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KMS, Organizational Learning, and the Human Metaphor
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Introduction
The importance of knowledge has long been recognized. In 1597, Sir Francis Bacon wrote, “Knowledge is power” (Bacon, 1597). More recently there has been an increasing recognition that “knowledge,” as opposed to “data” or even “information,” is the most critical organizational resource (Drucker, 1993).

Knowledge
Data can be defined as observations or facts without a context that gives it a broader meaning. When the context that surrounds data is retained, it becomes information. Only when information is meaningfully organized through experience, communication, or inference does it become knowledge.

Knowledge can take many forms. It can be either a “thing” to be accumulated or a “process” to be applied (Blacker, 1995). It can be either “tacit” or “explicit” (Sparrow, 1998). It can be “declarative,” “procedural,” or “causal” (Anderson, 1980). Finally, it can be held either by a “novice” or an “expert”. But, in all of these forms, knowledge is a human creation.

Organizational Knowledge and Learning
All knowledge acquisition takes place inside individuals (Simon, 1945), but for knowledge to become “organizational knowledge,” it must be shared throughout the organization (Levitt and March, 1988; Lipshitz, et al., 1996; Nonaka and Takeuchi, 1995).

Most organizations already have a basic form of knowledge base in their standard operating procedures (SOPs), company policies, transaction records, etc. But organizational knowledge also includes the combined experience of all of the organization’s employees – the human capital of the firm (Penrose, 1959, 1995). This type of knowledge, diffused throughout the organization, is called “migratory knowledge” (Badaracco, 1991) in that it is only “on loan” to the organization as long as the individual that holds it remains an employee. It is the combination of the diffused and migratory nature of this knowledge, along with its continual creation, that makes the sharing of this knowledge both difficult and imperative. Unfortunately, much of an organization’s newly created “knowledge” is never captured or shared; it never moves beyond those who actually experienced its creation. Thus, this non-collected, non-shared knowledge is continually being lost as employees simply forget their experience or leave the organization.

Nonaka proposed the knowledge-creating company, or one involved in “knowledge management,” as an example of organizational learning (Nonaka and Takeuchi, 1995). Lipshitz, et al have extended the Nonaka definition as the “process through which organization members develop shared values and knowledge based on past experience of themselves and others” (Lipshitz, et al., 1996). This definition not only emphasizes that the creation of knowledge is a human process, but that this knowledge becomes organizational as it is shared with others and the effects of its use materialize at the organizational level (Levitt and March, 1988).

I believe that the development of a successful knowledge management system, the processes by which organizations identify, capture, systematize, categorize, and disseminate knowledge from and to members of the organization, is the crucial factor in being a learning organization. These are the same processes that individuals engage in as they learn and manage knowledge. Therefore, I propose a biological/cognitive metaphor for the structure and functioning of an effective organizational knowledge management system. Specifically, I propose that the information processing of the human cognitive system, as modeled by the Adaptive Character of Thought – Revised (ACT-R) model (Anderson, 1996), is an appropriate metaphor for the categorization and dissemination processes that must be utilized by knowledge management systems within learning organizations.

The Human Neurological/Cognitive Systems
Human cognition may be defined as the collection of mental processes and activities used in perceiving, remembering, thinking, and understanding. This cognitive system has both a set of biological/neurological components (the brain/nervous system) and a production-system architecture (the “thinking” component as described by the ACT-R model). The basic biological/neurological components of the human cognitive system are: (1) sensory registers, (2) executive control processes, (3) short-term/working memory, and (4) long-term memory.

The biological/neurological components of the human memory system are shown in Figure 1. The model shows the several levels of processing prior to adding information to long-term memory. These processing
levels allow for the identification of information that is considered worthy of further processing (selective attention), the capture and systemization of this information (cognitive attention, rehearsal/maintenance elaboration), and its dissemination (retrieval/reconstruction). However, the dissemination process is more fully described by the cognitive system. The model also shows how information may be lost along these processing stages.

![Figure 1: The Memory System](image)

**Cognitive Model: Memory System as Metaphor**

Just as in the human system, sensory registers interface with the external environment; employees function as an organization’s sensory registers to its external environment. The first information processing challenge in the human system is that of sorting through the multitude of sensory inputs to identify and select those that warrant further processing. An organization faces a similar problem; each of its employees can be considered an analogue for an individual sensory modality, and each employee will potentially produce information/knowledge to be processed. While there is not an obvious priority for the processing of input from the human senses, there is a priority in an organization. The probability of significant knowledge is likely higher from the organization’s managers and knowledge workers than from employees lower in the hierarchy.

The larger issue, however, is how to sort through all of the potential inputs to identify the important inputs. As a practical matter, only the employee that has had the experience is capable of the initial selection of that knowledge for input into the system. Any potential input not selected at this initial level is eventually lost. Thus, an effective knowledge management system must provide adequate incentives to encourage this reflection and input.

Once input is proposed for the knowledge management system, it must be processed to determine whether and how it should be incorporated into the organizational knowledge base. As in the human system, this can be done in several stages. The early part of this processing could be done by middle management, however, the ultimate decision must rest with reviewers capable of seeing the broad strategic picture.

While the identification, capture, and systemization of knowledge is an essential part of any knowledge management system, it is the sharing of the knowledge that is crucial. Organizations have been developing and refining methods of categorizing and disseminating their knowledge since their inception. Standard operating procedures, company policies, etc., are all ways to disseminate knowledge. While these methods may be effective in disseminating templates of procedures, not all knowledge can be templated. How does an employee faced with a situation identify strategies in the organization’s knowledge base that can help?

Some companies have adopted a library approach to their knowledge bases. The contents of the knowledge base are catalogued, and indices are developed to assist in finding a specific element of the knowledge base. However, like using a dictionary to find the spelling of an unknown word, the indexing system may not be helpful to all users. It is here the production-system architecture of the ACT-R model and its use of the concept of spreading activation should prove valuable.

In the human cognitive system, nodes of declarative knowledge are linked by procedural knowledge. These linkages provide the context of the knowledge stored. The strength of these linkages is based on either the depth of the processing that occurred when the nodes were stored in long-term memory or the number of times that the specific linkage since has been called upon (“fired”). The stronger the linkage between the nodes, the greater the association between the nodes. Any of these nodes can become a focal unit (the beginning point of a “spread” to associated nodes), simply by the declarative knowledge in that node being fired. An obvious linkage for any element of an organizational knowledge base is its functional area, its knowledge “silo.” However, while a specific “silo” can provide access, other linkages will also be appropriate for proper cataloguing. An expansive key word system that catalogues knowledge multi-dimensionally is needed. The comprehensive-ness of this multi-dimensional catalogue is analogous to the strength of the linkages in the human system. Access is then a browsing function with appropriate filters to quickly cull inappropriate information. Just as the ACT-R model and spreading activation allow for the identification of the appropriate portions of the human knowledge base with a minimum of cognitive resource expenditure, a corporate knowledge base should be similarly user friendly.
The Research Framework

The linkage between information technology and individual/organizational performance has been an ongoing concern each. “Task-technology fit” has been proposed as an explanation of how technology leads to performance impacts (Goodhue and Thompson, 1995). While this “fit” theory operates on a number of levels, at the organizational level “fit” and utilization or adoption have been linked (Cooper and Zmud, 1990; Tornatzky and Klein, 1982). In order for a knowledge management system to “fit” within an organization, there must an understanding of the expectations, or tasks, that will be applied to the system. The cognitive model provides a method of understanding the expectations placed on a knowledge management system. While task-technology fit theory provides a mechanism, the technology-to-performance chain, for an overall, or socio-technical, review of an organization’s structure for an analysis of the effectiveness of that system.

The Research Objective

The objective of this research is to learn more about the structure and policies governing companies’ knowledge management systems in general, and, in particular, how these structures and policies contribute to the effectiveness of the knowledge management systems. The research will address social, technical, and business aspects of knowledge management relative to:
- the social and technical structure of the knowledge management system,
- the policies and procedures in support of the system, and
- how the system supports corporate goals.

The Research Methodology

The three most common purposes of research are: (1) exploration, (2) description, and (3) explanation. Exploratory research is most appropriate when little is known about the topic by the researcher or when the topic is relatively new. Unfortunately, exploratory studies frequently provide more questions than answers. Descriptive research is used to carefully describe situations and events. From these descriptions, the researcher can then attempt to examine “why” the observed situations exist (Babbie, 1998).

The topic of knowledge management systems is relatively new, with only a little empirical research into their application and use in organizations. I hope that in learning more about them, I can develop enough questions from which to build a program of research. Additionally, as I have already proposed a cognitive model, I hope to be able to find evidence to support or refute this model and use these data to refine it. Therefore, this research also has a descriptive nature.

No research methodology provides a perfect mix of precision of measurement, realism of context, and generalizability. Therefore, all research involves the exercise of choice on the part of the researcher. A decision to emphasize one of the three elements necessitates some level of retreat from the other two (McGrath, 1984). Given the primarily exploratory nature of this research, the case study method would seem to be most appropriate. The case study method, which emphasizes the context of the research, is generally appropriate for studying areas and topics for which the variables of interest have not been clearly identified (Benbasat, 1987).

This research will be conducted through a series of semi-structured interviews with eight to twelve individuals in each participating organization including (if possible):
- the sponsor of the knowledge management system,
- the project manager of the knowledge management system,
- personnel involved in the final review of proposals for inclusion in the corporate knowledge base,
- personnel involved in the cataloguing of new knowledge being added to the corporate knowledge base,
- personnel involved in any intermediate reviews of proposals for inclusion in the corporate knowledge base,
- personnel who have submitted proposals to the corporate knowledge base,
- personnel, who from their position could have submitted proposals to the corporate knowledge base, but have not,
- personnel who have utilized the corporate knowledge base, and
- personnel, who from their position could have utilized the corporate knowledge base, but have not.

These interviews will consist of a series of both open- and close-ended questions related to: (1) the social and technical structure of their knowledge management system, (2) the policies and procedures in support of the system, and (3) how the system supports corporate goals. Probes into promising areas will follow the structured questions. These interviews are projected to last one-hour each. Interviews will be tape recorded and transcribed to facilitate the categorizations. Participants will also be asked to review interview transcripts to access their accuracy.

References are available from the author