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Incorporating Human Factors into a Knowledge Management System

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Abstract : The success of a knowledge management system (KMS) does not depend on the technological aspect but also on the human factors. This study explores the knowledge sharing behavior along the four dimensions of knowledge types, knowledge sharing networks, knowledge sharing methods and knowledge sharing motivations. Interviews are conducted to gather qualitative data which are later transformed into a set of requirements for the proposed KMS. The outcome of the study is a KMS which incorporates the human factors into a KMS.

Keywords : Knowledge management, Information Communication Technology, Academic community, Malaysia, Higher learning institutions.

1. INTRODUCTION

The universities are knowledge intensive organizations and the academic community thrives on intellectual prowess, accumulation and dissemination, relies on a critical mass of knowledge sharing (KS). Most higher learning institutions face difficulties in integrating their knowledge to enhance the sharing of knowledge [1]. In a sustainable higher learning institution, knowledge often becomes embedded in several forms ranging from research articles at a high-level presentation slides, lecture notes, or books. These outputs become important to consider when measuring the institution's knowledge performance [2]. According to [3][4] institutions face increasing faculty demands for sharing quality resources of knowledge and expertise. In order to share knowledge efficiently, the right tools must be in place. In an academic institution, there is a need for a systematic structure to assist academicians to effectively share their knowledge.

Technological solution such as knowledge management system (KMS) are often cited as the solution to support knowledge sharing [5] and many academic institutions have KMS to support knowledge sharing [6]. KMS is a promising techno-management tool to improve the performance of academic institutions in the area of teaching and research, as well as in administrative services [1][7]. Despite the investment for knowledge management (KM) initiatives including the development of knowledge management systems (KMS) which use state-of-the-art technology to facilitate the collection, storage, and distribution of knowledge, it has been estimated that at least $31.5 billion are lost per year by Fortune 500 companies as a result of failing to share knowledge [8]. An important reason KMS failed to support KS is the lack of consideration of the complexities of human behaviour in sharing knowledge in the KMS development [9]. Many KMSs have failed because they were limited to technical solutions and did not consider human factors [10]. Among the factors identified are the lack of consideration on the human aspects namely how knowledge workers create, disseminate and manage information [11].

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This research aims to develop a KMS which is able to support KS among the academicians. Therefore in determining the appropriate requirements and taking into considerations of the human factors for the proposed KMS, this research studies the KS behaviour of the academicians and the functional expectations of the KMS. Both the findings are then incorporated as the requirements for the proposed KMS.

2. REQUIREMENTS GATHERING METHOD

One of the major tasks in designing systems development is the systematic elaboration of system requirements (functions and features). Determining the right requirements for the system is a very critical in the system development life hence there is a need to consider this phase carefully. The requirements for a KMS development must be captured from the experts, and the feedbacks from the user of the KMS. This includes the data needed by users as well as the use made of the data. In other words, KMS must consider the creation, dissemination and management of the information by the knowledge workers, in this context the academicians.

In this research, 13 reputable academicians in the ranking of professors and who have been in the profession for more than twenty years were interviewed. Respondents are from various specializations ranging from engineering, medical, humanities and social sciences. Respondents were asked on their KS activities and implicitly probed on the reasons they shared knowledge. For more detailed information such as their expectations on the functionality of a KMS, a scenario-based was used. The respondents are asked to visualize a KMS and their functionalities. Based on their responses, content analysis was used to discover the functional requirements of the systems.

3. RESULTS AND DISCUSSION

A. Knowledge Sharing Behaviour Components

Three components of knowledge sharing behaviour are discovered which are knowledge types, KS methods, KS networks, and KS motivational factors. Using the definition by [12][13] as the theoretical lens in analysing the data, two types of knowledge are discovered which are Corporate Knowledge and Social Knowledge. The details of the knowledge types are presented in Table 1.

Table 1
Knowledge Types

Knowledge Classification	*Sub-Dimension*	*Definition*
Corporate knowledge	Disciplinary knowledge	Knowledge from the core product of universities, generated through scholarship and research. Conveyed through consultancy, publication, and teaching
	Operational Knowledge	Knowledge held in the university policies, practices, and values which guide the university's styles of learning and teaching.
Social knowledge	Cultural, Spiritual	Knowledge related to the individual's beliefs and values.
	Pastime, and General	Shared matters relate to participants' norms and social life.

The academicians share and exchange their knowledge through two main methods which are synchronous and asynchronous, which are one-way flow and two-way flow. Asynchronous KS is carried out virtually through both a one-way flow method using the official website and personal blog and a two-way flow method using the email application. As for knowledge sharing networks, the work of the [14] [15][16] are used as the theoretical lens in analysing the data for knowledge sharing networks. Table 2 presented the findings for knowledge sharing networks discovered.

As for motivational factors, the study discovered five important factors which are building reputation, receiving acknowledgement (monetary and non-monetary, to get a promotion, and recognition), becoming knowledgeable person (to learn), the presence of an institutional vision and mission, and reciprocity (mutual sharing).

Table 2

Knowledge Network

Knowledge Network	*Attributes*	*Definition*
Business Club network	Academicians in the universities, and the associates in non-educational governmental and private organizations	Network of people connected formally through partnership of interested parties with other expertise in specific areas of relevance to most members of the business group
Personal network	Relatives, friends, colleagues, fellow members of organizations,	The set of people including and acquaintances with whom the focal person has a direct personal relationship and students. Students have been included in this network because the direct nature of the relationship between them and their lecturers (academicians)
Community of Practice network	Research Interest Groups	Comprise of members who share knowledge, ideas, insights, and experience in an area of interest.

As the interview result revealed, there were three suggestions by the respondents to be considered in the KMS for academic institutions. The first suggestion is the availability of experts' information (directory) in the system for consultation matters. This will enable academicians to seek the relevant experts for collaborative purposes. The second suggestion is the accessibility of the system. The accessibility refers to the KMS availability 24/7 and anywhere, and via various platforms. The third suggestion is the managing and categorization of system contents. There are several benefits of managing and categorizing system content include ensuring that users can easily navigate, browse, and search the system content. There are several ways for categorizing system content. For instance, it could be categorized by subject, topic, task, service, audience group, geographic location, or by any combination of these factors.

B. Knowledge Management System Framework Components

The KMS Framework is formulated based on the knowledge sharing behaviour model developed. The four dimensions which made up the KS behaviour model are types of knowledge shared, knowledge sharing networks, knowledge sharing methods and knowledge sharing motivations. The proposed KMS needs to address various services and issues related to academicians KS behaviour. The KMS framework was validated by an expert who has more than fifteen years' experience in information systems development. The expert is an information system lecturer specializing in information system framework and architecture. She has been in charge of developing a KMS in an academic institution for the past five years, and has evaluated various KMS in various organizations. Table 3 illustrated the KMS framework mapped components.

C. Knowledge Management System Development

Based on in-depth face to face interviews with the academicians, we have identified the system requirements for the proposed KMS. A use case diagram is used to describe the system components based on the requirements gathered. The system content (knowledge types) classifies according to what the academicians actually share in reality which are Corporate Knowledge (includes subject, research, work procedures, staff development, staff management, and university polices). Another classification is Social Knowledge which includes culture, spiritual, pastime and general. The proposed academic institution KMS highlight solely the knowledge types that have emerged from the analysis of the participants' responses and are managed through the system.

Table 3
KMS Framework Components Mapped

K- Sharing Behaviour Dimensions	*Classification*	*Knowledge Management Technology*	*Justification and Explanation*
Types of Knowledge Shared	Corporate Knowledge	Meta-knowledge Repository consists of the taxonomy of all meta-knowledge from the documents.	Corporate knowledge are explicit knowledge which are in the forms of documents and in variety of sources, therefore in storing corporate knowledge a meta-knowledge of all the sources of corporate knowledge will facilitates the organizing, searching and retrieving of all the knowledge sources.
	Social Knowledge	Knowledge Repositories consists of the databases of heterogenous data of textual and non-textual forms.	Social knowledge are tacit knowledge from various knowledge artefacts, either in structured, semi-structured and non-structured forms. Images and non-textual forms can be stored in databases, whereas semi-structured and unstructured knowledge can be stored in knowledge repository utilizing the ontology-based knowledge models. A fusion of SPARQL and MySQL query can be implemented for retrieval.
Knowledge Sharing Network	Business Club Network	Community home spaces which uses the platform of synchronous computer-based training, tele-learning and video conferences in order to provide collaborative knowledge services.	Business Club network is a formal network where work-related knowledge are shared. There are multiple groups where each group shares specialized knowledge. Examples of these groups are Research Interest Groups, Specialized Interest Groups.
	Personal Network	Groupware and mobile groupware, incorporating electronic discussion groups and group support systems.	Personal network is a network where the members have developed "friendship" among them. Knowledge are shared in an informal manner.
	Community of Practice	Digital social engagement tools which supports collaborative knowledge services such as groupware and mobile groupware, emails supported by mobile platforms.	CoP is defined as a group of people informally bound together to share common interest matters virtually. Members of the group may not know each other personally but they are bounded by the same interest at a particular time.
Knowledge Sharing Methods	Synchronous	Synchronous communication applications such as group conference management, instant messaging.	KS synchronous method refers to sharing knowledge in a real time (all participants are on-line at the same time).
	Asynchronous	Asynchronous communication applications such as wiki, email, newsgroups and blogs.	KS asynchronous method refers to sharing knowledge in a delayed time (simultaneous presence of communication partners is not necessary).

<table>
<tr><td rowspan="5">Knowledge Sharing Motivations</td><td>Acknowledgement</td><td colspan="2">Collaborative tagging and gamification elements utilization through data mining techniques. Indicators may include “likes” or “badge”</td><td>Basically acknowledgement is the main motivation in sharing knowledge. Ranking based on the highest knowledge provider or best knowledge provider are ways to provide the acknowledgement.</td></tr>
<tr><td>Reciprocity</td><td colspan="3" rowspan="2">These 2 knowledge sharing motivations can be incorporated using similar Knowledge Management Technology.</td></tr>
<tr><td>Building Reputation</td></tr>
<tr><td>Knowledgeability</td><td>Collaborative Social Networking platform. (Social Analytics Application)</td><td colspan="2">Knowledgeability concerns on the interest to learn and acquire more knowledge in a certain field of area. Therefore it is suggested that collaborative platform to connect subject matter experts and participants.</td></tr>
<tr><td>Institution Vision and Mission</td><td>This is more of a directive from the organization. Involves leadership commitment.</td><td colspan="2"></td></tr>
</table>

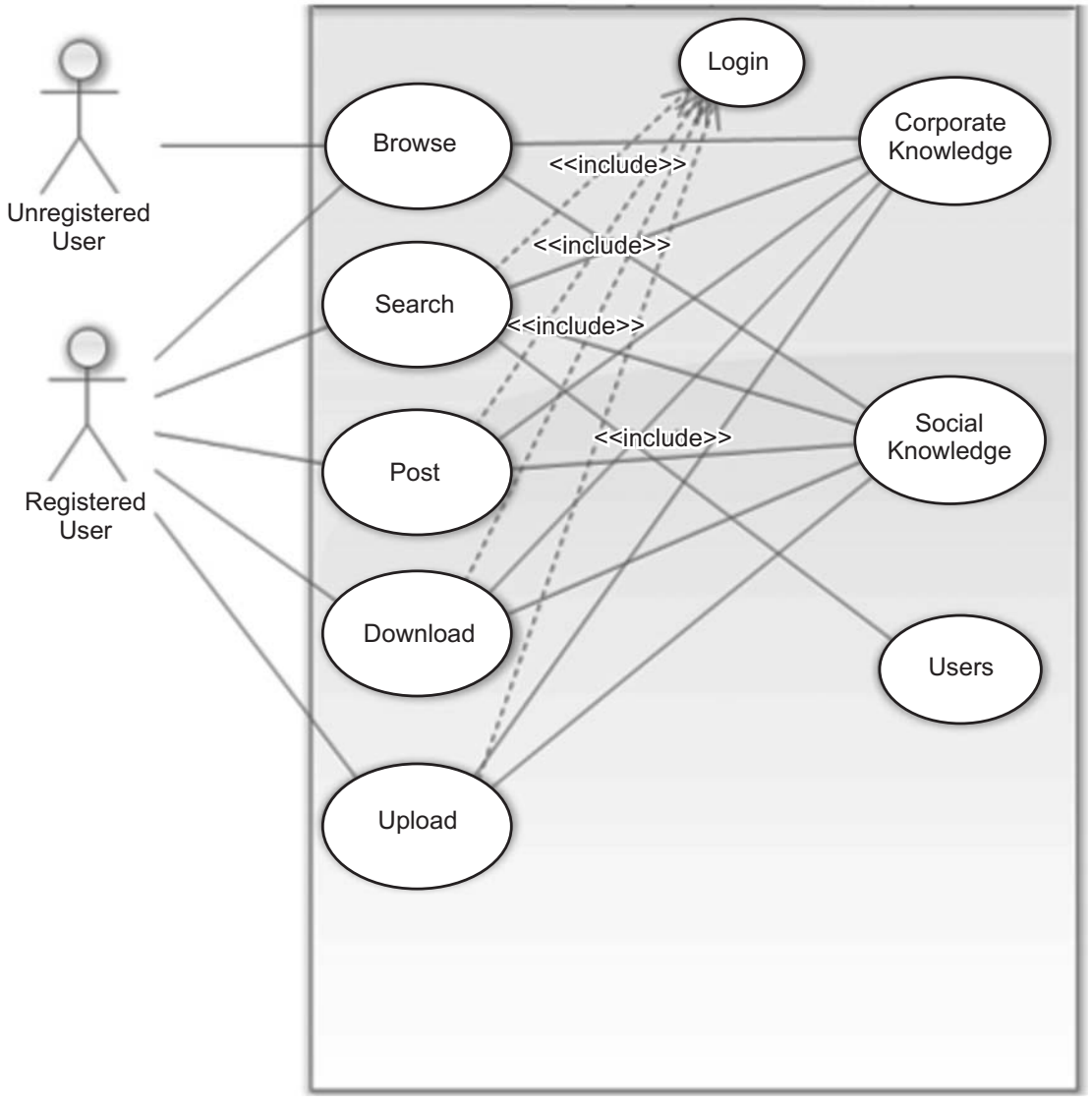

Figure 1: KMS Use Case Diagram

All the knowledge types being shared among academicians occurs in 3 different formats which are video, picture or texts. Based on Fig 1, the proposed KMS must include the login functionality as an authentication to the system for registered users. Only users who have registered in the system can post, search, download and upload into the system. The unregistered users (visitors) can only browse the content of the KMS. The search function allows the user to search in the system's repositories based on the type of knowledge. The system will search on the knowledge based upon the word or phrase that user wants to find. Fig. 2 depicts the searching and retrieving process.

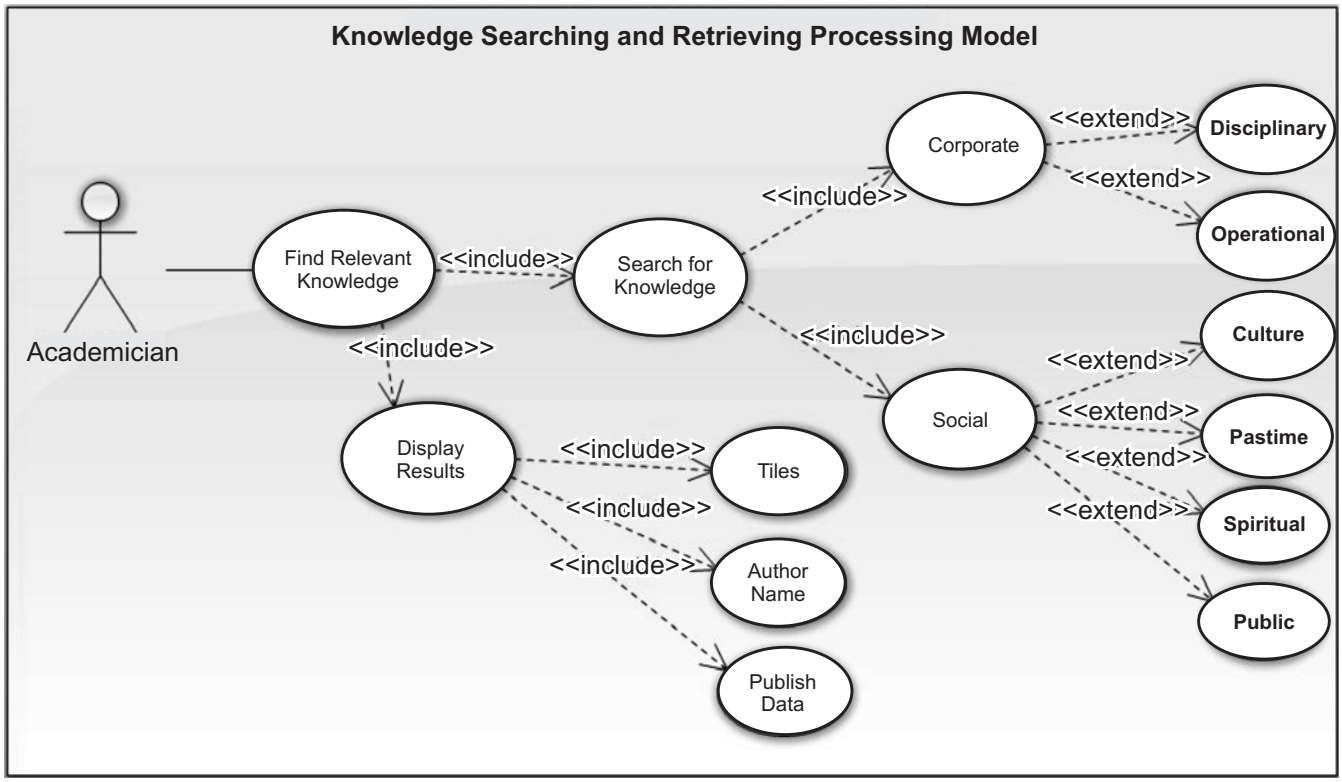

Figure 2: Knowledge Searching and Retrieving Model

In the proposed academic institution KMS, there is a database for each type of knowledge. Academicians can manipulate each type of knowledge through four functions; namely: Create knowledge, store knowledge, share knowledge and share knowledge. Through the create process, the user can add any knowledge types identified. By using the store process, the user can store the knowledge he has added. The reason behind that is to shorten the search process. A successful KMS should be designed to offer an easy way to search and find needed knowledge or details of user contact information the user wishes to find. It also needs the ability to directly connect people from different areas and institutions.

Based on the analysis of responses, three KS networks are business class network, Personal network and community of practice network as defined in Table 2. Therefore, in the proposed KMS, there is a need to address the diversity of KS networks. This could be achieved by allowing the academicians to open communication channels with the people with whom they currently share. Confidentiality and security can be included through permission from the system manager to open a channel or monitoring who and what the new user from another organization creates or share.

D. Knowledge Management System Interface

Fig. 3 is a proposed homepage for the Academic KMS. The homepage contains several functions and services recommended by the participants of this study. Users are able to manage their account profile, share directly with another member as well as post an inquiry or a question. They can also share and attach files in different formats. Through the advanced search facility, the user can search about knowledge or for

an expert. Users can communicate for learning purpose with other members via several collaborative platforms such as Learning Centre (includes Video Conferencing, Computer-based Training and Tele-Learning), instant messaging, email, wiki and members' blogs. They also can share with others through forums which are categorized according to the knowledge types. With the "Find an Expert" service, users are able to search and find experts in the area of the interest whose contact information is provided in the system.

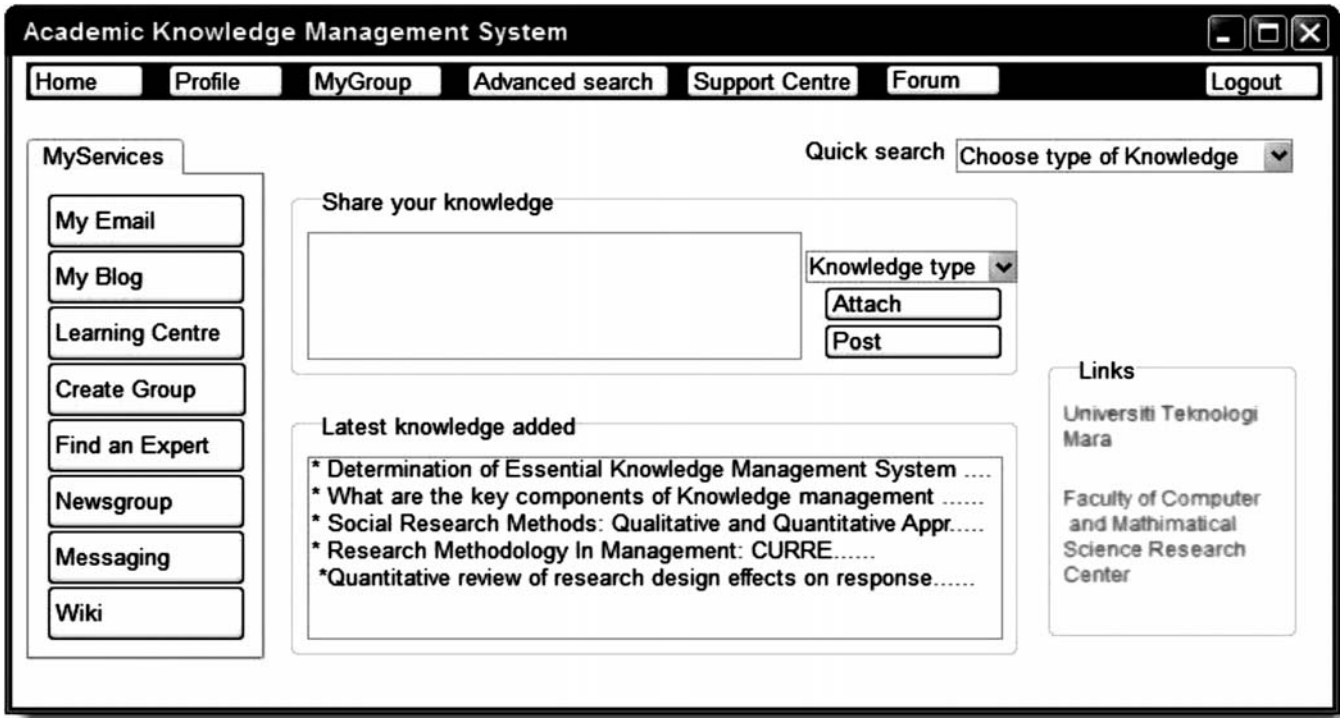

Figure 3: KMS Homepage Interface Snapshot

The system also provides a list of links to information relevant to the users. The "Support Centre" contains a manual to assist users to use all the KMS components.

The proposed KMS overcomes shortcoming of existing KMS which incorporates real academicians KS behaviour in the research site, in addition this KMS addresses significance of human factors in the implementation of KMS.

4. CONCLUSION

The issue of how to share knowledge within organizations in effective ways has received extensive consideration in both practice and research. Most learning institutions approve and utilize information and communication technologies, and one such communication technology is a KMS. IT-based KM intervention in academic institutions can prove to be a capable techno-management tool to improve performance in significant areas such as teaching and research. It is important for academic institutions to gain a better understanding of their academicians' KS behaviour to design and implement an appropriate KMS that is compatible with their behaviour and their needs. Therefore, this study models the academicians KS behaviour and integrates the human factors into a proposed KMS. A further research on the five factors that influence academicians' KS behaviour (building a good reputation, acknowledgement, to be knowledgeable, vision and mission, and reciprocity) and why these factors affect their KS behaviour is recommended.

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6. REFERENCES

1. M. Bhusry, J. Ranjan, and R. Nagar, "Implementing Knowledge Management in Higher Educational Institutions in India: A Conceptual Framework," Liceo Journal of Higher Education Research, vol. 7, no. 1, 2012.
2. B. Basu and K. Sengupta, "Assessing success factors of knowledge management initiatives of academic institutions–a case of an Indian Business School," The Electronic Journal of Knowledge Management, vol. 5, no. 3, pp. 273-282, 2007.
3. K. Seonghee and J. Boryung, "An analysis of faculty perceptions: Attitudes toward knowledge sharing and collaboration in an academic institution," Library & Information Science Research., vol. 30, no. 4, pp. 282-290, 2008.
4. P. Srivichai, K. Meksamoot, A. Jengjalem and N. Chakpitak, Integrated knowledge management system based mentoring for new university staff development. Paper presented at the ICT and Knowledge Engineering (ICT & Knowledge Engineering), 9th ed. IEEE, International Conference, 2011, pp. 150-155.
5. H. Andrea, A Comparison of the Influence of Social Factors and Technological Factors on Adoption and Usage of Knowledge Management Systems, Paper presented at 43rd. IEEE Hawaii International Conference, 2010, pp. 1-10
6. S. Sarker, S. Gasson, and C. Haythomthwaite, "Information And Communication Technologies In Support Of Knowledge Management / Organizational Memory / Organizational Learning"; Paper presented at the System Sciences, 2005. HICSS '05.
7. M. Alavi and D. E. Leidner, "Knowledge management systems: issues, challenges, and benefits," in. Communications of the AIS, N. Abramson, Ed. Piscataway, Communications of the AIS, 1999, vol. 1ch. 2es, pp. 1
8. P. Babcock, Shedding light on knowledge management. HR Magazine, vol. 49, no. 5,pp. 46−50.
9. C. Wagner, "Breaking the knowledge acquisition bottleneck through conversational knowledge management," in Innovative Technologies for Information Resources Management, 2006, pp. 200
10. S.C. Voelpel, M. Dous and T.H. Davenport, "Five steps to creating a global knowledge-sharing system: Siemens' ShareNet," The academy of management executive, vol. 19, no. 2 2005, pp. 9-23.
11. H. Smuts, A. van der Merwe, M. Loock and P. Kotze, "A framework and methodology for knowledge management system implementation," Paper presented at the Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists, pp. 70-79, 2009
12. R. James, "Quality assurance and the growing puzzle of managing organisational knowledge in universities," Journal of the Programme on Institutional Management in Higher Education, vol. 12, no. 3., 2000
13. C. Choo, "The Knowing Organization: How Organizations Use Information to Construct Meaning, Create Knowledge, and Make Decisions," Oxford University, 1998
14. B. Kuhne, E. Lambrecht and X. Gellynck, "Network types and their importance for knowledge exchange and innovation in the agri-and horticultural sector. Paper presented at the 21st Annual world symposium of the International Food and Agribusiness Management Association, International Food and Agribusiness Management Association (IFAMA), 2011
15. T. Van Tilburg, Losing and gaining in old age: Changes in personal network size and social support in a four-year longitudinal study, The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, vol 53, no 6, S313-S323, 1998
16. E. Hustad, Knowledge networking in global organizations: the transfer of knowledge, Paper presented at the 2004 SIGMIS conference on Computer personnel research: Careers, culture, and ethics in a networked environment, pp. 55-64, 2004.