A Review of Knowledge Management Models

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Abstract

Management caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings. The purpose of this paper is to critically review the various knowledge management models. The review found that the various knowledge management models varies in perspectives ranging from the basic assumption of the articulation and transfer of tacit and explicit knowledge to the more complex and complicated assumption that knowledge is intellectual capital and it is mechanistic in perspective as well as an important asset that has to be managed efficiently for firm's success.

Key Words: Knowledge management, models, process

INTRODUCTION

Knowledge and knowledge management is an escalating interest to both practitioners within organizations and to researchers. Knowledge management is becoming a core competence that companies must develop in order to succeed in tomorrow's dynamic global economy (Skyrme and Amidon, 1998). The importance of leveraging knowledge to increase efficiency and effectiveness within the organization is now widely acknowledged not only among large corporations and small business enterprises, but also among educational institutions. Valuable human and knowledge resources will be wasted unless management openly accepts and supports efforts to gather, sort, transform, record and share knowledge.

Nowadays, many organizations are launching knowledge management initiatives, believing that their well-intended effort will naturally result in the better exploitation of knowledge assets for business benefit. Managers in organizations are consistently looking for better ways to improve performance and business results by gaining new understandings into the underlying but complex mechanisms of knowledge and knowledge management to govern firm's effectiveness. Indeed, it has been acknowledged that knowledge management is broad and multi-dimensional and covers most aspects of the firm's activities. Hence to be competitive and successful, firms must create and sustain a balanced intellectual capital portfolio. Managers may need to set broad priorities and integrate the goals of managing intellectual capital and effective knowledge process (Wiig, 1997).

In addition, not only knowledge and knowledge management has been the center of focus and discursive discourse amongst employers and managers in organizations, it has also attracted immense attention in academia. Interest on knowledge and knowledge management has been seen in economics, management, information technology, anthropology, sociology, epistemology, psychology, and other disciplines (Quintas, Lefrere and Jones, 1997).

Given, the importance of knowledge management and the complexity of its nature, it is timely to try to understand the latest theories underlying knowledge and knowledge management. In an attempt to address this issue, this paper critically examines the latest models of knowledge management and discuss on the assumptions and views of each model. The aim of this paper is to investigate the current understanding of the theory and practice of the emerging and existing knowledge management models. Hence, employers or practitioners in organizations can understand their concepts and improved approaches can be developed and applied to organization and to those who need to work and implement knowledge management.

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This paper will begin by presenting the aims and objectives and followed with a short discussion on the concepts and definitions of knowledge management. This is followed with the discussion on some of the existing knowledge management models.

CONCEPTS AND DEFINITIONS OF KNOWLEDGE MANAGEMENT

Organizations play an important role in activating the explicit and tacit dimensions of knowledge. There are four modes of spiraling knowledge creation, namely: socialization, externalization, combination and internalization. The first mode of socialization is the exchange of tacit knowledge among members through the social interactions and shared experiences. Secondly, externalization is the translation of tacit knowledge into explicit knowledge through models, concepts, metaphors, analogies, stories and others. Subsequently, the combination mode is the generation of new and explicit knowledge by combining and bundling together different bodies of explicit knowledge. And finally the internalization mode is the creation of new tacit knowledge from explicit knowledge. All of these conversion modes are highly interdependent and tangled (Nonaka, 1994).

Review of the prior research on knowledge management indicates the existence of multiple definitions of knowledge management. For instance, Alavi and Leidner (1999) define knowledge management as "a systemic and organizationally specified process for acquiring, organizing, and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work". O'Dell et al., (1998) define knowledge management as "a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance". Beckman (1999) define knowledge management as "the formalization of and access to experience, knowledge and expertise that create new capabilities, enable superior performance, encourage innovation and enhance customer value". On the other end, Malhotra (2000 & 2001) is of the opinion that "knowledge management caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings".

As the breadth of these definitions illustrate, knowledge management is a set of things involving various activities. It encompasses theories, models, processes and technologies that support the protection, development and exploitation of knowledge assets. By managing intellectual capital that exists in both explicit and tacit forms, knowledge management enhances an organization's ability to learn from its environment and to incorporate knowledge into business processes. It creates a new value for the organization by improving its efficiency, effectiveness and competitiveness. As defined by Davenport and Prusak (2000), knowledge is a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of knower. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and processes. In addition, Grey (1999) defines knowledge management as a process involving identification of critical information, sharing of information, protecting and enhancing the value of information, and leveraging knowledge utility in major organizational level decisions. However, Tiwana (2000) argued that knowledge management is the management of organizational knowledge for creating business value and generating a competitive advantage and it enables the creation, communication, and application of knowledge of all kinds to achieve business goals.

CRITIQUES ON KNOWLEDGE MANAGEMENT

Nowadays, many organizations realized that they are not effectively capitalizing on the knowledge of their employees and that their long-term prosperity depends on the organizational effort to explicitly manage this knowledge and use it as a source for growth and corporate profit (Herschel and Nemati, 2000;

Herschel, Nemati & Steiger, 2001). As described by Blackler (1995), knowledge is disorganized and difficult to manage, multifaceted and complex, being situated and abstract, implicit and explicit, distributed and individual, physical and mental, developing and static, verbal and encoded. Knowledge can be viewed as individual or collective (Nonaka, 1994). Individual knowledge exists in the heads of individuals, while collective knowledge exists in the collective actions of the groups and organizations. Nonaka (1994) regards organizational knowledge creation as "knowledge spiral" in which there is a continuous interaction among individuals and continuous conversion of explicit knowledge to tacit knowledge and vice versa. This incessant interaction and conversion in turn results in joint creation of knowledge by individuals and organizations.

Knowledge has been argued and seen from various perspectives. Firstly, knowledge can be considered as a state of mind, an object, a process, a condition of having access to information and a capability Secondly, knowledge can be seen as a state of mind that centers on enhancing individuals' personal knowledge so they can effectively apply knowledge to the organization's requirements. In this perspective, knowledge is regarded as a thing or object, independent of human action. Knowledge can be stored, retrieved and manipulated (Wasko and Faraj, 2000). The third perspective views knowledge as a process and centers on applying expertise. It posits that knowledge does not exist independent of human action. Instead, it builds through social construction of meaning. Fourthly, knowledge can be viewed as a condition of access to information and is an extension to the object view. This view contends that organizational knowledge must be organized in a way that is easy to access and retrieve. Finally, knowledge can be viewed as a capability building and asserts that knowledge has a potential to influence future action. It theorizes that knowledge has the capability to build intangible assets and intellectual capital (Alavi and Leidner, 2001; Wasko and Faraj, 2000). However, Alavi and Leidner (2001) contend that each of the above perspectives require different strategies and different type of tools and technologies to manage knowledge. For instance, if knowledge is viewed as an object then knowledge management initiatives should highlight the significance of building knowledge stocks in the organizations. In this case, knowledge management system such as knowledge repositories should have the ability to capture knowledge stocks. Similarly, if knowledge is viewed as a process then knowledge management initiatives should be able to focus on the flow of knowledge in the processes of knowledge creation, knowledge sharing and knowledge distribution.

KNOWLEDGE MANAGEMENT MODELS

Boisot's Knowledge Category Models

In 1987, Boisot developed a model that considers knowledge as either codified or uncodified and as difussed or undiffused, within an organization. First, the term "codified" in this case refers to knowledge that can be readily prepared for transmission purposes such as financial data. In this model, codified undiffused knowledge is referred to as propriety knowledge and is deliberately transmitted to a small group of people, on a "need to know" basis. Second, "uncodified" refers to knowledge that cannot be easily prepared for transmission purposes such as experiences. The model suggests that uncodified and undiffused knowledge is referred to as personal knowledge (e.g. experiences, perceptions, views, ideas). Third, the left quantrant of the model covers public knowledge and common sense knowledge. Public knowledge is codifed and diffused (e.g. library, journals, books, newspapers, etc.). Finally, common sense knowledge which is relatively diffused and uncodified can gradually develop through the process of socialization and externationalization (Boisot, 1987). Indeed, this model suggests that there is a spread or diffusion of knowledge across organization as reflected in the horizontal dimension of the model. However, the codified and uncodified categories in the model are discrete categories of knowledge. In addition, the concept of diffused knowledge is rather general and lack clarity if it includes gathering knowledge within the organization or the idea of spreading it.

Figure 1: Boisot's Knowledge Category Model

Codified	Propriety Knowledge	Public Knowledge
Uncodified	Personal Knowledge	Common Sense
	Undiffused	Diffused

Nonaka's Knowledge Management Model

Nonaka's knowledge management model (Nonaka & Takeuchi, 1995) presumes that knowledge consists of tacit and explicit elements. In this aspect, tacit knowledge is defined as nonverbalised, intuitive and unarticulated, whilst, explicit knowledge is articulated and can be specified in writing, drawings, computer programming and others. This model believes tacit knowledge can be transferred into tacit knowledge in others by *socialization* and tacit knowledge can be transferred into explicit knowledge by formalizing a body of knowledge or through *externalization* process. The model also believe that explicit knowledge can be transferred into tacit knowledge in others by translating theory into practice also known as a process of *internalization* and explicit knowledge can be transferred to explicit knowledge in others by combining various existing theories – known as *combination* process. This simple matrix model presume that knowledge transfer in organizations is simple and straightforward but it was argued that it can be complicated and complex than it seems (McAdam & McCreedy, 1999). Even though each of these modes may independently create knowledge, the organizational knowledge creation processes only occur when all the four modes are organizationally managed and dynamically interacted. This process which is highly iterative constitutes 'knowledge spiral' which happens mainly through informal networks of relations in the organization starting from the individual level, then moves up to the group (collective) level and eventually to the organizational level. It creates a 'spiraling effect' of knowledge accumulation and growth which promotes organization innovation and learning (Nonaka, 1994; Nonaka and Takeuchi, 1995).

There are several similarities between Nonaka's and Boisot's knowledge management models. First, Boisot's codified and uncodified knowledge has some degree of similarity with Nonaka's category of tacit and explicit knowledge. Second, both models assume that there is a spread or diffusion of knowledge across the organizations as indicated by the horizontal dimension of the model. Finally, in correspondence with Boisot's model, Nonaka's tacit and explicit knowledge are two separate categories of knowledge.

Figure 2: Nonaka's Knowledge Management Model

		to Tacit	*to* Explicit
from Tacit		Socialization	Externalization
from Explicit		Internalization	Combination

Hedlund and Nonaka's Knowledge Management Model

Knowledge transfer in organizations is not as simple as Nonaka's simple matrix suggests. Knowledge transfer can be very complicated and complex hence, a more elaborate version of Nonaka's model was developed to describe the four levels of carriers or agents of knowledge in organizations. This four levels of 'carriers' perspective assumes that knowledge is categorized into the individual, the group, the organization and the interorganizational domains. In this aspect, the interorganizational domain includes important customers, suppliers, competitors and others.

Even though, this model is supportive as it relates the carriers to the types of knowledge, it is complicated as the carriers are segregated and related with the limited types of knowledge, which is consistent with Nonaka's externalization and combination knowledge management process (McAdam & McCreedy, 1999). Indeed, Hedlund and Nonaka (1993) argue that knowledge management characteristics can have serious implications for the various types of activities such as innovation and strategies and this can affect organizations' success or failures. Hence, this suggests that the essence of organizations' survival and success can depend on how they create, transfer and exploit their knowledge resources.

Figure 3: Hedlund and Nonaka's Knowledge Management Model

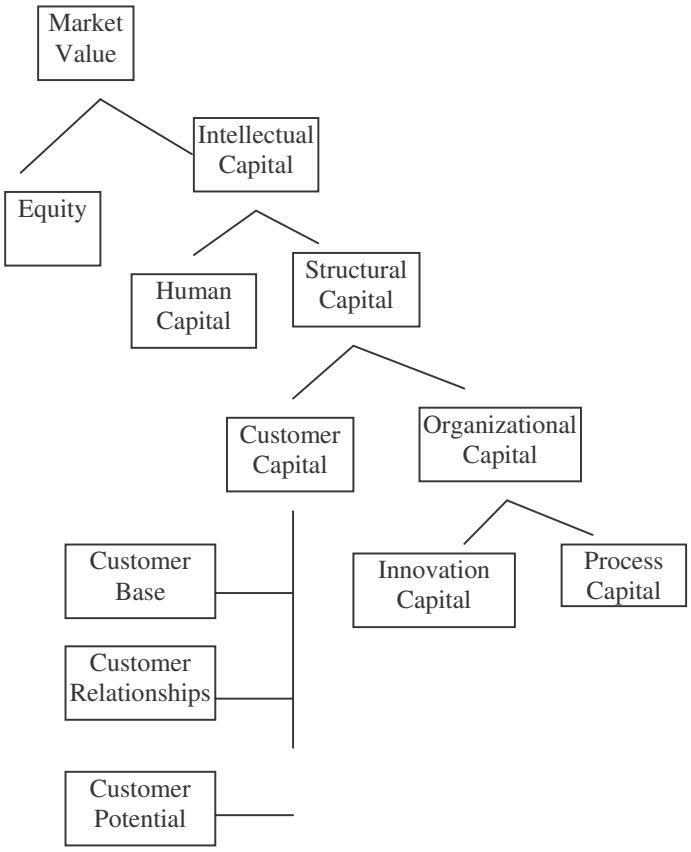
	Individual	Group	Organization	Inter-organizational Domain
Articulated knowledge	Knowing calculus	Quality Circle's documented analysis of its performance	Organization chart	Supplier's patents and documented practices
Tacit knowledge	Cross-cultural Negotiation Skills	Team coordination in complex work	Corporate Culture	Customer's attitudes to products and expectations

Skandia Intellectual Capital Model of Knowledge Management

Knowledge management was not only seen as the transfer of tacit and explicit knowledge but it has also been argued as intellectual capital (Chase, 1997; and Roos and Roos, 1997). The intellectual capital model of knowledge management was developed by a Swedish firm called Skandia as an approach for measuring its intellectual capital. The model focuses on the importance of equity, human, customer and innovation in managing the flow of knowledge within and externally across the networks of partners. Lank (1997) suggests that this model assumes a scientific approach to knowledge and assumes that intellectual capital can be transformed into commodity or assets of organizations but unfortunately, this intellectual view of knowledge management ignores the political and social aspects of knowledge management. Indeed, this is consistent with Nonaka's view of knowledge management.

Skandia intellectual capital model of knowledge management gives a strong emphasis to measurement associated with each of the decomposed elements (human, customer and structure) of knowledge management assuming that it can be tightly controlled. However, this approach can result in attempts to fit objective measures to subjective elements. Hence, this mechanistic approach to measurement is more consistent with Nonaka's process of externalization and combination (Lank, 1997).

Figure 4: Skandia Intellectual Capital Model of Knowledge Management



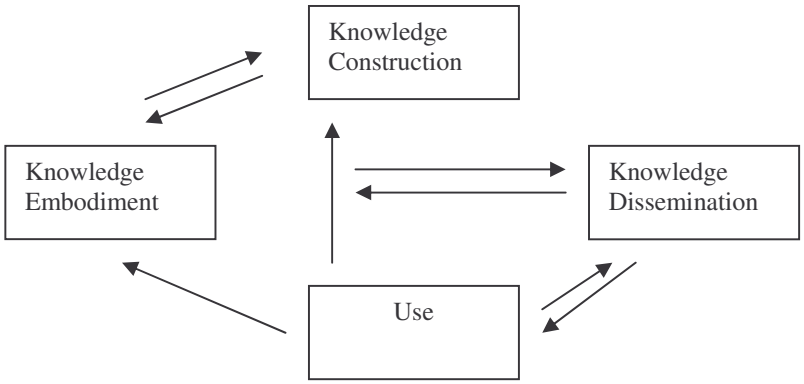
Demerest's Knowledge Management Model

Demerest's knowledge management model emphasize on the construction of knowledge within an organization. This construction is not limited to scientific inputs but is seen as including the social

construction of knowledge. The model assumes that constructed knowledge is then embodied within the organization, not just through explicit programs but through a process of social interchange (McAdam and McCreedy, 1999)

Figure 4 showed that there is a process of dissemination of the espoused knowledge throughout the organization and its surrounding. Ultimately the knowledge is seen as being of economic use in regard to organizational outputs. The solid arrows in figure 1 show the primary flow direction while the plain arrows show the more recursive flows. The model is attractive in that it does not assume any given definition of knowledge but rather invites a more holistic approach while, in reality, the flows of knowledge transfer may be extremely rapid and circulatory, as in the case for some forms of action learning.

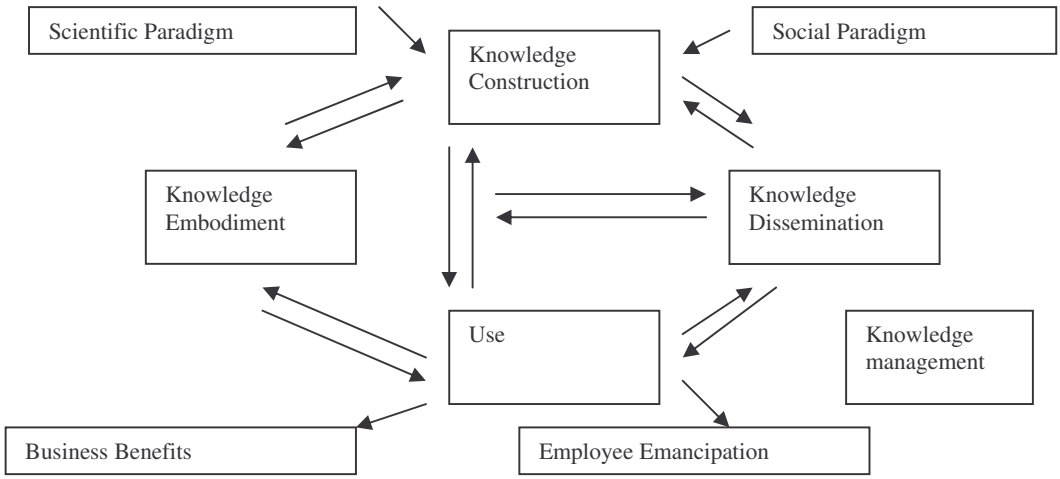
Figure 4: Demerest's Knowledge management Model (McAdam and McCreedy, 1999)



Demerest's model has been slightly modified of which seeks to address these limitations by explicitly showing the influence of both social and scientific paradigms of knowledge construction. The model also extends the "use" element to cover both business and employee benefits. If knowledge management is to have the support and commitment of all stakeholders in an organization then employee emancipation must be addressed along with the business benefits. These issues should not be seen as mutually exclusive but as complementary. Also more recursive arrows are added to figure 5 to show that knowledge management is not seen as simple sequential process.

Figure 5 is a useful means for structuring further research into field of knowledge management as it represents a balanced view. It allows knowledge management to be associated with the emerging social paradigm while at the same time contributing to the current paradigm.

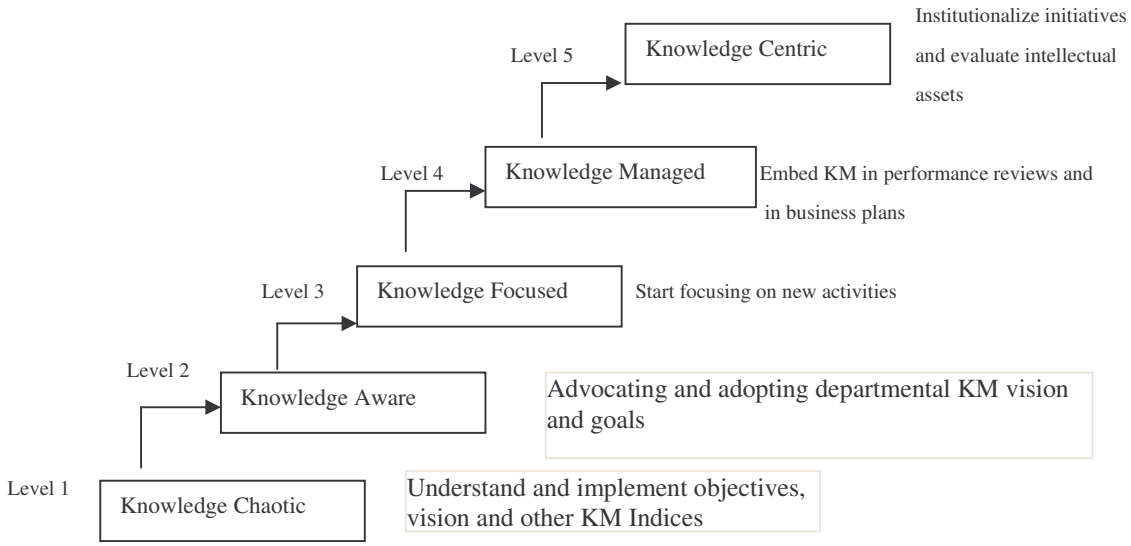
Figure 5: Demerest's Knowledge Management Model (Modified) McAdam and McCreedy. (1999)



Frid's Knowledge Management Model

According to Frid's (2003) knowledge management framework, the knowledge management maturity assessment levels and knowledge management implementation can be divided into five levels. The five maturity levels are knowledge chaotic, knowledge aware, knowledge focused, knowledge managed, and knowledge centric. The first *level - knowledge chaotic* suggests that organizations at this level are in the process of understanding and implementation of Frid framework for knowledge management which encompasses knowledge management vision, knowledge management objectives and knowledge management indices. Organization should focus on advocating and adapting departmental knowledge management vision and goals as well as performing Frid's framework knowledge management maturity assessment. Whereas *level two - knowledge aware* suggests that organizations at this level are a step higher than those at knowledge chaotic. Also, to understand and implement Frid's framework for knowledge management; advocating and adopting departmental knowledge management vision and goals; and performing Frid framework maturity assessment, organization at this point should focus on developing a knowledge management road map and working collaborately with the knowledge management office. At the third level - k*nowledge focused* indicated that organizations should have covered the implantation aspects as in the lower two levels and start focusing on five new activities. Organizations at this point should embed knowledge management into process engineering; provide initial knowledge management infrastructure, services and training; support early adopters and knowledge community; monitor and report on management indices and finally include knowledge management in budgets. However, the *fourth level termed as knowledge managed* adopt the fundamental activities suggested in level one, two and three other than organizations should attempt to embed knowledge management in performance reviews and also in business plans apart. Finally, *knowledge centric* as the last level is the highest of all knowledge management implementation maturity level based on Frid's model. The distinctive and differentiating activities that organizations should focus on are institutionalizing successful initiatives and valuing intellectual assets. These activities differentiate knowledge from other levels. Moreover, all knowledge management activities should be given equal emphasis at this level.

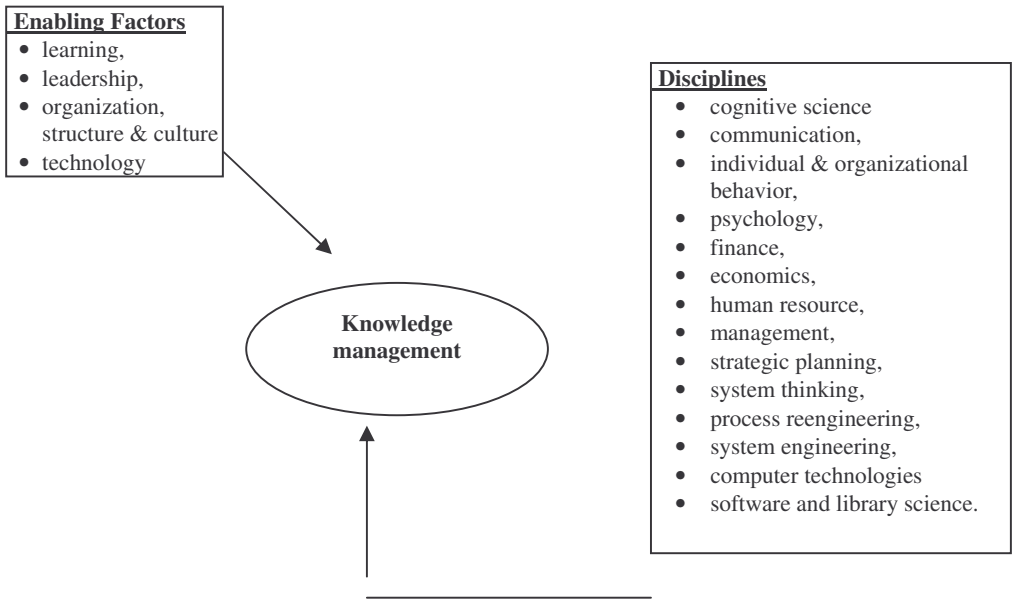
Figure 6: Frid's Knowledge management Model



Stankosky and Baldanza's Knowledge Management Framework

Stankosky and Baldanza (2001) developed a knowledge management framework which addresses enabling factors such as learning, culture, leadership, organization and technology. This framework presents that knowledge management encompasses a wide range of disciplines that include cognitive science, communication, individual and organizational behavior, psychology, finance, economics, human resource, management, strategic planning, system thinking, process reengineering, system engineering, computer technologies and software and library science.

Figure 7: Basic Disciplines Underlying Knowledge Management and its Enabling Factors



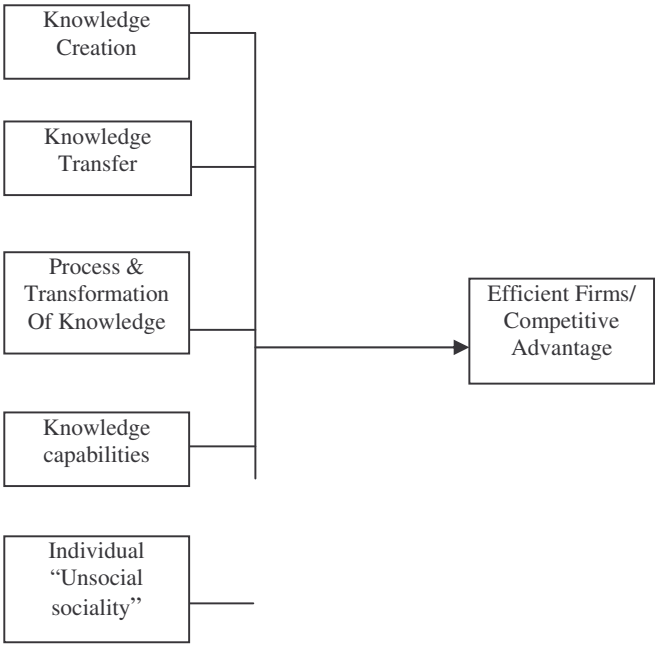
In addition, it was suggested that the four major foundations of an organization which is important for knowledge management are leadership, organization structure, technology infrastructure and learning. First, leadership is responsible for practicing strategic planning and systems thinking approaches, making best use of resources, fostering a culture that encourages open dialogue and team learning, and for encouraging and rewarding risk taking, learning and knowledge sharing. Key element for leadership is strategic planning, communication, system thinking and business culture. Second, organization structure should facilitate personal interactions and support communities of practice to capture tacit and explicit knowledge within the organization. Organizational structure in an organization should instill trust among people within the organization and encourage free exchange of knowledge. It should also be concerned with managing change in order to achieve better results. The key elements of organizational structure are processes, procedures, performance management system and communication. Third, technology infrastructure makes it possible to exchange information without formal structures. Technology infrastructure should promote the efficient and effective capture of both tacit and explicit knowledge. It should also support knowledge sharing in the entire organization. Communication, electronic mail, intranet, internet, data warehousing and decision support systems are some of the key elements. Fourth and final pillar of learning is leveraging knowledge. The role of learning is to manage information in order to build enterprise wide knowledge and use that knowledge to organizational learning, change and performance improvement. Learning communities, virtual teams, communication and a culture of trust can be identified as some of the key elements.

Kogut and Zander's Knowledge Management Model

Kogut and Zander (1992) are among the first researchers who established the foundation for the knowledge-based theory of the firm when emphasizing the strategic importance of knowledge as a source of competitive advantage. Their work is focused on the idea that "what firms do better than markets is the creation and transfer of knowledge within the organization". Knowledge, which consists of information and know-how, is not only held by individuals but is also expressed in regularities by which members cooperate in a social community. Firms as social communities act as "a repository of capabilities" determined by the social knowledge embedded in enduring individual relationships structured by organizing principles (Kogut and Zander, 1992). The organizing principles refer to as "the organizing knowledge that establishes the context of discourse and coordination among individuals with disparate expertise and that replicates the organization over time in correspondence to the changing expectations and identity of its members" (Kogut and Zander, 1996).

This view was further articulated and empirically tested in Kogut and Zander (1993). They assert that 1) firms are efficient by which knowledge is created and transferred, 2) a common understanding is developed by individuals and groups in a firm through repeated interaction to transfer knowledge from ideas into production and markets, 3) what a firm does is not depending on the market's failure rather the efficiency in the process of transformation relative to other firms, and 4) the firm's boundary is determined by the difference in knowledge and the embedded capabilities between the creator and the users (possessed with complementary skills) and not market failure. Kogut and Zander (1996) further extend their discussion on the concept of identity by asserting that individuals are "unsocial sociality" where they have both a desire to become a member of community and at the same time also have a desire to retain their own individuality (Kogut and Zander, 1996). As firms provide a normative territory to which members identify, costs of coordination, communication, and learning within firms are much lower which allow more knowledge to be shared and created within firms.

Figure 8: Kogut and Zander's Knowledge Management Model



CONCLUSION

The review of existing knowledge management models has seen a wide spectrum of perspectives. Knowledge management has been seen from the categorical view in which knowledge are categorized into discrete elements as seen in Boisot, Nonaka and Nonaka Hedlund's models to the more complicated and complex perspective of knowledge that is mechanistic and socially constructed orientation. Moreover, these knowledge management models have made reference to: first, the process of managing the flow knowledge; second, categorization models are mechanistic; third, the intellectual capital model assumed that intellectual capital are vital assets in organization and should be manage efficiently for firm's success; fourth, Demerest's model is intrinsically linked with the social and learning process within organizations; fifth, Frid's model suggests that knowledge should be managed systematically and of equal emphasis at all knowledge management process levels; sixth, Stankosky and Baldanza's knowledge management framework emphasized that leadership, organization structure, technology infrastructure and learning are important foundations for knowledge management in an organization; finally, Kogut and Zander's model focused on the strategic importance of knowledge as a source of competitive advantage. Indeed, these perspectives have indicated that knowledge management models have evolved. Even though knowledge management models have evolved from time to time, basically the models provide a way of translating managerial activities and guiding managerial efforts in managing knowledge in the organizations.

Nonetheless, the models have its own way of placing the major knowledge management activities and enablers with the aim to produce a dynamic system to reinforce the organization's core competencies. Meanwhile, the knowledge management process as described in the models are the action steps the organization uses to identify it needs and the manner in which it collects, adapts and transfers that information across the organization. Through the knowledge management process, the models can be used to foster the development of organization knowledge and enhance the organizational impact of individuals throughout the organizations. In addition, to be relevant in the twenty-first century, the knowledge management models are

also useful as a benchmarking tool that can direct organizations toward areas that require more attention and identify knowledge management practices which they excel. Hence, it is hoped that this review could act as a useful guide for literature evaluation and a basis for further research in the field of knowledge management.

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