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A Conceptual Framework for Building Knowledge Management Systems

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Abstract

Organizations today have come to the realization that their key asset and the only sustainable source of their competitive advantage is their people's knowledge. In this paper we draw on the knowledge market analogy and integrate the consideration of organizational culture and attributes, knowledge management guiding principles and leading success factors into the design of a conceptual framework for developing knowledge management systems. This development framework is intended to lay groundwork for effective knowledge management.

Introduction

Technological advancement has allowed many businesses the ability to achieve huge performance improvements in the way they conduct business. Since the earlier days' total quality management movement, an increasing emphasis has been placed on customer-centered improvement strategies via adding product/service value or differentiation to quality as the determinants of competitive success. This culminates in the recent business process re-engineering for a company's value chain. With the invention of Web-based technology, the focus has been extended to customer relationship management (CRM). However, not until recently has management realized that the redesigning of the primary and support activities in a value chain must be infused with knowledge and insight. Technology solutions alone are simply not enough (Klasson, 1999). Today, more businesses have come to the realization that their key asset and the only sustainable source of their competitive advantage is their ability to apply organizational knowledge effectively (Tiwana, 2000; Silver, 2001).

Each organization has its own culture, employees, background, and other idiosyncratic attributes. Successful application of organizational knowledge is strongly affected by the combination of these organizational-unique attributes. Actually, effective application of organizational knowledge is more of an organizational problem than a technological or technical problem. Several roadmaps and models for knowledge application have been proposed based on systems development methodology (Tiwana, 2000); however, the consideration of organizational attributes is either lack in the model or only implied in the development stages. In addition, most of the current models are mainly for large organizations with emphasis on technology or techniques. In this paper, we integrate the consideration of organizational attributes and other non-technological development principles and success factors into the design of a conceptual framework for effective knowledge management and application.

The rest of this article is organized as follows: In next section, we discuss the concept of knowledge management, the guiding principles and success factors for knowledge management, and current methodologies for knowledge management. We then propose a conceptual framework for knowledge management. This is followed by the summarization and discussion of our conceptual framework. Our conclusion and future research topics are discussed in the last section.

Knowledge Management

Knowledge and Knowledge Management

In recent years, many Fortune 500 companies have invested in creating an infrastructure within their organizations that can help employees access the knowledge they need to perform their work more effectively. According to Davenport & Prusak (1998), knowledge is the result of problem solving or decision-making experiences, and is usually embedded in the capability of selecting,

organizing, or manipulating information for specific tasks. In organizations, knowledge usually takes the form of rules, guidelines or procedures.

Management of organizational knowledge has been called the "fifth discipline" (Hoare, 1999) in an organization. According to GratnerGroup, knowledge management (KM) is a discipline that promotes an integrated approach to identifying, managing, and sharing all of an enterprise's information needs (Lee, 2000). Klasson (1999) points out that KM requires the ability to create and retain greater value from core business competencies for generating competitive advantages. In other words, the primary goal of KM is to create maximum competitive advantages via leveraging the best practices discovered in one part of the organization in building a collection of reusable assets that can be shared among the people in an organization (Silver, 2001). Many firms already have the necessary technologies in place, but what they need to truly exploit their knowledge is strong collaboration and business processes that can take advantage of the IT infrastructure.

Guiding Principles for Knowledge Management

Several principles play key roles in affecting effective KM, and form the foundation upon which to build KM systems. Based on previous KM research findings and the principles of systems development, we propose the following key principles for a successful knowledge management project:

- *People Focus.* Knowledge originates and resides in people's minds. These are those who own the means of production—their knowledge—and will be the ultimate determinant in a company's success (Webber, 1993).
- *Required Trust*. To share knowledge requires trust. Trust facilitates the exchange of knowledge (Fitter, 2000), and it creates the invisible ties that bind people and companies together and convert knowledge sharing into personal relationships (Webber, 1993).
- *Technology as an Enabler*. Technology is a tool that enables knowledge behaviors. Though knowledge resides in people, not in technology, technology can connect people, store and retrieve virtually unlimited amounts of content vital to the life and growth of an organization (Davenport & Prusak , 1998).
- *Encouragement & Reward*. To be truly effective, and in the interest of further promoting trust in knowledge sharing, rewards and encouragement provide the needed motivation. Meaningful rewards may be used as a function of performance evaluations, and can have the effect of reinforcing the support of the KM project as a whole.
- *Management Support*. In many cases, the mere feasibility of such projects would be crippled from the start without management support due to the project's dependence on the funding, legitimacy, and recognition that usually come from top management.
- *Quantitative and Qualitative Measurements*. Finally, measurements that look at qualitative as well as quantitative factors are necessary to adequately evaluate a KM project. Although the task of measuring the success of a KM project can be difficult, the need to provide valuable feedback on KM's effectiveness grows as electronic business (EB) and IT ventures are driven by the leveraging of valuable information (Delio, 2000). Some measures proposed by Davenport, De Long, & Beers (1997) include: Project resource growth, knowledge content and usage growth, project independence, and financial return to the project or the organization as a whole.

These principles play important roles in guiding any knowledge management endeavor. They should be considered throughout the conceptual framing process as well as development process.

Leading Success Factors for Knowledge Management

In addition to the guiding principles mentioned above, several key success factors provide benchmarks that can lead to a successful project. Leading success factors proposed by Davenport, De Long, & Beers (1997) are as follows:

- *Knowledge-friendly culture*. Creating a "knowledge-friendly" culture could be the single-most effective ingredient to a successful knowledge project—and also one of the most difficult to apply. According to the findings of a recent survey, one of main obstacles to KM implementation is the absence of a sharing culture in the organization (Dyer and McDonough, 2001). A culture that encourages knowledge development and sharing must be built on trust. It must be motivating and rewarding. In addition, participants should feel free to explore and *learn* above all.
- *Organizational and Technical infrastructures*. The organizational and technical infrastructures form the backbone of a knowledge management system. However, defining technology resources necessary for storage, access and communication must be balanced with the human resources. On the technical side we are concerned with the tools that enable the organizational learning process. On the organizational side, we are concerned with defining the roles and organizational groups. The key is to spread the responsibility as much as possible and apply the technology to make the process more effective and efficient.

- *Standard, flexible knowledge structures*. Though the nature of knowledge is fuzzy and categories and meanings of knowledge vary among different individuals, some form of structure is important for a repository of knowledge to effectively deliver knowledge to its users. Recent studies show that categories and keywords are promising in providing the task-specific and -relevant information to users (Delio, 2001).
- *Multiple channels for knowledge transfer*. The key factor with knowledge transfer is to use a variety of methods. Some methods are certainly more effective than others, but the reliance on even one effective method has proved less reliable than using several (Davenport, De Long, & Beers, 1997). Combining these methods to benefit from all of their individual advantages will provide the long-term solution.

According to Malhotra, there is a growing concern for the increasing dependence companies have for technology in knowledge management (Hildebrand, 1999). Many people tend to rely too much on the technology and too little on other important factors. This is mainly due to several misconceptions about KM in organizations (Malhotra, 2000). People tend to expect that KM technologies will deliver the right information to the right person at the right time, store human intelligence and experience, and distribute human intelligence.

A KM system is not equivalent to a database system. A KM system should provide the ability to foster ongoing learning, collaborative problem solving, and knowledge sharing for people in an organization. The business environment in which we function is changing rapidly. Thus, we must seek to create a system that synergistically combines information-storage-and-processing and knowledge application capabilities in facilitating the task of changing policies in response to new business conditions. An organization will be measured not in the amount of information it can obtain, but how well it can use the information to create knowledge. Unlike data or information, knowledge is embedded in people, and knowledge creation occurs in the process of social interaction (Sveiby, 1997). Humans actually play the most integral role in an organization's KM initiatives, and a truly successful KM system must be human-centered. Technology alone is not the solution to an organization's problems.

Current KM Methodologies

In responding to the aforementioned needs and issues, several knowledge management methodologies have been proposed. Nonaka & Takeuchi (1995) proposed a three-phase model for knowledge management, including knowledge acquisition, knowledge sharing, and knowledge utilization. Though this model provides a very general framework for KM, it does not incorporate explicitly organizational and cultural aspects into model building. In addition, it does not adopt a methodological approach to KM system development. Expanding Nonaka & Takeuchi's model and incorporating systems development principles, Tiwana (2000) proposed a four-phase model for KM: Infrastructure evaluation, KM system analysis, design and development, Deployment, and Evaluation. Though Tiwana's model is more rigorous than Nonaka & Takeuchi's model, it focuses mainly on the knowledge cycle process, and culture and reward structures are only mentioned briefly after the deployment phase. In addition, Tiwana's model pays little consideration to the issue of knowledge transfer.

Because of the lack of maintaining a balance between technology and organizational attributes in most of the current KM models, Liebowitz (2001) proposed a SMART (Strategize-Model-Act-Revise-Transfer) methodology for KM. This methodology is characterized by its rigor and its integration of KM into strategic goals of the organization. Cultural assessment and incentive structures are properly treated as the focus in the early phase, and development of channels for knowledge transfer is also designed into this methodology. However, implementation of the SMART methodology entails an enormous amount of resources which usually exceeds the affordability of small companies. Actually, this is resource-demanding methodology, and it will most likely succeed in large organizations, which have sufficient resources for implementation. On the other hands, small firms, with flatter organizational structure and less bureaucracy, are easier to maintain a sharing and trusting culture in the organization (Chiem, 2001). Capitalizing on this unique feature of small firms, we draw on the analogy of knowledge market (Davenport & Prusak , 1998) in proposing, in next section, a less complicated conceptual framework for KM systems development with major emphasis on organizational culture and attributes.

A Conceptual Framework for Developing Knowledge Management Systems

In this section we attempt to lay the groundwork for effective KM by proposing a conceptual framework for building KM systems based on organizational culture and attributes, KM principles, and KM leading success factors as discussed in the previous section. Our model is characterized by its reliance upon the knowledge market analogy. This conceptual framework is shown in Figure 1.

Our conceptual framework provides a blueprint for defining the necessary requirements planning for a successful implementation of a KM project. Basically, our framework consists of phases for addressing KM issues of Participants Identification ("who"), motivation identification ("why"), knowledge requirement or needs determination ("what"), and design ("how").

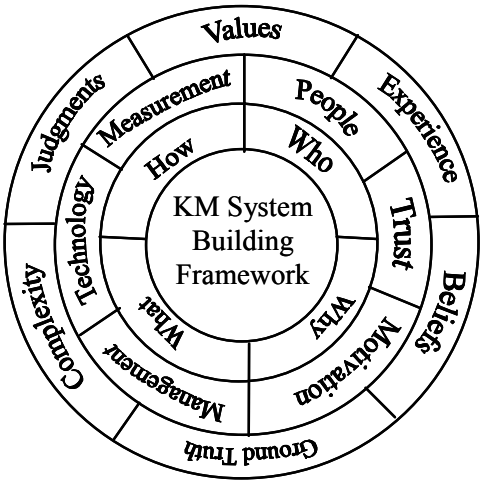

Figure 1. A Conceptual Framework for Knowledge Management System Development

Participants Identification

In an organization, employees are the major source of knowledge. The very first task for successful KM is the identification of participants involved in the knowledge environment. Participants identification can be explained by using the concept of a knowledge market (Davenport & Prusak, 1998). In a knowledge market one might find several buyers, sellers and brokers of knowledge. Knowledge buyers are those who are seeking to resolve complex issues that have no easy answers. They look for insights, judgments, and understanding that will make them more successful in their work. Knowledge sellers are those who are reputed to have substantial knowledge about a particular process or subject. These individuals are not always in plain view because they may be reluctant to share what they know or they may feel that their true power resides in the knowledge they hold. Usually, however, the lack of potential fair exchanges of knowledge presents the greatest obstacle to knowledge selling. Brokers are the facilitators. The brokers make connections between the buyers and the sellers. Usually, brokers play a key role in the exchange of knowledge in an organization because of their ability to span geographic, organizational, and departmental boundaries.

Motivation Identification

After identifying the participants, we need to address the issues why participants want to share or transfer knowledge in our environment. Davenport and Prusak (1998) found out that much of the resistance in many organizations to knowledge sharing activities stemmed from the participants' fear of not being able to receive a fair exchange. People will share their knowledge only when they expect to be able to receive some future benefit for the exchange. Many of the benefits sought are non-monetary.

Davenport and Prusak (1998) identified four main reasons why participants share their knowledge: Reciprocity, repute, altruism, and trust. Reciprocity deals with the interchangeability of the roles of knowledge participants. In general, reciprocity is not monetarily dependent, yet in some cases, salaries, bonuses or other tangible benefits may provide the exchange medium. Repute refers to the perception others have for a particular individual based on his or her willingness to share knowledge. Repute can bear tangible as well as intangible benefits. Someone who has a reputation for bearing (and sharing) expert-level knowledge on a particular topic can bring to him or herself substantial benefits in the form of job security or promotions. Company experts also bring repute to the organizations they work for. In some businesses like entertainment, consulting, and investment banking, knowledge will only be sought from those who have reputable knowledge. Occasionally, knowledge is shared for purely altruistic reasons. This is certainly the case with someone who is passionate about his or her knowledge. Altruism can play an important role in an organization if encouraged and cultivated. Trust is the most powerful factor for which knowledge is transferred. Three key factors should be followed to ensure that trust retains its power (Davenport & Prusak, 1998). First, the trust must be visible; people must see credit given for knowledge shared. Second, trust must be ubiquitous; it must apply to all individuals and all levels of the organization. And third, trust must start at the top; taking advantage of employees' knowledge should have no place in the upper ranks of management. Above all, management by example will play an important role in establishing trust as a medium of knowledge exchange.

Knowledge Requirement/Needs Determination

The next phase of knowledge project development is determining what will be transferred in the knowledge environment. At this phase, the importance of knowledge must be evaluated according to its relevance to organizational goals and objectives. Our main objective is to focus on the type of knowledge that will best meet the company's business objectives. Once we know that, we can determine how to facilitate transferring the knowledge to those who need it. As reported in the PR Newswire (2000), companies that do not align their knowledge management projects with their corporate objectives often squander millions of dollars in double-spending and excess cost.

From a knowledge market point of view, both the sellers and buyers have their own knowledge. In order to facilitate the knowledge transaction, we need to know what is known, and what do people want to know. Figure 2 shows what a knowledge seller knows and what a knowledge buyer knows as two distinct sets of knowledge. There might or might not exist some common knowledge between the two sets of knowledge. The idea of knowledge sharing hinges on the premise that there is, in fact, knowledge to be shared. Consequently, common knowledge can be disregarded. From Figure 2, there is a unique set of knowledge on each side which the other side does not own. It is the unique set of knowledge that forms the basis of knowledge exchange. Each side wants to know what it does not know and the other side knows. Figure 3 illustrates this situation. After the desire of each side has been clearly identified, the only question that remains is "how" to share the knowledge between them.

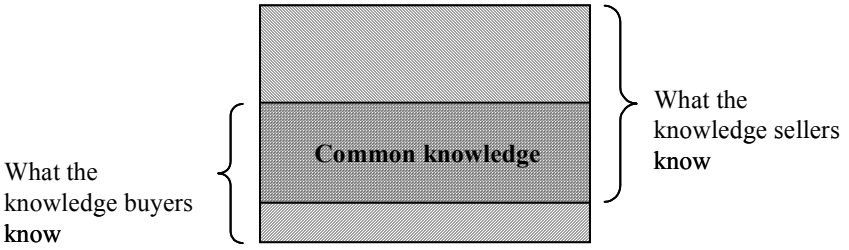

Figure 2. Distinct Sets of Knowledge Owned by Knowledge Sellers and Buyers

Design of Implementation Methods

Once an organization knows what it wants to do and what types of knowledge are required to accomplish the objectives set, it can then devise the type of system that will best deliver on these objectives. At this phase, the major task is to address the "how" issue—how to best satisfy the knowledge requirements of an organization. In a knowledge market, there have been several approaches for bridging the gap between what "we" know and what "they" know. One is to bridge the gap by sending knowledge back and forth via information technology, as conceptually shown in Figure 4. This approach may work for the most rudimentary of sales relationships, but for a true KM initiative it is insufficient. This approach can be called a "patching learning" approach, and can only work so long before redundancy develops and a scarcity of people to "send over" settles in.

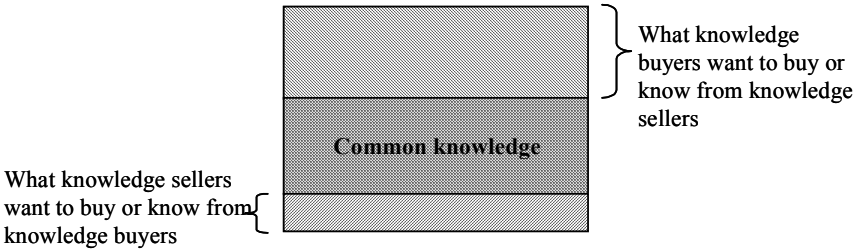

Figure 3. The Unique Sets of Knowledge Owned by Knowledge Sellers and Buyers

A successful KM project would incorporate a more comprehensive approach. It should actually converge the knowledge in a true "sharing" sense and the knowledge should flow in a cyclic direction, giving all participants the opportunity to benefit from the larger body of knowledge. Figure 5 illustrates the "Continuous Learning" approach. The essence of this approach is knowledge sharing. A trusting and sharing culture, rewards and encouragement, and top management's full support are all critical to the success of this approach. In a knowledge-sharing environment, new knowledge will be created through the sharing process, and the number of people who have the same knowledge will also increase. When KM initiatives instill a sharing-based continuous approach to learning, knowledge would continue to flow and grow in the organization. With this approach, all knowledge created within the organization remains within the organization. All parties can participate anywhere within the cycle. In essence, the knowledge drives the people, not the other way around.

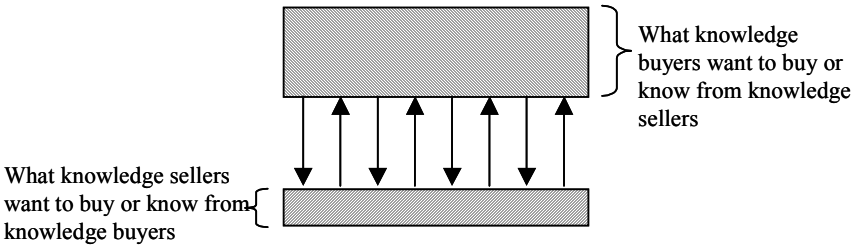

Figure 4. The "Patching Learning" Approach

Continuous learning is actually more an attitude towards knowledge sharing or a desire for more knowledge than a technological issue; however, this development approach is not possible without the use of technology. When people in an organization have strong passion for more knowledge, if they have the tools to effectively access it or share it, the results can be tremendous. Technology is incorporated in the KM system to enable faster, more efficient knowledge capturing and sharing, and would leave

the knowledge creation up to the people who hold it. Several techniques are available to meet the task, and can help transfer, assimilate knowledge into organizational core competence in increasing the competitiveness of the organization. We discuss three of them as follows:

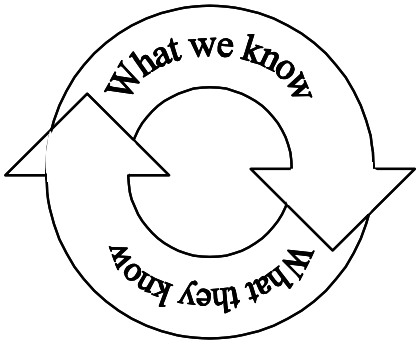

Figure 5. The Continuous Learning Approach

- *Knowledge Repositories*. This is a common form of knowledge project attempting to combine several types of documents into a central repository for retrieval (Davenport, De Long, & Beers, 1997). Knowledge repositories can be likened to libraries, and can be very effective for firms needing quick access to structured knowledge. Knowledge repositories might contain external knowledge, or that type of knowledge gained from external sources along with its respective commentary and review. Another type of repository might contain structured internal knowledge—material that is collected or prepared by individuals and placed in a central database for future use, review or retrieval by others. A knowledge repository might also include informal internal knowledge, usually in the form of discussion databases or bulletin boards. This type of information may be less structured, but it may provide additional insight not evident in formal documentation. Knowledge repositories fall short, however, in organizations where "tacit" knowledge is most effective. Other methods must be used to effectively transfer the tacit knowledge to other associates.

- *Knowledge Access.* By identifying existing knowledge as well as the people who hold it, knowledge access projects seek to facilitate actual knowledge transfer between individuals. Rather than a library, knowledge access projects function more like the Yellow Pages. They help knowledge seekers locate the individuals who have the knowledge they seek. Another difference between knowledge access techniques and knowledge repositories is in their technical implementation. Repositories generally exist in the form of electronic databases, whereas access techniques employ tools mainly for communication.

- *Knowledge Environment.* Knowledge environment techniques are mainly for building awareness and cultural receptivity to knowledge, initiatives attempting to change behavior relating to knowledge, and attempts to improve the knowledge management process. Knowledge environment efforts involve the efforts of the entire organization, including those of suppliers and customers. Norms and values are sometimes developed or changed in an effort to establish a "knowledge-friendly" environment. This type of effort takes a lot of coordination and a concerted employment of resources. It may be more effective in organizations that are less resistant to change in their corporate cultures, but the resulting benefits of a "knowledge-friendly" environment may provide long-lasting results to any organization.

Summarization and Discussion

Successfully determining the "who", "why", "what", and "how" of a KM project is absolutely essential to give form and structure to the project. Together, the answers to these questions constitute the project's conceptual framework. This process can be somewhat simplified when viewed systematically as a series of steps. To summarize, the basic steps are as follows: (1) Determine who the primary participants are, including the buyers, the sellers, and the brokers in the knowledge market. Also, How often do transactions take place and where? (2) Determine what is the motivation behind the knowledge transactions taking place in the knowledge market for the purpose of employing proper motivational strategies. (3) Determine the types of knowledge that will best deliver on the needs of the knowledge buyers in the knowledge market as measured according to the relevance to the business objectives and goals. (4) Determine the implementation techniques for transferring knowledge efficiently.

In many cases, a single implementation type may be inadequate to achieve the desired results. In such cases, a combination of project types can meet the requirements of an individual situation. The types of implementation techniques chosen depend many times on the amount of resources available to employ in the projects, the level of managerial support, and the ability of those in stewardship positions to communicate the benefits of participation to the rest of the organization.

Conclusion

In this paper we drew on the knowledge market analogy and integrated organizational culture and attributes, KM guiding principles and leading success factors into a conceptual framework for developing KM systems. This development framework

is intended to lay groundwork for effective KM. Our framework provides a blueprint for defining the necessary requirements planning for a successful implementation of a KM project. However, in our framework we did not investigate issues as to how to measure the contribution made by KM initiatives to an organization. One of the next topics we plan to pursue is the investigation of metrics associated with the economic value of KM initiatives. Another issue need to be addressed is about how to strike a balance between technology and organizational culture for the implementation of KM. Still, the emergent behavior arises from the interaction among the agents in the knowledge market is another worthwhile topic of future research.

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