HiKMas: Cultural Behavioural and ontology based approach towards a Holistic Knowledge Management System Design

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Abstract

This paper discusses the Holistic Knowledge Management System design which is based on culture, behavioural and ontology approach that addresses the need to support a better management of the tacit and explicit knowledge, learning processes, knowledge creation, sharing and transfer; and continuous learning. The Cultural Behaviour concept models some characteristics of users interacting with a knowledge management system and acknowledges the behaviour of users in the system that can be associated with incentives so that users are willing to share their knowledge and be active in the system. The framework designed focuses on three features, i.e. the cultural behaviour of people in the organization, incentives system and technical system. Detailed analysis was conducted on the cultural behavioural perspectives of users based on existing cultural practiced in the organization and factors that can motivate staff to share knowledge through the KM system was also looked at. Based on the analysis performed, it was discovered that the behaviour of KM users may be influenced by the technical system. From the technical system, the behaviour of users can be identified and the system rewards a form of incentive to staff that share knowledge. The methodology in developing this system involves identifying KM initiatives towards developing methodologies to convert tacit knowledge into explicit knowledge that can be codified, captured, stored, transmitted, used and be acted on by others. The knowledge system architecture proposed gives emphasis on the three main components namely the people, process and technology. The architecture designed had focused on the interaction between employees in the organisation through the use of the platform provided in the Internal Generated Repository (IGR), and the User Profile Editor; knowledge warehouse (External Knowledge Acquisition and Environmental Scanning) that enables access to internal and external repositories, infrastructure provided and the enabling environment (Knowledge Maintenance subsystem and Knowledge Manipulation)

Keywords: Knowledge Management System, Cultural behavioural perspectives, Ontology.

1. Introduction

Knowledge is known as one of the key components in determining the economic success of an organization and plays an important role in the competitive business environment. As such, knowledge needs to be organized and managed accordingly, in which this requires good knowledge management in an organization to ensure that knowledge is arranged, processed and produced respectively (Bhatt 2000). Good knowledge management will enable new knowledge to be created that will in return, drive the organization to develop.

In governing knowledge management, knowledge is often classified into two types, namely tacit and explicit knowledge. Tacit knowledge is the knowledge that is embedded in an individual mind in which this type of knowledge is difficult to be captured and documented. Explicit knowledge on the other hand is the knowledge that can be captured, recorded and kept in electronic databases and it can be obtained from work manuals, procedures, research materials, books, articles and journals. Therefore, to achieve successful knowledge management governance, both types of knowledge need to be addressed. However, the governance and the concept of knowledge management applied in organizations differs in the east and west. The western organization in US or European region heavily emphasized on capturing the explicit knowledge, making it as the main knowledge kept in repository. This is due to the fact that explicit knowledge is easily obtained and disseminated among the employees in an organization.

On the contrary, particularly in Japan, tacit knowledge is emphasized as the main knowledge kept; as knowledge is not seen as only data or information but also involves emotion, values and understanding relating to the information. As such, organizations in Japan not only manage knowledge but also create knowledge, in which the knowledge creation process often involves every employee in the organization (Juhana 2005). As the process involves everyone in the organization, this encourages structural knowledge creation that leads to the success of knowledge management (Bhatt 2000). According to Juhana (2005), most organizations globally had focused on gathering and

storing explicit knowledge; and rarely initiate the communication network that promotes knowledge sharing among the employees. This eventually results in a static communication network and knowledge repository; leading to the failure of knowledge management. Therefore, it is crucial for employee to share their knowledge in ensuring the organization competitiveness among its entrant.

In achieving business, economic and strategic competitiveness, Nonaka's and Takeuchi's (2005) Unified Model of Dynamic Knowledge Creation can be used to govern the organization's knowledge management. The model emphasized ways to obtain knowledge in an organization using the cultural behavioural method through the four ways approach. The approach involves the change of tacit knowledge to tacit knowledge; explicit to tacit knowledge; explicit to explicit knowledge and tacit to explicit knowledge. These ways will certainly help the organization to capture not only explicit but also tacit knowledge into the knowledge repository and allows various types of knowledge being distributed among the employees, encouraging knowledge sharing and creation among the employees and support the organization's success. However, as stated earlier, knowledge management globally is heavily focusing in gathering the explicit knowledge, overlooking the tacit knowledge. This leads to the problem statement of the work performed.

Problem Statement

Knowledge sharing is crucial to the knowledge creation process and it plays an important role in determining the organisation's business competitiveness. However the most common problem faced by an organisation is the knowledge creation process as most employees are not willing to participate in such process. According to Bhatt (2000), the failure of such process is due to the lack of positive culture in setting the organisation as the centre for learning and knowledge dissemination. This is partly contributed by the self-dependent act, in which employee's refuse to share knowledge due to personal, promotion or cultural reasons.

In order to overcome such problem, it will require huge amount of effort from the higher management level to encourage knowledge creation, sharing and desire for knowledge seeking among the employees. However, the knowledge management initiative and system in organizations had been less effective due to lack of knowledge creation activities in organizations (Juhana, 2005).

Aside from the above predicament, in addition, most organizations seem to focus heavily on the explicit knowledge digital library and failed to embed the cultural behavioural method as described by Nonaka and Takeuchi (2005). As such, a stumble block occurs in creating new knowledge and failure of knowledge management

in organizations. These needs to be addressed thoroughly; as the result of the work performed will certainly provide the key to a more successful knowledge management practices in organisations that will drive the organizations to be more competitive globally.

Research Objective

The objective of this research is to design a framework to develop a knowledge management system based on the cultural behavioural model that will enable staff in the organization to actively contribute to knowledge creation and knowledge sharing.

Research Model

In the research, a model was designed as shown in Figure 1. This research initially identified the tacit and explicit knowledge that will enable the development of a knowledge management system that can support sharing, dissemination and knowledge creation.

The model that was designed focuses on 3 features, i.e. the cultural behaviour of people in the organization, incentives system and technical system. Detailed study was conducted on the cultural behavioural perspectives of users found to be influenced by the culture instilled in the organization that can motivate staff to share knowledge through the knowledge management system. Based on the study and analysis performed, it was discovered that the behaviour of users of a knowledge management may also be influenced by the technical system. From the technical system, the behaviour of users can be identified and the incentive system rewards staff that share knowledge (Khalil 2008).
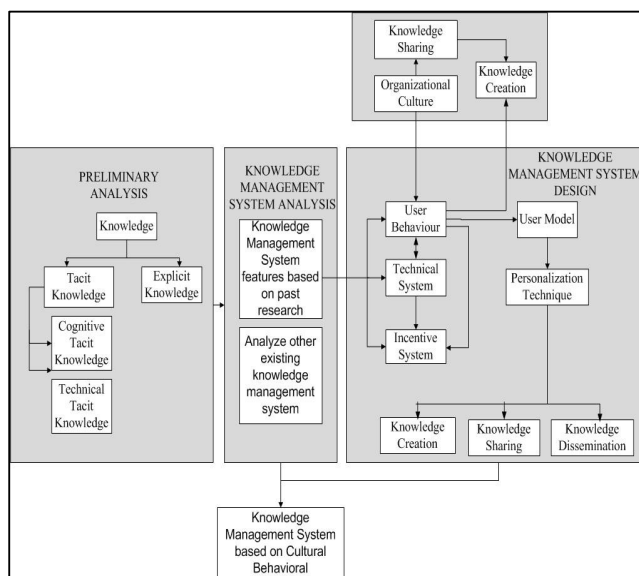

Fig 1. Research Model

The model above proposed a holistic knowledge management system that not only focuses on a

system that facilitates storing, searching and retrieving of knowledge assets (internal and external) but also aims at fostering the users' participation in knowledge sharing and knowledge creation and the adoption of knowledge management behaviours. Through user modelling process as applied in the Project Acacia 2004 (Razmerita 2003), the user's knowledge sharing and activity, predominant type of activity level will be tracked. According to Razmerita (2003:645) "…. by modelling the user's behaviour, different types of stimulus agents can intervene or provide feedback to stimulate the user towards learning and change. The adoption of knowledge management behaviour involves learning and change process. It can be facilitated by different intervention strategies acting at the cognitive, cultural and social level. On the one hand, these inferred characteristics make aware the user about his/her behaviour in the system. On the other hand, the identified behaviour is used to motivate the user to be active in the system: to share and to create knowledge. Thus the system can provide rewards, recognition mechanisms or other motivational mechanisms. For instance, the system can offer virtual money or it can acknowledge the "knowledge champions" as a mechanism for motivating the users.

2. Research Methodology

The methodology in developing the system involves several steps such as: (i) identifying initiatives to enhance knowledge creation activities in the organizations; (ii) developing specific methodologies to convert tacit knowledge into explicit knowledge that can be codified, captured, stored, transmitted, used and be acted on by others; (iii) enabling the acquisition of internal tacit and explicit knowledge and external explicit knowledge through searchable databases (commercial and public domain databases) (iv) enabling access to knowledge documents outside the organizations that will support business intelligence activities. The companies involved in this study were selected based on the knowledge management initiatives that have proved to be significant to the company's business development. The information on companies' knowledge management practices and initiatives were gathered through interviews, cyber visits and reports. As such, the companies chosen are companies from the petroleum industry, engineering services, pharmaceutical, science-base, automobile, computer and Information Technology (IT) industry. The study adopted an interpretive philosophy, which assumes that the world is largely what people perceive it to be (Cavana et al., 2001) and that access to reality is only attainable through social constructions such as language, consciousness and shared meanings (Myers, 1997). This qualitative method enables the researcher to maximise the likelihood of gathering data rich in

detail (Crabtree and Miller, 1992). The focus in this qualitative research is on in-depth understanding of a phenomenon and its context (Darke et al., 1998). Interviews were arranged with high-ranking management in the organizations selected which includes knowledge management managers, Heads of Research Department and Heads of Technical Department.

3. Analysis

Detailed interview notes were made and subsequently, content analysis was conducted. Data reduction through site summaries enabled various comparisons outlined in this paper.

3.1 Initiatives to enhance knowledge creation activities in the organizations

All the companies that were analyzed emphasized on the technology element in order for the objectives of knowledge management initiatives programmes to be achieved. All the companies have electronic knowledge management system and basically their systems provide the following facilities and enabled the following:

i) Online discussions and management forums

Forums seem to be a common feature in all the companies analyzed. Such forums provide cyber space for discussion and dissemination of information. In relation to enhancing online discussions, the online and management forums offer networking channel for seeking and sharing of advice and assistance.

ii) Knowledge base resources/repository

According to Junnakar (http://www.businessinnovation.ey.com) , knowledge management programmes must have two main dimensions, which are basically collecting and connecting dimension. In most of the companies analyzed, their knowledge management initiatives emphasize on the collection dimension. For instance, the science based and a petroleum company have repositories for business development, reports and research proposal and on the other hand an engineering company, has the knowledge base in the company's knowledge management system which allows engineers to share paperwork, reviews and experiences. In a power generation company offering operation and maintenance and engineering services,, the knowledge management system also includes standard operating procedures that can be accessed at any time when needed to assist in the acquisition of knowledge concerning operations. Similarly, in the petroleum company, their knowledge bases consist of resources from Operating Unit, Petroleum Resource Centre, Technical Research Management Division and resources from the company's Research and Science Services. The content in the company's knowledge database consist of technical standards.

Based on analysis, it was discovered that pharmaceutical companies, have common type of repository in which the repository includes yellow pages guide to the company's corporate knowledge as a mean to fulfil one of the objective of knowledge management; that is linking people and enabling access to the right information at the right time from the right person. In the petroleum company on the other hand, other types of content made available online through access to their knowledge management system includes research bulletins, company's initiatives, equipment listing, and lessons learnt database. In relation to lessons learnt database, personal experiences and recorded experience are converted to PDF files and stored into the electronic library.

iii) Knowledge sharing facilities

There are also other facilities that enhance the sharing of knowledge within the companies. For instance, in the engineering company knowledge management system, there is the group scheduler that aid the person in charge of scheduling meeting, discussions without having to spend much time just to schedule such meetings and discussions. There is also instant messaging that help exhilarate communication and decision-making. In a computer services, hardware and software company, the company developed corporate intranet to provide facilities for discussions. An airline company developed an electronic bulletin board for discussion and knowledge sharing and innovation Intranet which focus on how various types of data and information on technology is integrated with knowledge. In an automobile company, the company had developed application based on Lotus Notes to enable databank of decision support to be updated and accessed by workers through intranet. In a computer hardware, software and service company, a web-based knowledge management was designed to store document, technical specifications, sales and product analysis, and connect experts. The company's knowledge management system has search engines, browser, tools to process words, presentations, and knowledge application using DBMS and GrapeVine.

It was discovered that a pharmaceutical company had developed Intranet to identify main activities available such as discussions groups, provide development opportunities, and access to facilitator support. In a science and technology based company, the company had created an intellectual capital technology centre to facilitate communication, to store, share, disseminate and ease access to knowledge/ organization's intellectual capital. With this system, the company is able to manage intellectual capital systematically and centrally.

4. Proposed Knowledge Management System Architecture based on Cultural Behavioural Model.

Figure 2 shows that the knowledge management system architecture. comprises of important elements such as access channels, applications, knowledge warehouse, infrastructure and enabling environment.

Based on the Figure 2, it can be deduced that the architecture had focused on the interaction between employees in the organisation through the use of the platform provided in the Internal Generated Repository (IGR), knowledge warehouse (External Knowledge Acquisition and Environmental Scanning) that enables access to internal and external repositories, infrastructure provided and the enabling environment (Knowledge Maintenance subsystem and Knowledge Manipulation). The process component is materialised through the applications, knowledge warehouse and the infrastructure, while the technology is transpired through the exercise of infrastructure, applications of portals and enabling environment. An example of the enabling environment relates to the incentives provided for knowledge workers to share knowledge that is introduced at the whole organizational level and that is embedded into the knowledge management system as shown in Figure 2. In the proposed knowledge management system, when a knowledge worker submits knowledge asset in the system, points will automatically be added to the User Profile Editor.

Fig 2. The Proposed Knowledge Management System Architecture
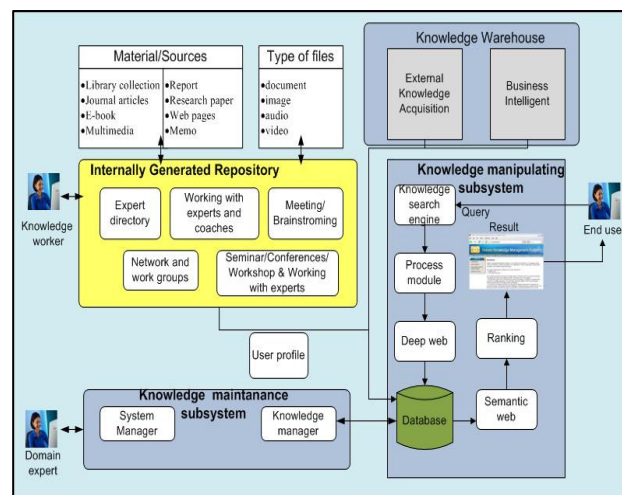
There are some guidelines in the system that determine whether the piece of knowledge is worthy of the reward. Points will automatically be given to publications that get accepted in reviewed journals, proceedings and books published by recognized publishers. For other types of knowledge as listed in table 1 below, points will only be given after being reviewed.

Table 1: Types of knowledge to be rewarded

Reports	Technical, research, training (includes video, audio and other multimedia files)
Conceptual knowledge	Product design trademark equity
Systematic knowledge	Product specification, user manual, information on client /vendor, patent and other intellectual property
Routine knowledge	Job routine document

Via the Knowledge Maintenance Subsystem, the knowledge managers will provide feedback and interact with the knowledge workers (staff that had contributed into the IGR) and evaluate the knowledge that had been input or uploaded. Therefore, the points given to the knowledge worker that have contributed to the system's repository is reviewed by the knowledge managers to ensure that only relevant and applicable knowledge is stored into the knowledge repository and shared more efficiently. Such filtering and validation process is a means to genuinely reward knowledge that had been created and used for the best interest of the organization.

5. Holistic Knowledge Management (HiKMas) System
The Holistic Knowledge Management (HiKMas) System consists of three main modules: Internally Generated Repository, Knowledge Maintenance Subsystem, and Knowledge Manipulation Subsystem. There are also two support systems namely: External Knowledge Acquisition and Environmental Scanning. The users of this system consist of knowledge workers, domain experts and end users.

Internally Generated Repository (IGR) involves six modules (Figure 3):

i. **Experts Directory** is a directory that provides information on experts found in an organisation/ institution. Information on these experts can be accessed through hyperlink and query facilities by areas of expertise and companies/organisation.

ii. **Meeting/Brainstorming** is a module that enables staff in organisation to obtain information on meetings and brainstorming sessions scheduled by the organisation. This module allows staff to upload, search and download minutes of meetings or reports of brainstorming sessions.
Fig 3. Interface of Internally Generated Repository (IGR)
iii. **Network and work groups** is a module that provides forum for staff of the organisation to communicate online more effectively. The module is designed in such a way that it helps to enhance discussions and sharing of information among staffs within the organisation or staff/experts in other organisations.

iv. **Seminar/Conferences/Workshop/Courses**
module enables staff to fill up online form to attend seminars/conferences/workshops/courses organised within the country or overseas. Through this module, it automatically requires the staff who had attended seminars/conferences/workshops/courses to upload their papers/reports as a way to capture new knowledge and support the process of updating the knowledge repository in the company. As such, this module would help overcome the problem of a static knowledge repository and enhances knowledge sharing, dissemination and transfer among staff within the organisation.

v. **Working with experts** module provides a directory for staff in the organisation to obtain information on external experts and thus enabling staff to identify external experts in order to secure training sessions with the external experts.

Fig 4. User profile management interface

vi. **Publication** is a module for staff to key in their publications data like books, journals and conference paper. Every publication data that is keyed in will be given points and this is cumulated into the user profile as a means to give incentive for sharing and contributing into the knowledge repository. This module also requires the staff to fill up their profile

Fig 5. Interface for staff to input their publication data

to enable other users to obtain more information about the authors and to search for people with the same field of interest (Figure 4-5). The information found in each of the five sub-modules above provides a platform to store the relevant records into the IGR module. The type of files used in the IGR system are based on the type of information that will be stored in each of the relevant modules.

Knowledge Maintenance Subsystem is the system used for system manager and knowledge manager to maintain the system's database. The main users of this system consist of domain experts who have the expertise to monitor and manage the knowledge/ information that had been input by knowledge workers. There are two types of experts who are involved: system managers and knowledge managers. System managers administer the information related with the system such as updating users' information. Knowledge managers manage knowledge by giving feedback and interacting with knowledge workers on information that had been input or uploaded.

External Knowledge Acquisition is one of the support system found in Holistic Knowledge Management (HiKMaS) System. External knowledge acquisition is a hyperlink that provides users of the system to access information sources found in digital libraries and searchable databases. Through the system, users will be able to access information sources such as books, conferences/

technical/ research reports, journal articles and sources in other forms of media. The second support system found in the system is the Environmental Scanning which is a directory and search engine that provides access to business information. This system enables staff in the organisation to access external business information and to conduct environmental scanning.

Knowledge Manipulation Subsystem enables end users to enter their queries in order to access information found in the knowledge repository. End users' query will be sent to the system's search engine to enable information processing to be executed before sending to the deep web sub-module which will access to the information requested by the end users of the system. The relevant information will then be searched from the system database (knowledge repository). The information that had been searched will use semantic web methodology for the purpose of displaying relevant information requested from the system. The result of the search will be displayed to the users and the information obtained from the system's database is arranged in rank order for the users.

6. Conclusion

This paper had emphasised on the cultural behavioural perspective of knowledge management, which organisations failed to integrate in their knowledge management initiatives. In addition effective organisation learning depends more on a human resources rather than technology driven. The cultural behavioural perspectives of users was studied as it was found to be influenced by the culture instilled in the organization that can motivate staff to share knowledge through the knowledge management system. In addition, it was discovered that the behaviour of knowledge management users may also be influenced by the technical system. The model that was designed had addressed the importance of the technical and incentive system to be integrated into the Holistic knowledge management system. Hence, the User Profile Editor was developed to be linked to the IGR . From the technical system view, the behaviour of users can be identified and the incentive system will provide information that leads to the rewards for staff that share knowledge. Organizations should realize that for knowledge initiatives programme to work, they need to encourage their workers to be involved in on going knowledge creation activities as advocated by Nonaka and Takeuchi. Through sharing experience within groups of core competencies, it helps to promote the replication of good practice and the resolution of issues and problems. Apart from emphasising on the cultural perspectives of knowledge management, this paper pointed out the importance of technology element in order for the objectives of knowledge management initiatives programme to be achieved.

7. References

[1] Junnakar, B. Creating futile ground for knowledge at Monsanto. Perspectives on business innovation,1:34-40. http://www.businessinnovation.ey.com (16 May 2007).

[2] Bhatt, G. D. 2000. Knowledge management in organizations: examining the interaction between technologies, techniques and people. *Journal of Knowledge Management* 5(1):68-75.

[3] Cavana, R.Y., Delahaye, B.L. and Sekaran, U. 2001. Applied Business Research: Qualitative and Quantitative Methods. Australia:John Wiley & Sons.

[4] Crabtree, B.F. and Miller, W.L. 1992. Doing qualitative research. London:Sage.

[5] Darke, P., Shanks, G. and Broadbent, M. 1998. Successfully completing case study research combining rigour, relevance, and pragmatism. *Information Systems Journal*, Australia:Blackwell Publishing.

[6] Myers, M.D.1997. Qualitative research in information systems. *MIS Quarterly*, Minneapolis: University of Minnesota, pp. 241-242.

[7] Juhana Salim. 2005. Knowledge management systems for strategic advantage: the Japanese perspective. *Sabatical Research Report*. Fakulti Teknologi & Sains Maklumat. Bangi: Universiti Kebangsaan Malaysia.

[8] Khalil Md.Nor. 2008. Knowledge management: does the organizational culture matter? http://www.fppsm.utm.my/jurnal/jk08/801.pdf [31 March 2008].

[9] Razmerita, L. 2003. Ontology-based user modeling for knowledge management systems. http://www.springerlink.com/content/thw9rmvmvk lx9hac/ [24 Jun 2008].

[10] Takeuchi, H. and Nonaka, I. 2005. Hitotsubashi on knowledge management. Singapore: John Wiley.