KNOWLEDGE MANAGEMENT FRAMEWORK IN A TECHNOLOGY SUPPORT ENVIRONMENT

Mohd Hasan Selamat[1], Rusli Abdullah[1] and Christi Joseph Paul[2]

Universiti Putra Malaysia, Serdang, Selangor, MALAYSIA

Summary
Knowledge Management (KM) is the latest managerial buzzword for improving the work processes and creating value for a firm's operations and development. Firms are showing tremendous interest in implementing KM processes and technologies, and are even beginning to adopt knowledge management as part of their overall business strategy. Thus, the major competitive advantage for a firm lies in the firm's knowledge and therefore "knowledge management" has become a critical issue. This paper reviews the current knowledge management frameworks used in a global support environment and expose all the gaps that exists in theory and practice of knowledge management. In addition an alternative KM framework was proposed that could be used in a real world organization in order to enhance the frailties identified.

Key words:
Knowledge, knowledge management, knowledge management framework, KMD.

1. Introduction

The IT society we live in today is becoming a knowledge society. An organization's knowledge is professional intellect, such as the technical know how, know what, concepts, and even the knowledge architecture used. Clearly, the quest to move beyond information management and into the realm of knowledge management is a complex undertaking involving the development of structures that allows the company to recognize, create, transform and distribute knowledge (Davenport, et al., 1998; Quinn, et al., 1996; Drucker, 2000). Knowledge Management systems are technologies that support Knowledge Management in organizations, specifically - knowledge generation, codification, and transfer. The use of KM in organizations is now widely recognized and expected to be an important part of organizational practices in the future. Firm growth today depends upon innovation and innovation depends on knowledge (Neef, 1997). Thus, the firm's knowledge has become the major competitive advantage for the firm (Drucker, 1968; Toffler, 1990; Nonaka, 1994). The recognition of the importance of knowledge results in the significant issue of "knowledge management." Knowledge management is managing the corporation's knowledge through the processes of creating, sustaining, applying, sharing and renewing knowledge to enhance organizational performance and create values (Allee, 1997; Davenport, et al., 1998; Tiwana, 2001). Knowledge management therefore not only acts as a catalyst for innovation and creativity, but also provides the means by which innovative ideas can be captured, shared and leveraged leading to new ideas (Neef, 1997).

Several knowledge management frameworks have been proposed by numerous researchers, such as Wiig's model, Leonard-Barton model, Arthur Anderson and APQC's model, and Choo's model (Holsapple & Joshi, 1999). The other framework was the van der Spek and Spijkervet model (van der Spek & Spijkervet, 1997) and the Lai and Chu model (Lai & Chu, 2002). Wiig's (1993) KM framework proposes the three KM pillars which represent the major functions needed to manage knowledge. The pillars are based on a broad understanding of knowledge creation, manifestation, use, and transfer. While the Leonard-Barton (1995) model highlighted a KM framework which comprised of four core capabilities and four knowledge-building activities which are crucial to a knowledge-based organization (KBO). Arthur Andersen and APQC (1996) have advanced a model comprised of seven KM processes that can operate on an organization's knowledge: create, identify, collect, adapt, organize, apply, and share. While the framework advanced by van der Spek and Spijkervet (1997) identifies a cycle of four knowledge management stages: conceptualize, reflect, act, and retrospect. Lai and Chu (2002) proposed another framework by integrating the previous frameworks. It consists of three aspects, knowledge resources, knowledge management activities, and knowledge influences.

Although Lai and Chu (2002) has conducted a review on these frameworks, the cases used in the study were only based on highly knowledge intensive companies. Therefore, knowledge management done on other industries such as global support environment where there is rapid technological advancement and changes are not

studied. Thus, our objective is to expose any gaps between the current knowledge management activities and what has been practiced in reality with regard to the global support environment. The Shell IT International (SITI) knowledge management framework was used as our case. It is an IT organization for Shell Group of companies' world wide with multi level structures, organization, large support base and cross-cultural background. Hence it is a support entity and there are rapid technological advancement being developed all the time. The rest of this paper is organized as follows. In section 2, the definition of knowledge, knowledge management and knowledge management frameworks will be reviewed. Knowledge management in practice will be examined using the case study and an alternative framework will be proposed in section 3. Concluding remarks will be presented in section 4.

2. KNOWLEDGE MANAGEMENT FRAMEWORK

2.1 Knowledge

In general knowledge can be experience, concepts, values, or beliefs that increase an individual's capability to take effective action (Alavi & Leidner, 1999; Allee, 1997). It is imperative to address the differences between knowledge, information, and data. Data is raw numbers and facts, while information is a flow of messages or processed data. Knowledge is actionable information that is possessed in the mind (Maglitta, 1996; Nonaka, 1994). In addition, Alavi and Leidner (1999) argued that information becomes knowledge when it is processed in the mind of an individual and knowledge becomes information when it is articulated or communicated to others in the form of text, computer output, speech or written words, etc. If a person cannot understand and apply the information to anything, it remains just information (Lee and Yang, 2000). Knowledge is classified into explicit and tacit knowledge. Explicit knowledge is knowledge that can be codified and documented while tacit knowledge is embedded in the background and experience of an individual or group and is thus highly idiosyncratic (Dixon, 2000; Roberts, 2000).

2.2 Knowledge Management

The term knowledge management is often problematic as there is little consensus regarding its definition (Neef, 1999 and Bhatt, 2001). Many authors avoid the term completely, rather preferring to focus on specific aspects of the topic such as knowledge, innovation or learning (Costello, 1996). Furthermore others argue that knowledge management is closely related to concepts such as organizational learning, organizational memory, information sharing, and collaborative work (Schultze, 1998).

Knowledge management is managing the corporation's knowledge by means of systematic and organizational specified process for acquiring, organizing, sustaining, applying, sharing and renewing both tacit and explicit knowledge by employees to enhance the organizational performance and create value (Davenport, et al., 1998; Allee, 1997; Alavi & Leidner, 2001). It is seen as the systematic means of managing individual, group and organizational knowledge using the appropriate means and technology (Sallis and Jones 2002). Many researchers and industrialists postulate that knowledge management centers on the creation or generation of knowledge (Nonaka, 1991; Stewart, 1997). Others believe that knowledge management should focus less on knowledge creation and more its capture and integration (Martin, 1995; Grant, 1996; Alavi & Leidner, 1997). However, most agree that knowledge management encompasses all of these activities, that is, the creation or generation, codification, storage, dissemination and implementation of knowledge in the organization. A significant implication of this view of knowledge is that for individuals to arrive at the same understanding of data or information, they must share a history or context (Alavi and Leidner, 2001). Thus systems designed to support knowledge in organizations may not appear radically different from other forms of information systems, but will be geared toward enabling users to assign meaning to information and to capture some of their knowledge in information and or in data.

Knowledge management in a support entity can be defined as any process or practice of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organizations (Swan, 1999). Knowledge management is the use of technology to make information relevant and accessible wherever that information may reside. To do this effectively requires the appropriate application of the appropriate technology for the appropriate situation. Knowledge management incorporates systematic processes of finding, selecting, organizing, and presenting information in a way that improves an employee's comprehension and use of business assets (Brown & Duguid, 2000). Others counter such views arguing knowledge is also concerned with the establishment of an environment and culture in which knowledge can evolve (Davenport and Prusak, 1998).

2.3 Knowledge Management Activities

Several knowledge management frameworks have been proposed that include different knowledge management

activities. Based on the frameworks that have been narrated earlier, eight activities are highlighted which play major roles in the knowledge management of organizations that are inclined towards support and technology. The activities are as follows:

1) Initiation

This activity requires a plan for change before launching a project or information system. If the organization can create a climate for change or make their members aware of the need for change, the implementation process will be smoother. At this stage, people begin to notice the importance of knowledge management and will start to campaign for it. This is a concern with the awareness of the need for knowledge and the recognition of the strategic capabilities and a knowledge domain. This can be accomplished through research or identifying the requirements and core competencies. Furthermore, knowledge is valuable only when it is put into an organization's strategies (Stewart, 1997). According to Alavi (2000), knowledge generation by itself cannot lead to the excellence of the organization. Rather, the organizations have to create value by using that knowledge. Making a strategy of knowledge management is another critical issue in this stage. In general, this stage involves creating an awareness of the requirement for change, identifying knowledge requirements and creating knowledge management strategies.

2) Production

This stage refers to the production of knowledge. Knowledge can be produced by identifying what knowledge exists in the organization, who owns it, and who are thought leaders, or collecting and importing knowledge and technologies from outside or learning from existing knowledge.

3) Modeling

Nonaka & Takeuchi (1995) proposed that there is an appropriate time to conduct a screening process. After the concepts have been created, the organization should justify the generated knowledge in order to preserve the most critical information. This stage is concerned with justifying and structuring the generated knowledge. For example, we can classify similar knowledge by index. Then we can link, combine and integrate this knowledge. In other words, this stage is concerned with organizing knowledge and representing it into the knowledge repository for future retrieval.

4) Repository

The generated knowledge is very precious to the organization. In order to maintain the explicit knowledge and facilitate further sharing, it is important to have a repository for maintaining all critical knowledge. What knowledge and how it should be placed into the repository are major issues.

5) Distribution and Transfer

This stage is concerned with how to distribute knowledge to other people. Knowledge can be made available to people by establishing human interactive processes or an information technology infrastructure. There are two distribution strategies: push and pull (Davenport & Prusak, 1997). The push strategy has a central provider, who decides what information is to be distributed to whom. It is also known as knowledge driven model. While in the pull strategy, it is the user who judges what he needs and is motivated to seek and retrieve the knowledge.

6) Technology Infrastructure

The technical systems within an organization determine how knowledge travels throughout the enterprise and how knowledge is accessed. Initially, common representation schemes for capture of knowledge should exist across the organization. Business intelligence technologies support knowledge regarding a firm's competition and environment and should be noticeable and accessible. While technology is not the most important aspect of knowledge management, it does play a crucial role in facilitating communication and collaboration among knowledge workers in an organization (Abdullah, Benest, Evans and Kimble, 2002). Collaboration technologies and distributed learning technologies allow individuals within the organization to work together and collaborate interactively. Collaboration is seen as one of the key manners in which knowledge is transmitted and created within the organization (Sveiby, 1996). Knowledge discovery technologies allow a firm to search or new knowledge, which is either internal or external. Knowledge mapping technologies allow a firm to track its sources of internal and external knowledge so that individuals in need of a specific type of knowledge know where it resides.

7) Application

The value of knowledge can only be realized when it is applied to solving problems. This stage is concerned with how to utilize knowledge in order to produce commercial value. It can be improved through measurement, symbolic action, the right institutional context, and performance evaluations (Davenport & Prusak, 1997).

8) Retrospect

Retrospect or learning after doing is concerned with reviewing the process, performance and impact of knowledge management and detecting if new knowledge was created. In order to keep pace with knowledge creation and management in a changing environment, retrospect is imperative. It is not necessary for these eight knowledge management activities to be a sequential process. Each activity may have feedback to and from the others. These eight KM activities, will be diagnosed accordingly when the review is done on an IT support organization's knowledge management framework based on some first hand cases and the survey which will be given to 30 staffs of the organization.

2.4 Knowledge Management Framework

Based on the previous discussion, the current KM framework in Shell IT is based on the support tools that are used to create and maintain solutions. This is catered normally for the support staffs who handle the first and second level support. The first and second level support staffs are the Help Desk consultants and the IMG (Integrated Management Group) support analysts respectively. The internal Shell staffs of Shell IT use the KM facility to obtain or maintain information about their specific department and how the technicalities of their department have been setup. This will serve as documentation proper for auditing purposes on how the internal departmental processes and tasks have been defined. It is shown in Fig. 1.

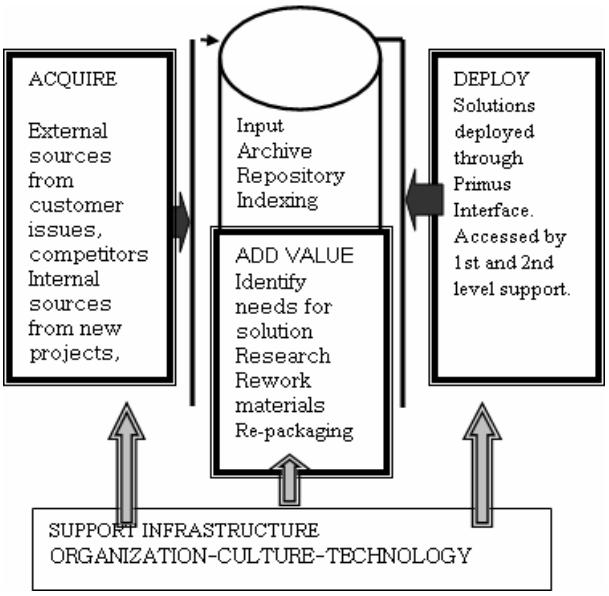

Fig. 1 Current KM framework of Shell IT

3. CASE STUDY

The Shell IT International (SITI) is being analyzed as a case study. Due to the time limitation, we didn't explore the study on other IT support related organization. Thus all analyses are based on SITI data only. In this section, we will present an overview of the case study and then analyze this case based on the analytical framework presented in previous section.

3.1 An Overview of the Case Study

Shell IT International (SITI) is an IT organization for Shell Group of companies worldwide. With staffs ranging to approximately 100,000 in number, support for these staffs are as crucial as in producing the correct knowledge documents at the right time. It is a global support entity in the field of IT. It has multi level structures, organization, large support base and cross-cultural background. IT for Shell is a single IT community that focused on delivering maximum value to the Shell businesses across the whole value chain by providing the IT enablers and delivering world class IT. Values and behaviors are the basic ideals to help point the way to the creation of an IT community of people with similar skills and interests for many different organizations, nations, cultural and experiences. Shell IT International uses the Primus Knowledge Management software into its IT Support structure. This technology enables us to capture knowledge and make it readily available to support staff and customers alike.

Customer service excellence largely depends upon high levels of efficiency-both in resolving problems and in getting crucial information to customers. Efficiency within the IT environment can be increased if technical issues are solved only once and the solutions are made available to everyone. To eliminate duplication of effort, the information used every day in the support organization must be accurately captured. Once the knowledge is captured, easy access to solutions alleviates unnecessary delays in problem resolution. Capturing the solutions during the customer support process, rather than creating additional work after the call realizes the power of the Knowledge Management system. Actual customer problems supply the material for the Knowledge base. Knowledge Management can also increase efficiency by making solutions available to both customers and support staff. By making both a web-based knowledge management tool and support staff available to customers, Shell IT offers easily accessible self-help as well as a

friendly, knowledgeable voice at the other end of the phone.

3.2 Analysis of the Case Study

After having an overview of the case, we analyzed the case based on the theoretical framework presented in the previous section. The KM will be evaluated using the knowledge management diagnostic (KMD), created by Bukowitz and Williams (1999). KMD enables us to know of the KM effort of an organization, thus paving the path for the researcher to identify its usage within the given facility. This method can be used as the instrument for conducting the knowledge survey or knowledge audit in an organization. The primary objective of the KMD survey was to bring awareness and take notice of the existing knowledge profile of the department thereby identifying the weak areas that needed attention and action. The survey analysis will be divided into 8 sections. The eight sections actually depict the activities of Knowledge Management from the KM Initiation phase to the KM review and retrospect phase. These are the core activities of KM from which analysis was made with the hope of exposing existing gaps in the support organization. The survey results are presented in Table 1.

Table 1: Results from the Actual Survey

KM Activities	Scores (%)	Classification of scores using KMD
Initiation	71	HIGH
Production	60	LOW
Modeling	62	LOW
Repository	70	HIGH
Distribution and Transfer	63	LOW
Technology Infrastructure	73	HIGH
Application & Usage	74	HIGH
Retrospect	59	LOW
Average	66	

Based on the tabulated scores, high scores and low scores are determined by the average factor. The results of the survey with high scores of the specific sections indicates good practices and lower scores indicating the gaps that has been identified in the organization. Although there are no absolute cut of score to indicate the best practice of corporate knowledge management usage, the score of 70 % and above is considered to imply a good KM practice. While a percentage scores that are lower than the average are deemed to be potential areas of improvement in the company's KM activities (Bukowitz, 1999). In the survey, the average threshold score is computed to be 66 %. This is computed by adding the percentage of all the sections and dividing them by the factor 8, which denotes the 8 key activities of KM. From the survey results, four activities are considered to be in the good KM category range, i.e. Initiation, Repository, Technology Infrastructure, and Application and Usage. The remaining four activities, namely Production, Modeling, Distribution and Transfer, and Retrospect are the areas where gaps are identified in their KM. The two cases are analyzed as follows:

3.2.1 Activities with Low Scores

Using the KMD survey model derived by Bukowitz (1999), percentage of scores below the average value computed for the activities denotes a low score and potential problem areas that lack emphasis in the KM processes. These activities are discuss as follows:

1. Production

This activity has an accumulated score of 60%, which is considered to be low according to Bukowitz (1999) studies on KM effective measurement. The reasons as to why this stage of KM processes is in the low category are due to lack of systematic capture of sufficient information and knowledge. Being a support industry, many support analysts use the KM facilities rather than identify or obtain methods to generate knowledge. Teams involved do not have the initiative to gather knowledge in areas where they are lacking as escalation is the norm in most support organization as in Shell IT.

2. Modeling

This activity relates to the method of justifying and structuring the generated knowledge and has the accumulated score of 62 %, which is within the low band of KM best practices based on Bukowitz (1999) research on most of the IT organization. The reason as to why low scores were reflected on the survey is due to the fact that existing knowledge has already been modeled and used in the organization through applications such as Primus, which are used only for support purposes. Furthermore, the practice to create new structures in the solution base occurs very rarely as most of the time, the solution used by support personnel are readily obtainable from external sources such as vendor websites. This "new knowledge" can be structured into the existing model without much modeling done.

3. Distributions and Transfer

Lack of sharing in terms of knowledge contribution seems to be the reason why this activity falls short in the KM process. This activity has an accumulated score of 63 %, which is in the low category of KM best practices. This

was observed during discussion sessions with many of the external colleagues through conference calls, when new solutions and information related to an issue are put forward. Often, this information is not well distributed amongst the regional support due to the time and language barrier. Most of the time, the knowledge required gets distributed through proper training and workshops. Human interaction seems to be the best possible method to share important information and knowledge. In a vastly global support entity, interactions through the means of communication are inevitable and chances of information getting misconstrued are high. However, the score for this section is almost close to the average due to the fact that indeed, sharing does takes place although it's not a rapid pace.

4. Retrospect

This section of KM is centered on the maintenance of the KM architecture in the domain of solutions review and management. The score averaged in the section is 59 %, which is in the low band of the KM measurement. The reasons as to why this is in the low category are due to the fact that the practice for reviewing of solutions is done on a reactive basis, rather than proactive. Most of the time, solutions that are retired or defunct, are not being archived and are still in the live knowledge base search as what was being documented when this activity is being observed.

3.2.2 Activities with High Scores (Good KM Practices)

The other activities in the KM framework are above the average range, which denotes good KM practice. As expected, the application or use section of the KM activity, garnered the highest score of 74 %, which denotes the good practice. This is because it point to the usage of its premier solution knowledge base is vital to a global support entity like Shell IT. Since Shell IT is a technology based infrastructure and the culture adopted is IS / IT inclined, it provides the foundation on how the KM architecture is managed.

The future role of information technologies is nevertheless important to integrate, span cross-functional boundaries, avoid fragmentation and provide global networks for knowledge sharing. Online information systems, document management and groupware are three key technologies now being used extensively in business for knowledge management. The Shell IT corporate intranet however, is the common platform used to access the pool of knowledge that exists within and this is a strong point as to why the technology infrastructure does play an important role in the KM accessibility and usage.

3.3 An Alternative Knowledge Management Framework

The alternative framework formulated is based on the findings of the survey. The four key KM activities of which were the contributing factors to the gaps that exists were strengthened to provide the necessary improvements to the existing model. In an effort to address the problem areas of the KM process, the framework should be consistent with the notion of systems thinking. Systems' thinking is important for KM because it encourages consideration of the entire knowledge process and facilitates the linkage between KM initiatives, the strategic goals and the objectives of a support organization.

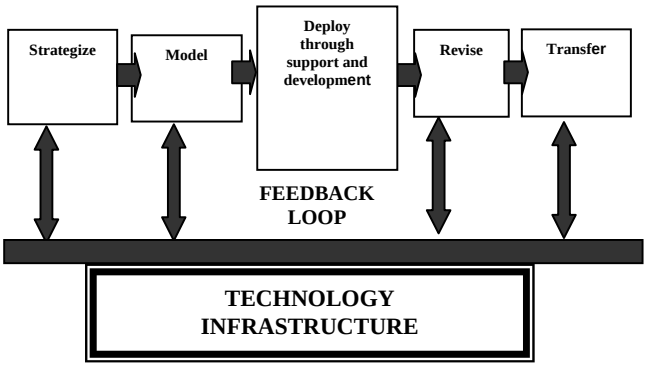

Figure 2. Alternative KM framework

The alternative framework modeled in Figure 1, addresses the limitations of the current KM framework of Shell IT. This framework addresses the entire processes needed for its internal and external knowledge management usage and development. This framework is cyclic in nature, with multiple feedback loops. The feedback loops are iterative, which means it can provide queries and receive feedbacks from various departments in the organization. This framework is supported by the technological infrastructure, which provides the backbone for various technologies to map knowledge. In fact, the tools to deliver the solution base are dependent on the interface used by the support staffs and time critical applications to broadcast "hot" solutions and technical know how to global users. The models' procedure was summarized in Table 2.

Phase	Procedures	Outputs
Strategize	• Perform strategic planning • Determine key knowledge requirements and set KM priorities	• Review current IT infrastructure and documents metrics for measuring success of KM procedure
Model	• Conduct knowledge audit, determine competencies and weaknesses • Define KM initiatives	• Status of the knowledge in organization • Knowledge management program plan
Use	• Capture and secure knowledge based on real cases in the industry • Review the knowledge and integrate into the knowledge base • Sharing and distribution of knowledge	• Knowledge acquisition documents • Success rate of the solutions used in the real world cases
Revise	• Conduct knowledge review; validity and accuracy • Perform quality control, re-usability of the solutions in the new systems • Update existing knowledge base	• Solutions that are obsolete will be retired • Recommendations of updates from various teams
Transfer	• Create integrated knowledge transfer programs • Use knowledge to create value for the enterprise • Feedback received from various sources will be documented	• Lesson learned documents based best practices or worst practices will be disseminated throughout the organization

Table 2: Detailed Procedure of the Alternative Framework

Based on this suggested framework, there will be a better control over the human aspects of schemes when it comes to complementing the processes. As drafted in Table 2, each procedure in the KM Phases, has an output to achieve and this output provides direction regarding what should actually be completed during each phase. The organizational culture is handled in the Strategize phase, and learning is handled in the Use phase. Tasks are outlined in the procedures and sub-procedures of each phase.

4. CONCLUSION

It has been observed that the major competitive advantage for a corporation lies in the corporation's knowledge and therefore knowledge management has become a critical issue. This paper reviews the current knowledge management frameworks used in a global support environment and expose all the gaps that exists in theory and practice of knowledge management. Thus, the potential gaps in the knowledge management framework, which are exposed, were largely based on initiative of the staffs and management alike in the organization. All key processes in the KM framework that were being supported by the IT infrastructure or technology in one way or another however were being categorized in the best KM practice zone. The KM activities that were dependent on personnel to be driven, or accomplished, often fell short in providing the necessary deliverables or poorly being manufactured. On the other hand, KM activities that were being run on technology and supported by the system did yield encouraging results from the satisfaction and effectiveness point of view. In addition an alternative KM framework was proposed that could be used in a real world organization in order to enhance the frailties identified.

However, the results of our survey were based only on one support organization and the eight management processes of previous framework. Thus, in the future a wider scope should be explored such a study on other IT support related organization rather than on a single entity. Likewise emphasis should be given on how to develop new methodologies and framework based on the current limitations of any existing framework, rather than focusing on one-dimensional method. Therefore this can provide the foundation from which future work can build on towards analyzing KM processes in support-based organization.

References

Abdullah, M.S., Benest, I., Evans, A. and Kimble, C. (2002). Knowledge Modeling Techniques For Developing Knowledge Management Systems, 3rd European Conference on Knowledge Management, Dublin, Ireland, ISBN:0-9540488-6-5, pp. 15-25.

Alavi, M. (2000). Managing Organizational Knowlegde, In R.W. Zmud (ed.), *Framing the Domain of IT Management: Projecting the Future Through the Past.* PinnFlex Education Resources, Inc, Cincinnati, OH, pp. 15-28.

Alavi, M., & Leidner, D. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Quarterly: Reviews, 25 (1), 107-136.

Balachandran, J., & Foo, S. (2002). Implementing KM in an information technology environment: A practical approach. Journal of Information and Knowledge Management, 1 (2), 187-196.

Bell, D. (1973). The Coming of post industrial society forecasting. New York: Basic.

Bhatt, C. (2001). Knowledge management in organizations: Examining the interaction between technologies, techniques, and people. Journal of Knowledge Management 5, (1), 68-75.

Botkin, J. W. (1999). How knowledge communities can revolutionize your company. New York: Simon and Schuster.

Brown, J. S., & Duguid, P. (2000). The social life of information. Boston, Massachusetts: Harvard Business School Press.

Bukowitz, W. R., & Williams, R. L. (1999). The Knowledge Management field book. Knowledge management process framework: 9-12

Costello, G. (1996). Knowledge Management in Strategic alliances: The Role of Information Technology. England: University of Oxford.

Davenport, T. (1996). Knowledge Management at Ernst & Young [WWW page]. URL http://www.bus.utexas.edu/kman/E&Y.htm.

Davenport, T., & Prusak, L. (1998). Working Knowledge: how organizations manage what they know. Boston: Harvard Business School Press.

Dixon, N. (2000). Common Knowledge: How Companies Thrive by Sharing What They Know. Harvard Business School Press, Boston, MA.

Drucker, P. (2000). Managing knowledge means managing yourself: Leader to leader.16 [WWW document] URL http://www.pfdf.org/leaderbooks/L2L/spring2000/drucker.html

Galliers, B., & Newell, S. (2001). Back to the future: From knowledge management to data management. The 9th European Conference on Information Systems Bled, Slovenia, Moderna Obganizacija.

Garvin, A. (1993). Building a Learning Organization. Harvard Business Review Article, July – August.

Gold, A. H., A. Malhotra, et al. (2001). Knowledge management: An organizational capabilities perspective. Journal of Management Information Systems 18, (1), 185-214.

Grant, R., (1996). Prospering in dynamically competitive environments: organizational capability as knowledge integration. Organization Science, 7 (4), 375-387.

Holsapple, C.W., & Andrew, G. (1999). Description and analysis of existing knowledge management frameworks. Proceedings on the 32nd Hawaii international conference on systems sciences.

Lai, H., & Chu, T. (2002). Knowledge management: A review of industrial cases. Journal of Computer Information System, Yat-sen University, Taiwan (R.O.C).

Leonard-Barton, D. (1995). Wellsprings of knowledge. Boston, Massachusetts: Harvard Business School Press.

Lee C C. and Yang J. (2000). Knowledge value chain, Journal of Management Development, 19(9), pp.783-793.

Malhotra, Y. (1998). Tools @ Work: Deciphering the knowledge management hype. Journal for Quality & Participation, 21 (4), 58-60.

Martin, J. (1995). The great transition; Using the seven disciplines of enterprise engineering to align people, technology and strategy. New York: Amacom.
Neef, D. (1999). Making the case for knowledge management: The bigger picture. Management Decision, 37 (1), 72-78.

Neef, D. (1997). Making the case for knowledge management: The bigger picture. Ernst & Young LLP Working Paper, Center for Business Innovation.

Nonaka, I. (1991). The Knowledge Creating Company. Harvard Business Review, (November-December), 2-9.

Nonaka, I., & Takeuchi, H. (1995). The knowledge-creating company: How Japanese companies create the dynamics of innovation. New York: Oxford University Press.

Penrose, E. T. (1959). The Theory of growth of the firm. New York: Wiley and Sons.

Raub, S., & Ruling, C. C. (2001). The knowledge management tussles: Speech communities and rhetorical strategies in the development of knowledge management. Journal of information technology, 16 (2), 113-130.

Roberts, J. (2000). From know-how to show-how? Questioning the role of information and communication technologies in knowledge transfer, Technology Analysis & Strategic Management, 12(4), pp.429-443.

Sallis, E and Jones, G. (2002) Knowledge Management in Education: Enhancing
Learning & Education, Kogan Page, London.

Scarbrough, H., Swan, J., & Preston, J. (1999). Knowledge management: A literature review. London Institute of Personnel and Development.

Schultze, U. (1998). Investigating the contradictions in knowledge management. IFIP WG8.2 & WG8.6 Joint working conference on information systems: Current issues and future changes, Helsinki, Finland.

Simon, H.A. (1968). The Sciences of the artificial**,** Cambridge, MA: MIT Press.

Stewart, T. (1997). Getting real about brainpower. Fortune magazine.
Sveiby K. E. (1996). Transfer of knowledge and the information processing professions**.** European Management Journal, 14 (4), 379-388.

Tay, W. (2002). The art & practice of knowledge management**.** The media shoppe.

Van der Spek, R., & Spijkervet, A. (1997). Knowledge Management: Dealing Intelligently with Knowledge. In J. Liebowitz & L. C. Wilcox, Knowledge management and its integrative elements **(**pp. 31-39). New York: CRC Press.

Wiig, K. M.(1997). Roles of knowledge-based systems in support of knowledge management. In J. Liebowitz & L. C. Wilcox, Knowledge management and its integrative elements (pp. 69-87). New York: CRC Press.

Rusli Abdullah received the B.S. and M.S. degrees in Computer Science from University of Putra Malaysia in 1988 and 1996 respectively, and PhD in Software Engineering from Technological University of Malaysia in 2005. His research interests including information system, knowledge management and software engineering. He is now with the Faculty of Computer Science and Information Technology in University Putra of Malaysia as a full-time lecturer. He is also the Head Department of Multimedia and Software Development in Institute of Multimedia Development at the same university.

Mohd Hasan Selamat received his M.S. degrees from Essex University and PhD from East Anglia University in United Kingdom. His research interests including software engineering and information system. He is now a full-time lecturer and Head Department of Information System in Faculty of Computer Science and Information Technology, University Putra of Malaysia.