Enriching Knowledge Management in Research & Development Organization: A Malaysian Perspective

Amlus Ibrahim[a], Nur Fadziana Faisal Mohammad[b], T. Ramayah[c] and Abd. Rahim Saad[d]

Fakulti Pengurusan Teknologi, Universiti Utara Malaysia
[a]*amlus@uu,.edu.my,* [b]*fadziana@uum.edu.my*

[c]*School of Management, Universiti Sains Malaysia*
ramayah@gmail.com

[d]*Sirim Malaysia Berhad*
rahim@sirim.com

ABSTRACT

The paper study on the knowledge management in utilization of information communication and technology, hereinafter called ICT, in research and development organization. In a turbulent and rapidly changing environment, every organization faces the challenge of how to best manage its knowledge assets to generate value for the marketplace and obtain competitive advantage Such advantage derives from special capabilities that are rare, valuable, non-substitutable, and costly to imitate Historically, the focus was on capabilities involving tangible assets; now, knowledge is widely recognized as the source for competitive advantage, with the tangible assets representing the physical manifestation of but a fraction of this knowledge As companies scramble to develop strategies for more proactively and strategically managing their knowledge, the field of knowledge management (KM) receives increasing attention from trade organizations and academic journals. From this study it was found that to improve the chances of conclusively demonstrating value to the overall business enterprise, a new KM implementation in an innovation organization should address six imperatives: instill the organization's goals and strategies, access tacit knowledge, provide search tools, promote creativity, capture new learning, and build a supportive culture.

Keywords

Knowledge management, research and development organizational cultures, knowledge management enablers, culture facilitates knowledge

1.0 INTRODUCTION

In a turbulent and rapidly changing environment, every organization faces the challenge of how to best manage its knowledge assets to generate value for the marketplace and obtain competitive advantage (Lubit, 2001 and Smith, 2001). Such advantage derives from special capabilities that are rare, valuable, non-substitutable, and costly to imitate (Barney, 1991). Historically, the focus was on capabilities involving tangible assets; now, knowledge is widely recognized as the source for competitive advantage, with the tangible assets representing the physical manifestation of but a fraction of this knowledge (Leonard-Barton, 1995; Nonaka, 1995). As companies scramble to develop ICT strategies for more proactively and strategically managing their knowledge, the field of knowledge management (KM) receives increasing attention from trade organizations and academic journals (Blake, 2000).

2.0 KNOWLEDGE AND ITS MANAGEMENT

Purists consider "knowledge" to be that which is within and between the minds of individuals and is tacitly possessed. Knowledge has the capability to add value to the organization (or individual). After knowledge has been explicitly captured (i.e., documented), the purist considers it to be a form of data or information (Nonaka, 1995). Data are better viewed as a "set of discrete, objective facts about events." Information is "data that makes a difference"; that is, it has a message that informs the recipient of potential value (Davenport and Prusak, 1998). This documented material--data and information--and knowledge are all vital to the R&D process.

We came to understand that "managing" knowledge is not literally possible and, from an ICT and R&D perspective, we are really interested in facilitating knowledge flow. The difference between "managing knowledge" and "facilitating knowledge flow" can be illustrated by analogy to the flow of a river. Managing knowledge, in its most-commonly-practiced techno centric form, can be compared to the building of dams, embankments, locks, and weirs that regulate, direct and filter the course of a river. Facilitating knowledge flow,

in this context, is about ensuring that existing river banks are not washed away, that fallen trees are cleared so tributaries may flow unhindered to join the main course, and that, if the river overflows its banks, skilled farm workers are at hand to exploit the newly-deposited rich alluvial deposits (Davenport and Prusak, 1998).

According to Schlie (1999) and Mullin (2001) knowledge management is something about a knowledge flow process that reaches well beyond having excellent data or information, communication, technology storage and retrieval to embrace retrieval, creation, capture, use, and reuse of knowledge and information for innovation. Loshin (2001) knowledge management is the art or science of collecting organizational data and, by recognizing and understanding relationships pattern, turning it into usable, accessible information and valuable knowledge. A central focus for R&D, innovation is the successful exploitation of ideas to create a new, useful offering of product or service (McElroy, 2000). An individual or a development team initiates the process by creatively connecting insight or foresight into the needs of the market with the potential capability to deliver a suitable offering. But knowledge sharing is a critical catalyst for creativity and subsequent innovation because it provides a means by which innovative ideas can be captured, shared or tested. This leverages the communal knowledge and leads to new and improved ideas. The "sharing" may be face-to-face, across distance with electronic technology, or across time with access to information archived by others. Promoting this knowledge flow in a way that stimulates the knowledge creation process is a major pursuit for R&D managers (Mullin, 2001).

3.0 COMPARISON WITH OTHER KNOWLEDGE MANAGEMENT MODELS

A number of models for KM are found in the literature. They contain similar attributes, many of which are captured within the knowledge flow framework discussed here. Most of these propose processes that are cyclic in nature; that is, they convert tacit knowledge to explicit knowledge and through the creation of new knowledge create more tacit knowledge. An example is the well-documented approach of Nonaka (1995).
Similarly, the models are process-centered, with each set in the context of some external process. Culture is often noted as a central issue. KM is described as a very people-dependent activity and largely information technology independent, although IT plays a role in facilitating knowledge creation, capture and reuse. It is actually the people and their interactions that create knowledge (Dueck, 2001). The models are also multi-dimensional and some are extremely complex. Few specifically address the innovation process. This is not

surprising when we consider the uncertain nature of R&D and the often-circuitous path that R&D individuals take in pursuit of new knowledge to meet their objectives and goals (Coates, 2000).

As noted by Ross Armbrecht et al. (2001) interviews with many R&D managers about the above models with regard to KM revealed that the most important and often-cited issues dealt with culture and the optimum use of the company's internal knowledge base. The highest priority issues were:

* What kind of culture facilitates knowledge flow and how can it best be designed, incorporated and managed? Breaking the "knowledge is power" paradigm requires both major change and consistent leadership behavior over an extended period of time.

* How can the knowledge of experts and people leaving the organization be captured? This problem was difficult enough when retirement and death were the primary routes by which workers' knowledge became unavailable to the enterprise. Now, in an era where the paradigm is one of "knowledge worker as journeyman," an organization leaves itself much more vulnerable not only to loss but to leakage of important knowledge assets.

* What can be done to accelerate the R&D process? Although it is only one of the tools to be used, KM is expected to impact speed of R&D through quicker access and movement of the most relevant information, faster decision-making, and wider sharing of the best implementation practices.

• How can the creativity envelope within the R&D organization be expanded? Studies suggest that much of an organization's creative power reside in a relatively small set of individuals. If through effective knowledge sharing and learning this creative core could be expanded, significant increases in the overall output from R&D and significant value creation for the corporate entity would ensue.

4.0 KNOWLEDGE MANAGEMENT DRIVERS AND METRIC IN R&D

The most often-cited driver for the pursuit of KM in R&D is acceleration of the knowledge creation process. The faster knowledge can be created, the more value a company can deliver to further its growth. If the process is made more effective, then the cost of innovation decreases. Reducing cost in manufacture of existing products is also of great value. And, in a more general sense, if KM can better align the entire

organization around its goals and objectives, the result will be a desirable increase in productivity and creativity (Smith, 2001).

More quantitative metrics for KM remains under development. Process metrics includes the usual tracking of costs versus budget and frequency of hits on KM web sites. A variety of output metrics are used. The most extensive is a year-to-year analysis of the value of the company's technology assets, including an estimate of the worth of its tacit knowledge base. (This is similar to the intellectual property valuation completed as a part of due diligence in an acquisition.) A more specific technique is to assess the quality of the knowledge base, that is, how current, accessible and easily updated it is. Similarly, one respondent engages an external consultant to periodically assess the readiness and the progress of the knowledge base within the company. Another company measures the reduction of manufacturing cost as a result of sharing technical advances among its plants (Smith, 2001).

Knowledge Management and its Enablers in R&D

An enabler is a conceptual tool used to describe a process or asset that allows an organization to achieve its objectives. The term "enabler" is increasingly used to describe KM efforts in order to stress the difficulty in traditional management control of such processes, especially knowledge creation (Von Krogh, Ichijo and Nonaka, 2000). Our focus is on the controllable elements of KM that best enable knowledge creation, acquisition and transfer. Base on previous research, three critical enablers have been identified that the companies utilize in their KM efforts: culture, infrastructure, and information technology (Figure 1).
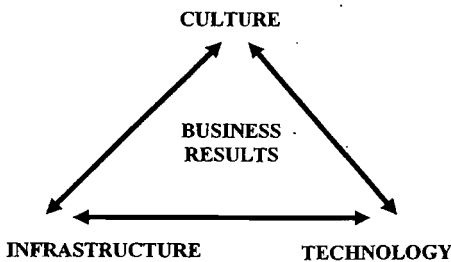
CULTURE

BUSINESS
RESULTS

INFRASTRUCTURE   TECHNOLOGY

Figure 1. Three Enablers of Knowledge Flow
Source: Von Krogh, Ichijo and Nonaka, 2000

At the highest level is culture, the system of shared meaning within an organization that strongly influences the ways in which its members act. Although definitions of organizational culture vary, common elements include symbols, values and norms (Davenport and Prusak, 1998). The symbols represent important ideals to the company. Values more explicitly capture the priorities of the organization. Norms manifest themselves in routines and behavior. Culture permeates the organization and influences the

infrastructure and IT. Culture has great impact and is difficult to change.

Infrastructure includes physical layouts, hierarchies (organization structure) and the KM business processes. This last category can include the KM program itself. Infrastructure impacts culture and can aid or hinder the KM efforts, especially in terms of employee interaction (hence the bi-directional arrows in Figure 1).

Finally, there is information technology. Much of the KM literature is dedicated to this aspect of KM strategies, especially in terms of codification of knowledge in the organization. IT is much more than just codification of knowledge, as it can enable communication among employees and can foster innovation. The use of IT feeds back into the culture and can lead to a particular KM IT orientation. IT also has had a profound impact on infrastructure, reducing physical barriers of time and place and affecting the legitimacy of hierarchies based solely on controlled access to information (Marwick, 2001)

5.0 ORGANIZATIONAL CULTURE

An organization's culture has tremendous impact on its KM efforts. Culture encompasses the behavioral norms and paradigms that guide daily life and interpersonal relationships. These norms determine which behavior is valued and which is proscribed. Top management actions, business processes, priorities, incentive programs, and performance measurement shape culture (Gold, Malhotra and Segars, 2001; Hauschild, Licht and Stein, 2001)

Organizational culture often originates with the values and vision of the company's founders. It evolves gradually as the organization's environment changes and new symbols, norms and values emerge. It tends to become stable unless affected by a powerful external force, such as a financial crisis or a new CEO hired from outside. In fact, one survey company spoke of the challenges in maintaining KM momentum after a merger. Thus, an understanding of organizational culture also requires an understanding of organizational change. Formal knowledge management programs represent change for nearly all organizations (Gold, Malhotra & Segars, 2001).

6.0 UNDERSTANDING

One of the most common inhibitors revealed was a lack of understanding related to the value of KM programs. KM was described as being "difficult to sell as it is a fuzzy concept." There is often confusion about the nature of KM efforts, specific program elements and anticipated outcomes. Getting people "on the same page" is difficult and can inhibit not only KM success but also cause the complete demise of KM programs.

Past success without formal KM can also act as an inhibitor, as certain factions may not understand why change is needed.

Most of the companies with successful KM programs have specific strategies designed to combat this lack of understanding. For example, one company uses numerous presentations and training programs to promote a vision of the value of KM. Another continuously educates employees through a KM Website run from the company library. Special attention is paid to new employees, especially in the case of new KM programs. Others advised regular updates of KM progress, involvement of top management, and the use of business terms and language to communicate objectives. Most of the programs surveyed were still in the process of developing their formal KM efforts and respondents noted the importance of patience and building awareness through small successes. The old adage of "under-promise and over-deliver" may apply here.

7.0 SUPPORT

Lack of support will inhibit KM efforts in terms of resources, usage and exposure (Davenport & Prusak, 1998; O'Dell & Grayson, 1998). Most of the more advanced KM programs identified specific top-level managers with KM responsibility.

Senior management should provide a vision, visible moral support and appropriate fiscal resources for the initiative. The locus of this support has varied considerably among organizations but examples include the CEO, board members, executive councils or steering teams, and vice president of R&D. One company's president is a noted expert in the area and has written several articles on KM.

The best programs have significant support not only from top management but also from all levels down to the newest company member. Informal "champions" throughout the organization drive this support. Many companies initiated KM pilot programs before enterprise-wide efforts were launched. There was widespread belief that "success breeds success" and support was an important element in that success. Several companies reported follow-through problems associated with waning support after exciting KM launches. A major part of achieving sustained support, as previously discussed, is gaining understanding of both the value to be created and the magnitude of the change needed to capture that value. Success does not come overnight but often follows years of hard work.

8.0 INCENTIVES

Incentives are clearly a means of motivating behavior. With incentives, there must be some sort of measurement to identify when certain behaviors are worthy of reward. This measurement process proves to be a considerable sticking point for companies as they launch KM programs. Given the intangible nature of knowledge, it is difficult to identify clear measurement of its successful utilization. Most of the companies mentioned measurement and incentives as an inhibiting factor. A specific inhibitor pertains to the traditional individual-based incentive programs, which often interfere with KM objectives of sharing knowledge throughout the organization (Senge, 1990).

Several companies identified strategies that facilitated advances in their KM programs. One area of general agreement was to anchor performance evaluation in the business strategy and existing business objectives. There must be a link, for example, to increased sales or reduced costs. Some companies actually create measures to support KM activity. Such measures include the number of hits to certain KM internal web sites and the number of projects using knowledge from other projects. Finally, there seems to be agreement that moving more toward group-based evaluation tools would help KM efforts.

9.0 INTERACTION

Knowledge can be transferred in two principal ways: (1) Some knowledge is captured from individuals and codified in documents and or databases, when another person reads or accesses this knowledge information, a transfer takes place. (2) Another transfer method includes no codification at all but is based on the exchange of knowledge through discussion. Companies balance between the two methods, but it is clear that employee interaction occurs with both, especially the latter.

Interaction should be encouraged for the transfer and creation of knowledge (O'Dell & Grayson, 1998). Surveyed companies identified several inhibitors that reduce the effectiveness of such interaction. One important element is the incentive program as previously discussed. Individual incentives that don't reward team interactivity can hinder KM efforts. Another problem is the organizational "silo" wherein employees are disconnected from other employees due to structure or geography (Ross Armbrecht et al., 2001).

Finally, some companies described the protection of knowledge and information for individual and group "power" that would be lost if such knowledge were shared and/or made widely available. Secrecy within and between organizations, needs to be examined clearly. The concept of "need to know" inhibits the

sharing of knowledge under the justification of protecting proprietary knowledge. In today's fast-paced business world, the value created through knowledge sharing appears to outweigh any unreasonable emphasis on secrecy.

Many companies admitted that this protection of knowledge internally was an ongoing problem in the KM process and an area in which they continue to seek solutions. It appears to be less of a problem in matrix-type organizations and especially in those organizations with cross-functional teams. Training programs and shared technologies improve interaction and the sharing of uncodified knowledge. Large-scale recognition program also facilitate employee interaction and better KM (Hauschild, Licht, & Stein, 2001).

10.0 CONCLUSION

Although knowledge cannot be "managed," its flow can be stimulated and channeled. Knowledge flow models are excellent boundary objects to stimulate thinking about KM in R&D. R&D can profit from the earlier thinking in this field by assessing the practices and enablers at work in its respective organizations and filling gaps or implementing relevant better practices. Some companies already consider KM in R&D to be a source of sustainable competitive advantage (Lubit, 2001).

KM in R&D does have a different flavor. Instead of aiming primarily to multiply the use and value of existing knowledge, it adds a strong element of discovery of new knowledge for value creation. In addition to capture and retrieval of knowledge, with its solution grounded in information technology, the key facilitators are collaboration, sharing and individual learning, with the roots of change residing in social science and anthropology.

A broad array of ICT solution exists for archiving and retrieving information, supporting collaboration, and searching web-based sources for information. It is important that a KM program determine the choice of IT tools rather than the reverse (Ryan & Prybutok, 2001).

The mind contains the most valuable knowledge, and KM is causing us to rethink the latent value of this tacit knowledge all across our organizations. Improving the capability to access, interact with, and extrapolate from the tacit knowledge base to create new knowledge will impact the core R&D process positively. There is great leverage to be created through a sharing and creative environment because tacit knowledge expands the creative potential of the entire organization when it becomes accessible. It is apparent that effort directed at KM in R&D is an "increasing-returns" activity at this stage in its life cycle. Many organizations are finding

that their investments yield excellent returns to the business bottom line (Ganguly, 2000).

Facilitation of knowledge flow and knowledge creation for R&D is in its infancy and remains an open field. There are few tried-and-true KM processes and much experimentation is underway. Because they support human interactions, these processes are less likely to be addressed exclusively by information technology. Change must take place in underlying business processes and culture, and thus will be more difficult to implement and institutionalize. Consequently, patent applications for KM processes are emerging

An Enabler is a process or asset that allows an organization to achieve its KM objectives. Culture, infrastructure and information technology, ICT, are key enablers. To realize the benefits of increasing information availability and rapid technology development, and to respond to shorter product cycles, an organization's culture, structure and IT must shift dramatically to support the needed enhancements in KM. However, these enablers are so interwoven that a change in one can result in inhibition by another unless a holistic approach is taken. Information technology and infrastructure can be changed relatively quickly; however, a sustained commitment to the desired KM practices is required to drive the slower cultural evolution.

A culture that promotes open sharing of knowledge can be realized if leaders clearly articulate the value of the KM initiative, attract support at all levels, reward proper behavior, and encourage employee interaction. KM is facilitated by minimizing hierarchy, designing workspaces that promote interaction, and dedicating exclusive resources to it. Information technology can make it easy to access and share information and knowledge. Technology should be selected to be consistent with the cultural goals of the organization and implemented immediately instead of waiting too long for the "best" technology.

To improve the chances of conclusively demonstrating value to the overall business enterprise, a new KM implementation in an innovation organization should address six imperatives: instill the organization's goals and strategies, access tacit knowledge, provide search tools, promote creativity, capture new learning, and build a supportive culture. From the many successful practices in use, the organization should initiate at least one to address each imperative. Make each one visible, business-value driven, clearly needed by the organization, and a cultural change agent for sharing knowledge.

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