the use of rewards and incentives that reinforce the positive effects of supportive messages from management and the expenditure of the funds necessary to ensure technology availability. Further tests of the structural, cultural, and technological influences on knowledge management should be conducted in order to gain additional insight into the factors that encourage knowledge management activity. Future studies should also explore whether increased knowledge management activity has a positive effect on organizational performance.

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