Knowledge Management Initiative in Universiti Putra Malaysia (UPM)

Marzanah A. Jabar, Hj. Hasan Selamat, Abdul Azim Abdul Ghani and Hamidah Ibrahim

Faculty of Science Computer and Information Technolog
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
E-mail: marzanah@putra.upm.edu.my

ABSTRACT

UPM realizes that its organizational knowledge which resides in individual brain or stored in organizational processes, products, facilities, systems and documentation is quickly becoming a sustainable competitive advantage. This growing attention has lead to the idea that these resources must be protected, cultivated and shared among its members. Knowledge Management Centre (KMC) in UPM was established in 2002. Based on the vision and mission of UPM and KMC, five critical management areas have been identified: Infrastructure, Knowledge Repository, Marketing and Customer Service, Intellectual Property Rights (IPR), and Knowledge Management Research and Development. This paper discusses the knowledge framework adapted by KMC. These key elements represent the building blocks in implementing the Knowledge Management System (KMS) in sustaining and extending knowledge sharing culture in UPM. An overview of technologies used in (KMS) components, will be discussed in their actual and potential contribution in the process of KMS in UPM.

Keywords

Knowledge Management, Knowledge Management Framework, Knowledge Management Technologies, Knowledge Portal

1.0 INTRODUCTION

Knowledge is an asset that can enhance an organization. Knowledge is considered as fundamental asset of the organizations. Increasing attention has been devoted to knowledge and knowledge management (KM) issues within organizations. Environmental factors such as the market globalization, the increased product complexity and the turbulence of competitive scenarios, the powerful role of knowledge as a source of sustainable advantage have been considerably emphasized, Zack (1999). Technology plays an important role in the organizing, capturing and distribution of knowledge. Technology is a facilitator of knowledge management, a tool to assist individuals and groups in the creation, capturing and distribution of knowledge. Many tools to support KM have been developed and these tools are based on technologies according to Davenport and Prusak (1998) and Abecker et al. (1998), that can be designed and implemented, can effectively support KM.

2.0 BACKGROUND

KM tools are technologies which enhance and enable knowledge generation, codification (know how), and transfer Ruggles, (1997). 'Spiral of Organizational Knowledge Creation' defined in 'The Knowledge Creating Company: How Japanese Companies Create the Dynasties of Innovation.' by Nonaka, Ikujiro and Takeuchi (1995), described knowledge as two types : Tacit, as highly personal knowledge that is inside our head and is difficult to express. Explicit knowledge is formal knowledge that is in books, manuals that can be expressed and grabbed. There are four possible conversion of knowledge known as the Nonaka SECI model.

- Tacit to tacit – happens when two or more human beings interact, and tacit knowledge is expressed in a social way and passed from human to human which is called **socialization**.
- Tacit to explicit – happened when human captures tacit knowledge by writing it down or capturing it on computer (digitizing/codification) and is called **externalization**.
- Explicit to tacit – happened when a human consumes explicit knowledge by reading/viewing/hearing from the media it was externalized, and this process is called **internalization**.
- Explicit to explicit – this happens when multiple sources of external knowledge is brought together within a new context, like researching multiple sources, or when computers reference different data sources and is called **combination**.

Davenport and Prusak (1998) defined 'technology' as the catalyst in implementing knowledge management, and it evolved mainly in the areas for collaboration and search engine, these includes pervasive technologies such as the internet and extranet. Carvalho et. all (2001) described how technology can be used to cater the knowledge conversion

modes based on the schema proposed by Nonaka and Takeuchi (1995) to represent the four knowledge conversion modes in Table 1.

Table 1: KM Technologies and knowledge conversion processes. Carlvalho (2001)

	To Tacit	To Explicit
	Socialization	**Externalization**
From Tacit	Knowledge Maps	Groupware
	Knowledge Portals	Workflow
		Knowledge Based system
		Knowledge Portal
	Internalization	**Combination**
From Explicit	Innovation Support Tools	Intranet
		EDMS
		Business Intelligence
		Competitive Intelligence

3.0 KMC INITIATIVE IN UPM

KMC in UPM was established to systematically leverage information and expertise to improve its responsiveness, innovation, competency and efficiency. The KMC vision is to become a leading educational resource centre in a larger knowledge system that aids the various needs of the UPM, national and international communities. KMC's mission is to develop the knowledge capture and retrieval structures, by creating and providing relevant knowledge management functionality to the university community and a range of partners and university customers while supporting the research, education, consultancy and administrative efforts of UPM. The management areas of KMC have been identifies as the Infrastructure and System, Repositories, Community Interface, Intellectual Property Rights, Research &Development and Education. KMC has prepared policies and guidelines for the management of knowledge in UPM:

1. The intellectual property produced by staff and students shall be deposited into UPM Knowledge Repository and constantly updated.
2. The culture of sharing and retrieval of information from the deposited Knowledge Repository shall be practised by UPM community.
3. Knowledge auditing shall be implemented according to the established policy and procedures.
4. All inventions and innovations shall be immediately deposited into the Knowledge Repository.

KMC is currently headed by a Director and its 5 divisions of the management areas are headed by personnel of various disciplines. The knowledge management framework (Table 2), adopted by KMC in the initial implementation of KM is based on the three levels framework by J. Liebowitz (2003).

Table 2 : Knowledge Framework

Level	Strategy	Actions
Level One	KM Awareness	1. Attending KM seminars and courses 2. Road shows to various department in UPM 3. UPM's Knowledge Discovery Workshop Oct 2002 4. UPM's Knowledge Enrichment Workshop Feb 2003
	KM Strategy	1. Creation of KMC 2. Identify KM processes
	KM Taxonomy	Based on UPM 7 clusters 1. Applied Science 2. Engineering and technology 3. ICT 4. Pure Science 5. Medical Science 6. Social science and professional literature 7. Administrative
	KM Benchmarking	Comparison study of other KM implementation
Level Two	KM Technologies and Tools	Evaluation and selection of KM solution and tools
	KM Organization	Creation of committees
	KM communities	Selection of 17 scientists from various discipline, and the formation of the following communities: • Agriculture • Food Science & Technology • Bioscience and Biotechnology
Level Three	KM Pilot	Development of the AgroBio Portal
	KM Measurement	1. Statistic from the Portal (Access time and number of downloads) 2. Activities of the communities (Number of members, interactions) 3. Interviews with knowledge providers/users
	Change Management	New policies and procedures

The KM framework in Appendix 1 described the building blocks for the fundamental design of KMS in visualizing and determining the requirement within the university-wide application. The knowledge management framework serves as the building blocks for the fundamental design for UPM Knowledge Management System (KMS), it allows KMC to visualize and determine the required services in their specific environment and their interaction within the structure of KMS.

4.0 THE PILOT PROJECT (http://agrobio/infosider4/index.jsp)

A pilot project known as AgroBio Portal in UPM was initiated in July 2002, with the objective to create a central corporate memory for harnessing the intellectual capital resources. 17 'content providers' has been selected as the 'champion group' for this project. They are researchers from three various disciplines which are the Agriculture, Food science and BioTechnology. This project also serves as the 'test-bed' for KMC to measure the workability, usability and acceptability of knowledge management (KM) processes. The project commenced in October 2002 with a focus on the Agriculture and Bioscience research, as this is the strength of UPM as one of Malaysian top research centre.

4.1 Systems Architecture

The core knowledge management process activities provided by the portal will capture explicit and tacit knowledge, cataloging and storing of information for ease of access, transforming information for use and disseminating information. In Appendix 1 are the various components designed for the AgroBio Portal based on the KM Framework.

4.1.1 Personalized Portal

The portal provided could be customized and allows users to manage their personal knowledge assets such as bookmarks, files, and calendar. It also provides access to UPM corporate knowledge resources and managing personal knowledge taxonomy.

4.1.2 Knowledge Repository

Knowledge from a wide range of information systems are gathered and transformed into structured information resource. Users can contribute their knowledge to the repository through AgroBio Portal. Metadata and Knowledge maps enable the capture of explicit information and also document history, context and the related expertise of the staff. The system provide the platform to retain experiences, share knowledge and manage knowledge assets through knowledge contribution , to enable distribution, knowledge sharing or re-purposing for other application such as e-learning.

4.1.3 Discovery of Experts

The system's Expert Directory enables users to quickly find and access people with specific skills and expertise in the organization. The system provides the capability to identify tacit knowledge within the personnel based on their interaction with the system. A researcher who has contributed many research papers in a particular subject matter will be automatically identified as an expert within the knowledge category. The system also allows users to recommend fellow staff or external consultants as subject matter experts.

4.1.4 Collaboration

The community and collaboration module provide common location for collaboration activities where users can create and manage communities related to their working projects or areas of interest. Interest groups or project groups can utilize the different features for purpose of sharing project information ideas or files. All activities and discussions transpired within the community are logged, thus allowing future users to re-visit the thought processes via search within the knowledge warehouse.

4.1.5 Workflow

Provide an automated process in executing a task while also serving as a platform to capture knowledge that is generated. Best practices will also be captured, where staffs can view the 'best practice done' to better understand the task, thereby reducing the 'learning cycle' and increasing the efficiency rate.

4.1.6 Linking Enterprise Knowledge Asset

Integration of existing searchable sources (repositories, document management system, databases and internet) is the step in unifying access to the knowledge. The spidering technology in the Portal enables the knowledge to be searched and mined using the knowledge miner, and having agent provides dynamic information delivery based on user defined requirements.

The Portal is designed with features and functionalities (Table 3), so as to provide the necessary means for users to perform the KM processes.

Table 3: Analysis of AgroBio Portal functionalities

AgroBio Portal Features	Functionalities
Portal features:	
Personalization	A personalized viewed of preferred utilities and information which can be easily configured based on the user preference.
Curriculum Vitae (CV)	Quick access to personal resume, with both professional and personal items (eg. Hobbies) Option is also given to update the CV, and allows other users to gain access to the CV profile.
Contribution	A listing of previous contribution, with the ability to sort and view the latest update of knowledge assets in various knowledge classes.
Worklist	A listing of things to do coming from the systems, which requires the approval of the login user. Eg. Request for full documentation, request for approval for specific application (from EDMS or workflows)
Application	Listing of the user request such as application for SKW. It will automatically tracks status of the application. (Pending, Approved, Rejected, Draft)
Library	Quick access to the login user's favorite Knowledge Asset displayed within the knowledge map. Able to add or remove the document from the library
Experts	Quick access to a listing of the login users favorite experts and recommended experts. Ability to keep track of expert's contact information such as e-mail address, phone numbers and field of expertise.

KMap	Quick access to the preferred or frequently used nodes of the knowledge map
Scores	Listing of the accumulated incentive points. Knowledge points are awarded to the user for contributions to the knowledge repository or viewing other knowledge assets and giving comments.
Community	Quick access to a listing of the communities that the login user is a member of and tracks the latest posted messages, events and bulletins.
Links	Shortcut to favorite websites or application links, with the ability to modify by adding or removing links.
Portlets	Ability to configure the layout of the various portlets to be displayed. This includes access to various intranet systems in UPM.
Notification	Ability to configure an alert mechanism of the addition of new knowledge assets that fits the 'interest' profile of the login user.
Office Tools	Quick access to commonly used office application
Knowledge : Contribution Search Explorer	Provide a knowledge contribution form to capture the metadata of the knowledge asset in order to expedite the knowledge contribution process Four search options are provided to conduct the full text search within the knowledge repository. The search result is ranked based on the relevancy of the content of the knowledge assets and the search term.
Expert : Search, recommend	Ability to search for an expert based on keywords or 'Area of Expertise'. The details of an expert found through a search can be easily added to 'My Expert' list. Ability to recommend an expert. Requires the login user to state the reasons for recommendations and core research activities.
Workflow	Provide automated application and approval of SKW (Seminar, konferensi dan workshop) application. Application and management can easily monitor the status of the application. The committee can review application by having online information such as information on the past two years of SKW attended and past three years journals published by the applicants. Using collaborative features of the portal, the committee members can participate in an online messaging char or a forum to discuss the merits of the applicants. The successful applicants will then be reminded by the system to contribute assets gained through participation of the event.
Collaboration: Community Instant Messaging	Ability to create communities based on interest or projects and allows other users to join and participate in the online activities. Able to conduct full-text search on all the content within the communities. Able to conduct a scheduled real-time conference via instant messaging.
Reports:	This feature extends the user's ability to generate a few types of reports. Eg: 1. Statistic of knowledge assets in repositories 2. List of communities and it's members 3. Status of workflow 4. Administrative reports.

Based on Table 3, contribution to the formation and communication of tacit and explicit knowledge, and the technologies involved is shown in Figure 1.

Figure 1: Conversion of knowledge between tacit and explicit forms in AgroBio Portal based on Nonaka (1995)

Tacit to Tacit (Socialization) Portal Features Instant Messaging Community Expertise Search and Recommend	**Tacit to Explicit (Externalization)** Portal Features Collaboration Workflow
Explicit to Tacit (Internalization)	**Explicit to Explicit (Combination)** Portal Features Contribution (EDMS) Intranet Based Systems (through Portlets) Reports

Organizational learning takes place as the participants uses the functionalities, and by doing it, their knowledge is shared, articulated and made available to others.

Socialization includes the shared formation and communication of tacit knowledge between people. In AgroBio Portal the activities where the tacit knowledge sharing can take place is a team meeting where experiences can be shared through instant messaging, or discussion and to some extend shared documents. Sharing of tacit knowledge can also be done by finding people with common interest to join a community. In expertise search and recommends, the systems act as the search engine for individuals through the profiles and curriculum vitae, and also as a way for inferring expertise through the portal.

In the **externalization** mode, as team members shared knowledge using collaboration tools such as chat in real time interactions, discussion should lead to the formulation and sharing of metaphors and analogies. In newsgroup or forum, where people who may not be from the team, basically strangers can pose questions, exchange ideas or offer assistance. Although explicit knowledge are exchanged here, these were based on the judgments of the tacit knowledge, and once the knowledge is made explicit persons with the same problems can find solution based on these archives. By having questions and answers facilities, knowledge could be elicited from the community and experts. In the SKW workflow systems, it support and improve information sharing and distribution, by capturing policies, procedures and practices of the automated business processes, facilitate work tracking and audit. In this way it automates work thus minimizing the learning cost. They make explicit the knowledge that is embedded in standard processes, mainly supporting the formal codification of existing knowledge.

The **combination** mode is best supported by IT facilities as it deals mainly with explicit knowledge. The conversion of explicit knowledge happened during the capturing of knowledge contributed in the form of reports, documentation, publications, e-mail, presentation, web pages and other

knowledge class and is made available to everybody by generating it as electronic documents to enable sharing. Portal features that aid the access to these documents can easily accumulated metrics used for documents used. Other measure of quality is through the score system. The portal will enable the users to select their intranet information sources example they may want to have access to the student system, office automation such as leave application.

It can be seen from Figure 1, that there is no technologies defined under the **internalization** quadrant, where knowledge is first externalized and then shared, understood and internalized thus creating the tacit knowledge. By accessing explicit knowledge, it enriches the explicit knowledge and gives opportunity to create new knowledge by combining it with their tacit knowledge. Some of the technologies available are the simulation tools, technical databases of patents, articles and research projects are kept. This is to feed the explicit knowledge needed for innovation.

5.0 PILOT PROJECT EVALUATION

17 knowledge providers were selected for the pilot project, and were briefed on the objective of the project. They were then guided to use the initial stage of the portal to contribute their knowledge asset, and the creation of the taxonomy and classes. During the workshop, sessions were held for need analysis, exploring the sharing cultures and hands on session for the portal. Interviews were conducted in continuation of the first workshop, as part of the knowledge audit, to gain full understanding of the environment where KMS is to be implemented, the content which may be used best to leverage the aims of KM, and the functionality which will best allow end-users to access and understand the content. All 17 content providers were given a set of questionnaires with questions on knowledge contribution, knowledge map, knowledge classes and metadata, knowledge retrieval, e-community and portal functionalities.(KMC 2003). 14 of the 17 chosen contend providers responded to the 90 minutes interviews and questionnaires session. 10 or 71% of the respondents were very resourceful and has provided many positive and valuable responses towards the project. Listed below are some of the findings based on the comments and suggestions from the content providers:

1. Enhancement to the portal in terms of :
   a. integration,
   b. ease of use,
   c. consolidation of information and services
   d. sharing of information
   e. extraction and reuse of information
   f. tacit knowledge capture
   g. one-stop centre of information services
2. Backlog of existing knowledge not in the repositories
3. Who will validate knowledge contributed
4. Knowledge updating
5. Need to address the policies and incentives
6. Training
7. Culture
8. ICT infrastructures
9. Intellectual Properties

The comments from the interviews indicated that the initiative is a wise move which ultimately will lead UPM to a world-class university. Suggestions were made on how to encourage the participation for the contribution of knowledge. Issues on security and incentives were also raised. There was also a note of skepticism of KM as another fad.

6.0 CONCLUSIONS

This paper presented the development of AgroBio Portal as a single place to get knowledge they need to do their work and at the same time, generating knowledge sharing within UPM communities. The selection of technologies described and used requires analysis of UPM's knowledge needs. It can be found that the strongest contribution to AgroBio Portal is made by technologies that deal largely in explicit knowledge, even though the focus of the model is on tacit knowledge which is featured in three out of the four quadrants. Contribution to the formation and communication of tacit knowledge and the support for making it explicit is still weak, and need further research. Knowledge as information only make sense in relation to cognitive capacity of the users, and as Senge (1998) stated that we can receive information due to technology facilities, but it will not make any difference if we do not have the appropriate skill to apply this information.

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Appendix 1 : Knowledge Technology Framework

<table>
<tr><td>Interface Layer</td><td colspan="6">Agro-Bio Portal Mobile Devices Data Syndication</td></tr>
<tr><td rowspan="3">KM Services</td><td colspan="2">Discovery Services</td><td>Expert Services</td><td>Contribution</td><td colspan="2">Collaboration Services</td></tr>
<tr><td>Content Directory</td><td>Content Search</td><td>Expert Search</td><td>Knowledge Contribution</td><td>Application Sharing</td><td>Chats & Instant Messaging</td></tr>
<tr><td>Push Notify</td><td>Profiling</td><td>Expert Directory</td><td>Workflow</td><td>Tasking and Calendaring</td><td>Interactive Helpdesk</td></tr>
<tr><td>Corporate Taxonomy and Information Repository</td><td colspan="6">Knowledge Map</td></tr>
<tr><td rowspan="2">Infrastructure</td><td colspan="6">Knowledge Repository</td></tr>
<tr><td colspan="6">Messaging, Internet and Intranet Services</td></tr>
<tr><td>Information and Knowledge sources</td><td>UPM Library</td><td colspan="2">Administrative Application (16 Apps)</td><td>k-disk</td><td>People</td><td>Office Automation</td></tr>
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