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December 2003

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Wai Boh
Carnegie Mellon University

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KNOWLEDGE SHARING MECHANISMS IN PROJECT-BASED KNOWLEDGE WORK: CODIFICATION VERSUS PERSONALIZATION

Wai Fong Boh
Graduate School of Industrial Administration
Carnegie Mellon University
Pittsburgh, PA USA
wboh@andrew.cmu.edu

Abstract

The rise of networked computers has made it possible to codify, store, and share certain kinds of knowledge more easily and for less cost than ever before. With computer-based information technologies playing an increasingly important role in how organizations store knowledge, electronic databases for people to share knowledge and information have become even more widely available. Despite the benefits of codification as a knowledge-sharing mechanism, it can be costly and difficult to develop, adopt, and maintain a database of such codified knowledge. Given such costs and difficulties, it becomes critical to identify when it is effective to use codification as a knowledge-sharing mechanism. There has been a lack of focus in prior research on examining the portfolio of both formal and informal knowledge-sharing mechanisms available for organizations, and on examining whether there are circumstances in which knowledge-sharing mechanisms other than codification may have been more effective in the first place, considering the cost of codification. This study thus examines codification and personalization (sharing of knowledge through direct person-to-person contacts) as two types of knowledge-sharing mechanism. Focusing on the codification versus personalization dimension of knowledge-sharing mechanisms, we examine the conditions that affect when it is more effective to use a codification approach versus a personalization approach for knowledge sharing in project-based knowledge work. We hypothesize that knowledge equivocality, task frequency, knowledge-seeker's social network, and knowledge stickiness will affect the effectiveness of these two types of knowledge-sharing mechanism. The hypotheses are empirically tested in a professional service firm that builds up its knowledge and capabilities through conducting project work.

Keywords: Organizational learning, knowledge work, knowledge workers, knowledge networks, knowledge management systems

Introduction

The rise of networked computers has made it possible to codify, store, and share certain kinds of knowledge more easily and for less cost than ever before. Codified knowledge can be a good mechanism to store large amounts of knowledge, serving as a means of creating an organizational memory for all employees (Goodman and Darr 1998). With computer-based information technologies playing an increasingly important role in how organizations store knowledge (Olivera 2000), electronic databases for people to share knowledge and information have become even more widely available. An example of using codification as a knowledege-sharing mechanism is the use of a shared database to keep track of a customer support organization interactions with customers as described by Orlikowski (1996). The organizational memory of the history of the relationship of the company with its customers enabled specialists to follow up on what their colleagues had done when an existing customer called.

Despite the benefits of codification as a knowledge-sharing mechanism, it can be costly and difficult to develop, adopt, and maintain a database of such codified knowledge. Given such costs and difficulties, it becomes critical to identify when it is effective to use codification as a knowledge-sharing mechanism. There has been a lack of focus in prior research on the portfolio of both formal and informal knowledege-sharing mechanisms available for organizations, and on examining whether there are circumstances in which knowledege-sharing mechanisms other than codification may been more effective in the first place, considering the cost of codification.

Other than codification, another strategy for sharing knowledge within an organization is the personalization strategy (Hansen et al. 1999). Personalization as a knowledge-sharing mechanism is concerned with the use of people as a mechanism for transferring knowledge. Knowledge shared through a personalization strategy will be closely tied to the person who developed it and will be shared mainly through direct person-to-person contacts. Individuals are effective carriers of knowledge because they are able to restructure knowledge so that it applies to new contexts (Allen 1977). Personalization also allows for discussions and sharing interpretations that may lead to the development of new knowledge (Prencipe and Tell 2001). A good example of the use of personalization as a knowledge-sharing mechanism is the use of story-telling among technical representatives (Orr 1990) to share experiences. These stories were extremely useful for solving problems that have not been encountered previously, but had various aspects embedded in the problems faced by others in their previous encounters. Given that a variety of knowledege-sharing mechanisms are likely to be found in any one organization (Prencipe and Tell 2001), this study examines what task and individual factors affect when each type of learning mechanism is likely to be more effective.

Knowledge Work in Project-Based Organizations

In project-based organizations, the knowledge, capabilities, and resources of the firm are built up through the execution of projects (Hobday 2000). Professional service and technical organizations, such as research government contractors, accounting firms, and software engineering firms, are typical examples of project-based organizations, where a project is often a major business endeavor and the normal mechanism for executing new business opportunities (Hobday 2000). Having a strong focus on projects raises questions about how such an organization learns and builds up its knowledge capabilities and resources. The temporary nature of the projects imply that new human encounters and relationships take place whenever a new project is started, which may increase the barriers to learning from the previous experience of others (Prencipe and Tell 2001). Each project is customized, thus it tends to differ from another in several, critical aspects, and each may entail heterogeneous activities that may well not be repeated in successive projects. Despite this lack of routineness of the projects, ideas or knowledge from one project might solve the problems of another, if connections between existing solutions and problems can be made across the boundaries between them (Hargadon and Sutton 1997). Common problems may also be encountered across different projects and effective sharing of knowledge across projects can reduce the organizational costs of reinventing the wheel. How, then, does a project-based organization ensure that the necessary knowledge is shared among their employees? Given the importance of knowledge as an essential resource and a primary source of competitive advantage (Empson 2001), this becomes a critical question for professional and technical service firms.

While there has been empirical work on organizational learning and knowledge-sharing mechanisms, most of the work has been descriptive in nature, focused on describing the types of learning mechanisms used in various organizations, or focused on the manufacturing and service industries. With the growing importance of knowledge work, it is important to examine whether the advantages of experience evident in manufacturing tasks are replicated in knowledge work.

This study attempts to address these problems in the literature. First, we focus on the study of knowledege-sharing mechanisms as a more operationalistic concept of the organizational learning process than concepts that pertain to understanding as it takes place within the minds of managers, which is hard to identify and measure (Daft and Huber 1987). We define a knowledge-sharing mechanism to be a mechanism for accumulating, storing, interpreting, retrieving, and applying know-what, know-how, and know-why that is relevant to the performance of the organization and its members. Such mechanisms are not only restricted to formal processes adopted by the organization, but also include informal practices (Brown and Duguid 1991). The knowledge-sharing mechanisms are the means by which individuals access knowledge and information not only from other actors, but also from the organizational memory embedded in the culture, routines, structure, and ecology of the organization. Second, to address the lack of theory on the effectiveness of different knowledege-sharing mechanisms, we develop hypotheses about conditions under which various intra-organizational knowledege-sharing mechanisms are more effective. This answers the question of when organizations should use different mechanisms for sharing knowledge with one another and across projects. Third, we empirically test our hypotheses to assess the validity of our theories and to ensure the operationalism of our constructs. Focusing on the codification versus personalization dimension of knowledege-sharing mechanisms, we examine the conditions that affect when it is more

effective to use a codification approach versus a personalization approach for knowledge sharing in project-based knowledge work.

Theory and Hypotheses

This study focuses on problems faced by individuals and groups as a unit of analysis. The central tenet of the study is that the relative effectiveness of the knowledege-sharing mechanisms depends on the characteristics of the tasks, the individual in the organization who is attempting to accomplish the task, and the characteristics of the knowledge that is sought to complete the task.

Knowledge Characteristics: Ambiguity

A key factor driving when formal, codification knowledege-sharing mechanisms are more appropriate than informal, personalization knowledge-sharing mechanisms is the need for equivocality reduction in the knowledge sought (Daft and Huber 1987). Equivocal knowledge is knowledge that needs to be interpreted. When professionals observe an event, the information cue may be ambiguous and have several interpretations. When knowledge is ambiguous and there is a great need to reduce equivocality of the knowledge sought (e.g., transmission of knowledge on know-why, such as why one proposal is better than another), it is more effective to use personalization as a knowledege-sharing mechanism, as it presents richer communication channels. When information is sought by personalization, discussions can be held and clarifications can be made while knowledge is shared between two or more parties. Such discussions and clarifications can aid in coming to a better understanding of the knowledge and information being shared, and hence facilitate the development of a more accurate interpretation of the knowledge being shared. On the other hand, when knowledge is nonambiguous and there is a greater need to transmit and distribute the information than to reduce the equivocality of the knowledge shared, it is more effective to use more formal, codification knowledege-sharing mechanisms. This is because such mechanisms serve as an effective way to record and store potentially relevant information and to distribute the information to relevant parties in a consistent manner. With available access to codified knowledge and information, nonambiguous information and knowledge such as know-what (e.g., what sections to include in a proposal) is more effectively shared through formal, codification mechanisms. Hence, we hypothesize that

> H1: The more equivocal the knowledge sought for a task, the more effective personalization knowledge-transfer mechanisms will be for sharing the knowledge.

Task Characteristics: Frequency with Which Task Is Repeated Within a Domain

Hansen et al. (1999) propose that there is a greater tendency for organizations to use the codification strategy when they sell relatively standardized products that fill common needs. Conversely, there is a greater tendency for organizations to use the personalization strategy when they provide highly customized solutions to unique problems. Hence, codification can be effective when a company is dealing with similar problems repeatedly. If an organization sells relatively standardized products that fill common needs, the tasks that they conduct are likely to be repeated, and in the case where the tasks are repeated, the same knowledge is more likely to be reused. Thus, the codification strategy may be more suitable in this respect, as the flexibility of human communication may not be necessary to reapply existing knowledge. Translating this to the task level of analysis, this implies that the greater the frequency with which a task is repeated, the greater the tendency for organizations to use the codification strategy.

The concept of task repetition, however, needs to be clarified. There are several different ways in which a task can be repeated within an organization. A task that is repeated within an organization may be conducted by the same person (e.g., a nurse who is in charge of registering patients is the only person who has to repeat the task), or it may be conducted by different people (e.g., all project managers have to write proposals to bid for projects, and while the organization produces many proposals, each project manager may only have written a few proposals on their own). If the same person repeats a task, there is less need to codify any information that may be required for the task, as the information or knowledge will be more efficiently accumulated through experience and repetition. If different people repeat a task, however, there may be a need to share information across individuals as more than one individual may require the same type of information. In the case of a project-based organization, we expect to see repetition of some tasks by different people within the same domain that would require the same information. As a result, sharing of such knowledge may be required. In such cases, whether a codification or personalization knowledge-transfer

mechanism is suitable would depend on the frequency with which the information is sought (Hansen et al. 1999). We hypothesize that

H2: The more frequently the task is repeated, the more effective codification knowledge-transfer mechanisms will be for sharing the knowledge required to complete the task.

Social Network

Networks of individuals can be a powerful means of storage and retrieval of the organization experiential knowledge. Research has shown the important role of social networks in information sharing (Granovetter 1982) and suggests that social networks contribute to knowledge sharing within organizations (Hansen 1999). The social capital of individuals allows individuals easy access to others, facilitating the development of intellectual capital by affecting the conditions necessary for exchange and combination to occur (Nahapiet and Ghoshal 1998). Given that individuals have a general preference for obtaining information from other people rather than from documents (Allen 1977), there may be a greater preference for individuals to adopt the personalization approach for knowledge sharing rather than the codification strategy. This strategy, however, may be limited by individuals social network. In order to be able to approach someone for knowledge, the necessary transactive memory of who knows what must first of all exist. The social capital of an individual not only affects the individual's transactive memory, but also facilitates access and ease of approaching another individual for knowledge. Hence, we hypothesize that the social network of an individual affects the effectiveness of informal personalization as a knowledge-sharing mechanism.

H3: The denser the social network of an individual, the more effective informal, personalization knowledge-transfer mechanisms will be for sharing knowledge.

Cost of Codification

While there are advantages to sharing knowledge through codification, there are also costs involved. First, the success of such a knowledge database hinges on many factors such as the ability of the database to achieve a critical mass of users, and the ability of the organization to convince individuals to contribute their knowledge into the database (Goodman and Darr 1998). Even if contributions to the database are automatically captured (e.g., bulletin boards) or require little effort on the part of the contributors, users of the database often suffer from the problems of information overload, difficulties in finding the relevant information, and inability to obtain information and knowledge of sufficient quality (Hansen and Haas 2001). Maintenance of a database also poses serious problems and costs to companies. Companies thus need to consider the trade-off between the cost and benefits of codification. Codifying knowledge that is very sticky (Von Hippel 1994) or costly to acquire and transfer may be very costly and ineffective. Such knowledge may require the understanding of much contextual information in order for the prior experience to apply, or it may be very tacit in nature. Hence, we hypothesize the stickiness of the knowledge that affects the cost of codification of such knowledge can make it ineffective and too costly to adopt the codification knowledege-sharing mechanism even if the task factors appear to make it favorable to do so.

H4: The cost of codification of a type of knowledge will moderate the long-term impact of the task factors on knowledge sharing effectiveness.

Methods

To test our hypotheses, we study the use of various knowledge-sharing mechanisms in a medium-size applied research and professional service organization. We plan to collect data on the problems that researchers face in the course their of work, and examine how they share knowledge across individuals and across projects to solve their problems.

Organizational Context

Research Inc. (a pseudonym) forms projects to do research, consulting, and technical work for other organizations. Its customers include government agencies and private and public companies. Peer organizations in the industry include RAND, American

Institutes for Research, and Westat. The organization is a multi-location firm that creates project teams to bid competitively for work in domains such as education, health, and information services.

Research Inc. is an appropriate setting to study our research problem. As a research and professional service firm, its key resource is the expertise of employees. Over 80 percent of the staff are professionals, and over half of these employees have a doctoral degree. Given the importance of knowledge as a resource in the firm, and the wide usage of teams to supply the complex mix of services required by clients, effective knowledge sharing within and across project teams is critical for project teams to work together. Hence, it presents an interesting opportunity to study how knowledge is transferred from one project to another based on the use of different knowledege-sharing mechanisms. In addition, the organization has recently started to develop an organization intranet as a repository for various documents and reports, which serves as a good example of the use of codification as a knowledge-sharing mechanism.

Data Collection

We plan to use a variety of methods for data collection. The triangulation of various techniques of data collection provides multiple perspectives on issues and allows for cross-checking of existing and emerging concepts. First, unstructured interviews will be conducted to obtain information about the types of knowledege-sharing mechanisms used, and the knowledge sharing culture in the different units of the organization. Through these interviews, we hope to identify critical incidents of effective and ineffective knowledge sharing. As a behavior-centered methodology, the critical incidents technique was developed to identify behaviors characteristic of effective and ineffective job performance (Flanagan 1954). Interviewees were asked to describe critical incidents where the sharing of knowledge, or lack thereof, with colleagues has positively or negatively affected their work on a project. Observations of staff meetings and project meetings will also be conducted to identify examples where problems have been identified and knowledge sharing through collective discussion resolves the issues or provides further leads for subsequent problem solving. Ongoing access to the intranet and analyses of intranet logs to examine the types of information people access most often will also provide a means to triangulate the data from the above sources.

Table 1. Formal and Informal Knowledge-Sharing Mechanisms Used by Research, Inc.

	Codification	Personalization
Formal	• Database of project abstracts • Database of resumes and self-classified expertise categories • Staff Directory • Project Directors Manual • File sharing system for prior project proposals • Meeting minutes • Proposal Manual • Announcements of new project awards, new staff, new presentations and publications, and newsworthy information	• Monthly meetings to keep colleagues informed about other projects • Senior staff as project and program reviewers • Project Directors brown bag meetings for sharing experiences • Meetings • Brown bag presentations to allow others to learn about specific projects • Sharing of common researchers across projects that are in similar domains to ensure they have adequate overview of all projects within the same domain area • Mentor-protégée and Buddy relationship
Informal	• How-to Manuals (e.g., for data collection, for managing listservs) • Telephone conversations documentation	• Brain-storm with other colleagues • Broadcast e-mails to specific groups to request for certain information • Informal project debriefs • Referrals to experts or other colleagues who have been involved in prior projects and proposals • Informal one-on-one office visits for more personal communication • Hallway conversations and informal lunch-time conversations • Imitation of colleague behavior • Role playing

Preliminary Results

We present the preliminary qualitative analysis of the interviews we conducted. First, based on the interviews, we derived a list of knowledge-sharing mechanisms used by the researchers in the organization to share knowledge and learn across projects (Table 1).

Next, we provide examples of effective and ineffective knowledge sharing critical incidents that interviewees provided and illustrate how task and knowledge factors moderate the impact of the knowledge-sharing mechanisms on knowledge sharing effectiveness (Table 2).

Table 2. Examples of Effective and Ineffective Knowledge Sharing Critical Incidents

Effective Knowledge Sharing

1.	A researcher learned about Project A in the monthly meeting. When a client approached him for a new project (Project B) that was similar in nature to Project A, this researcher approached the project director of Project A, who was also his good friend. The research team from Project A and Project B thus came together for meetings. Project B learned the strategies and approaches adopted by Project A, and reused many of the materials and approaches of Project A. That helped to make Project B work more efficient.					
	Tasks	**Knowledge Ambiguity**	**Task Frequency**	**Social Network**[a]	**Knowledge Stickiness**	**Support for Hypotheses**
1.1	Learning about the nature of Project A through formal, personalization knowledge sharing mechanism	Low	High	NA	Low	H1, H2, H4 not supported
1.2	Sharing of knowledge between Project A and Project B through formal and informal personalization knowledge sharing mechanism	High	Low	High	High	H1, H2, H3, H4 supported

Ineffective Knowledge Sharing

2.	A researcher was involved in a project (Project C) that requires data collection from schools in a particular district. She had been working on obtaining access to the target population of subjects in the district for the past four months. One day, when she was having lunch at a conference with colleagues in Research Inc., she realized that another colleague was working on another project (Project D) with schools in that same district and had the necessary contacts that would help Project C. As a result, Project C was able to benefit from the contacts of Project D, but not before 4 months of effort and hard work had been spent trying to connect with the same target population of schools.					
	Tasks	**Knowledge Ambiguity**	**Task Frequency**	**Social Network**	**Knowledge Stickiness**	**Support for Hypotheses**
2.1	Learning about other projects that target the same subject population through informal, personalization knowledge sharing mechanism	Low	High	Low	Low	H1, H2, H3, H4 supported

[a]Social network for the relevant individuals can be cross-checked with archival data to determine the extent to which individuals have worked together (or the centrality measure of each individual.

Current Status

Initial unstructured interviews have been conducted with the IT director, three program directors, and 14 researchers to gain an understanding of the intranet and the types of mechanisms that the organization uses to share knowledge among individuals and within and across organizational units and projects. Further interviews will be conducted in subsequent months. The results of the qualitative analysis of interview are expected to be available for presentation the conference.

Acknowledgments

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