A Review of Literature on Knowledge Management using ICT in Higher Education

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Abstract: The paper aims to survey the role of Knowledge Management (KM) using Information and Communication Technology (ICT) in higher education by conducting literature review and classification of articles from 2000 to 2012 in order to explore how KM technologies and applications have been developed in this period. The emergence of Information and Communication Technologies (ICT) in the last decade has opened new avenues in Knowledge Management that could play important roles in meeting the prevailing challenges related to sharing, exchanging and disseminating knowledge and technologies in the higher education. This paper provides a high level overview of KM using Information and Communication Technology (ICT) in higher education. A critical analysis is done by studying attempts made by professionals to implement KM using ICT in higher education.

Keywords: Knowledge, Knowledge Management, ICT, Network, higher education

1. Introduction:

Knowledge is a capacity of people and communities to continuously generate and renew themselves to meet new challenges and opportunities. The growth of the advanced service sector and the increasing need of immaterial labour, have contributed dramatically to change the way in which knowledge is produced, disseminated and consumed. Knowledge is a dynamic and smooth flow of specialized experiences, values and insights. A number of people, perceiving the value of measuring intellectual assets, recognized the growing importance of organizational knowledge as a competitive asset. Universities and other higher education institutions are involved in knowledge creation, dissemination and learning hence they are recognized to be in the knowledge business.

Knowledge Management (KM) concept is introduced in the beginning of 1990. Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives. Jennifer Rowley. KM is a systematic, organized, explicit and deliberate ongoing process of creating, disseminating, applying, renewing and updating the knowledge for achieving organizational objectives [Elias M. Awad et. al., (2008)]. Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives. The knowledge to be managed includes both explicit, documented knowledge, and tacit, subjective knowledge. Management entails all of those processes associated with the identification, sharing and creation of knowledge. This requires systems for the creation and maintenance of knowledge repositories, and to cultivate and facilitate the sharing of knowledge and organizational learning [Davenport et. al., (1998)]. KM has three basic elements i.e. generation of new knowledge, dissemination of the knowledge and application of the knowledge. Organizational culture, technological tools and human beings are the key elements required for managing knowledge more effectively for better education delivery in time phased manner [Petrides et. al., (2003)]. With KM higher education institutes are better able to increase student retention and better graduate rates, work to analyze the cost effective use of technology to meet more enrollment, transform existing transaction based system to provide information and compete in an environment where institutions cross state and national borders to meet student needs anytime/anywhere.

There have been many higher education Institutions that have implemented KM principles, methods, practices or tools. This paper provides a high level of overview and attempts made by higher education institutions about implementation of KM using ICT. The rest of the paper is organized into four sections. In the first section, overview is given about the related work performed in higher education related to KM using ICT, followed with the tabular representation of different ICT tools and
application area is discussed. Further findings and suggestions are given and then paper is concluded.

2. Review of the related work in Knowledge Management using ICT:

ICT is a body of thought that focus on how information is managed. A wide range of ICT tools is used to create, codify and share knowledge across both geographical and temporal boundaries. In this section an attempt is made to conduct review of literature related to implementation of KM using ICT in higher education and then critical analysis is done.

Jennifer Rowley (2000) made a study on implementation of KM in higher Education in United Kingdom and reported that the existing facilities like libraries, electronic collections of learning materials, networks for e-mail communication, and management information system provide data on the student profile. With the help of JANET network researchers and academic staff have access to electronic documents, email, access to network resources, training and awareness etc. Jillinda J. Kidwell et al., (2001) stressed the importance of KM techniques and technologies in higher education which helps for decision-making capabilities, reduced product development cycle time i.e. curriculum development and research, improved academic and administrative services and reduced costs. He suggested to design web based portal to offer the services such as research details, curriculum development and its revision, faculty development programs, student services, career placement services, alumni association services, for accounting section and human resources details. Saxena Anurag (2003) asserted the application of KM technologies in different areas like study material development data, student registration data, support services data, study material production and distribution data and evaluation and certification data for distance education courses in IGNOU. Through the work (John H. Milam, 2004) emphasises the application of KM in higher education with the help of web portal which is used intensively for team collaboration and groupware, natural language queries of data, sharing information on best practices and anytime/anywhere online learning. For sharing and distributing knowledge in the organization, technologies suggested are data warehouses, data mining, and virtual reality modelling to visualize and transcend extraordinarily complex, transaction-based data. Rathinavelu et. al.(2004) explored the importance of ICT to create and share high quality multimedia contents through web based knowledge sharing system by developing Kshare system for collaborative learning among teachers and students through intranet within the institution to acquire, utilize and share knowledge by using ICT.

A formal approach to the use of blogs as learning spaces in the higher education sector has been proposed by Jeremy B Williams, et al.(2004) by conducting a survey about the usage of Blogs in Harvard Law School, the Brisbane Graduate School of Business (BGSB) at Queensland University of Technology (QUT). In the paper, The Implementation of Knowledge Management System In Taiwan’s Higher Education, (Yaying Mary et al.,2005) states the application of Knowledge management systems in a private college in Taiwan, which is facing administrative challenges and cutting-edge competition. A complete technical and organizational infrastructure is built by outsourcing tailor-made Gweb e-KM solution software on Lotus Domino System by creating a culture of knowledge sharing using organization-wide vocabulary. Jonice Oliveira et. al.[2005] has proposed GCC - An environment for knowledge management in Scientific Research and Higher Education Centres.

Nory B. Jones et al.(2007) throws a light on development of a web-portal to connect researchers in university to fill a perceived gap in knowledge sharing and accessibility within the University using knowledge management methodologies. Web portal facilitate knowledge acquisition, sharing and discovery by allowing people to publish documents, share ideas, work collaboratively and store information and knowledge in easily searchable repositories. Neil Witt et al., (2007) in his study on KM approach to developing communities of practice amongst university and college staff suggested to establish Higher Education Learning Partnerships Centre for Excellence in Teaching and Learning (HELP CETL) to support staff involved in the delivery of higher education level from foundation degrees through a network of nineteen further education colleges. To achieve this, a KM system using a Community of Practice (CoP) Framework was investigated and then employed as the key HELP CETL communication and information sharing tool. Prayong Thitithananon et al. (2007) explores an implementation of KM practices in Thailand’s Higher Education development by using ICT tools for improving the current education systems in order to be agreement with the royal decree of rules and regulations in excellence of country management. Alok Sharma(2007) prepared a software tool EDULOGIC for engineering institutions for imparting quality education in a highly structured, controlled and quantified manner. The data, content and results produced over contiguous years build the necessary ground for managing the related accumulated knowledge for students and faculty. Ruslai Abdullah[2007] discussed the role of KMS for the benefit of faculty communities in higher learning institutions to promote knowledge sharing, storage and capture and represent the knowledge. Author has further
prepared a model of groupware facilitation for knowledge sharing in higher learning institutions by using K Portal, database server.

Noa Aharony (2008) made an investigation on the use of Wiki in a Knowledge Management Academic Course to support discussion during the process of creating and sharing knowledge, for the delivery of class curriculum and projects and to enable students and instructors to be in a continuous discussion, which can be used as a knowledge repository. The research is focused on comprising wiki pages which were gathered from knowledge management wiki course in Israel and aims to explore and analyze the application and use of a wiki, a key concept of Web 2.0, in a knowledge management academic course. Meena Kharatmal (2009) has stated the objective of GNOWSYS for managing library, knowledge management, Information gateways/portals and distributed semantic grid for publishing knowledge. Using GNOWSYS it is possible to develop semantic web technologies for exploiting tacit knowledge management (KM) technologies, including the Web 2.0 for exploiting tacit knowledge. It proposes an integrated framework for extracting tacit knowledge in organisations, which includes Web 2.0 technologies, KM tools, organisational learning (OL) and Community of Practice (CoP).

Thomas Bebensee et al. (2009) explored the Web 2.0 applications as a means of bolstering up KM by conducting research in Germany by using free Web 2.0 tools for collaborating and sharing files with each other among students. Marjan Mansourvar (2010) has stated that web portal as the type of knowledge management system provides a rich space to share and search information as well as Communication services like free email or content provision for the users. S. Rajakshma et al. (2011) has prepared the Info-Ca-Sh dynamic web content knowledge portal for information exchange of knowledge among faculty and students. The knowledge portal Info-Ca-Sh focuses on the improvement in knowledge collaboration, codification, and social network analysis of higher educational Institutions. Xiang Liu (2011) examines how Chinese college students use Web 2.0 technologies for Personal knowledge management and identifies existing problems in PKM applications. Author also discussed the use of wiki or blog to share or transfer knowledge. Nur Razia Mohd Suradi (2011) has discussed about the deployment of K-Portal by using open source tools JOOMLA, PHP programming language, MySql as database and Apache Tomcat as a web server. The purpose is to catalyst centre of knowledge information and encourage knowledge sharing culture among academic staff, within UNISEL by using K-Portal.

### Table 1: ICT Tools and Resources in Higher Education

<table>
<thead>
<tr>
<th>Authors, Year</th>
<th>Application Area</th>
<th>ICT Tools</th>
</tr>
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<tbody>
<tr>
<td>Jennifer Rowley (2000, 2006)</td>
<td>Researchers and academic staff have access to electronic documents, email, network resources, training and awareness, digitisation, pre-prints and grey literature.</td>
<td>JANET network</td>
</tr>
<tr>
<td>Saxena Anurag, Khare, Pankaj, and Misra, R.P. (2003)</td>
<td>Application of KM technologies in different areas like study material development data, student registration data, support services data, study material production and distribution data and evaluation and certification data for distance education courses in IGNOU.</td>
<td>National digital repository by IGNOU</td>
</tr>
</tbody>
</table>

### 3. ICT Tools and Resources in Higher Education:

From the Related Work discussed above, it is observed that KM uses ICT tools in higher education for effective transfer and sharing of knowledge. ICT tools are sued for communication, collaboration, and networking functionality to support knowledge capture, storage, structure and distribution.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yaying Mary (2005)</td>
<td>By creating a culture of knowledge sharing using organization-wide vocabulary.</td>
<td>Gweb e-KM solution software on Lotus Domino System</td>
</tr>
<tr>
<td>Jonice Oliveira, Jano M. de Souza, Rodrigo Miranda, Sérgio Rodrigues [2005]</td>
<td>GCC: An Environment for Knowledge Management in Scientific Research and Higher Education Centres</td>
<td>Personal Blogs and mental maps, virtual communities</td>
</tr>
<tr>
<td>Alok Sharma, Harvinder Saini, Raviteja Tiruvury [2007]</td>
<td>EDULOGIC - Used to check performance of students and faculty and highlight the performance of weaker group.</td>
<td>Software EDULOGIC</td>
</tr>
<tr>
<td>Nory B. Jones, Darylyne Provost [2007]</td>
<td>To facilitate knowledge acquisition, sharing and discovery by allowing people to publish documents, share ideas, work collaboratively and store information and knowledge in easily searchable repositories.</td>
<td>University Research Web-Based Knowledge Portal</td>
</tr>
<tr>
<td>Neil Witt, Anne McDermott, Mike Peters and Mark Stone [2007]</td>
<td>A Knowledge Management Approach to Developing Communities of Practice amongst University and College Staff</td>
<td>HELP CETL - Communication and Information Sharing Tool.</td>
</tr>
<tr>
<td>Prayong Thitithananon, Tasapong Klaewthanong, Ubon Ratchathani (2007)</td>
<td>To improve the current education systems</td>
<td>Implementation of KM practices in Thailand’s Higher Education development by using ICT tools</td>
</tr>
<tr>
<td>Ruslai Abdullah, (2007)</td>
<td>Management of knowledge for student courses, to improve internal document management, to increase the level for information and knowledge dissemination</td>
<td>K Portal, database server, search engine, videoconferencing, discussion room</td>
</tr>
<tr>
<td>Noa Aharony [2008]</td>
<td>Useful for creating and sharing knowledge, for delivery of class curriculum and projects, useful to support searching and indexing for retrieval of information, used as a knowledge repository, collaboration among students</td>
<td>Use of Wiki</td>
</tr>
<tr>
<td>Thomas Bebensee, Remko Helms and Marco Spruit [2009]</td>
<td>Web 2.0 applications as a means of Bolstering up Knowledge Management</td>
<td>Web 2.0 tools like Dropbox, Google Docs, Spreadsheets and Mindmeister, wikis, GoogleApps etc.</td>
</tr>
<tr>
<td>Meena Kharatmal, Sandhya R., Nagarjuna G. [2009]</td>
<td>Information gateways(portals) ,distributed semantic grid for publishing knowledge, data exchange, to manage user profile, digital libraries, and to develop semantic network, concept graphs, circle diagrams.</td>
<td>Web portal GNOWSYS</td>
</tr>
<tr>
<td>Frank Nyame-Asiamah [2009]</td>
<td>Used to exploit tacit knowledge, provide access to collaborative work capabilities, executive cognitive support, enterprise knowledge portals, personal information portal, &amp; electronic discussion boards.</td>
<td>web 2.0 technology, web based portal, SMS, PDA,</td>
</tr>
<tr>
<td>S.Rajlakshmi et.al. (2011)</td>
<td>The tacit and explicit knowledge of the registered users, documents are shared and captured using web portal.</td>
<td>Info-Ca-Sh dynamic web content knowledge portal, use of Blog and Twitter as tacit codification tools.</td>
</tr>
<tr>
<td>Xiang Liu (2011)</td>
<td>Used for Students’ Personal Knowledge Management</td>
<td>Web 2.0 Technology like wiki or blog</td>
</tr>
<tr>
<td>Nur Razia Mohd Suradi, Hema Subramaniam (2011)</td>
<td>To catalyst centre of core information, encourage knowledge sharing culture, to discuss topics regarding research interest group, Teaching material details, collaboration details</td>
<td>K-Portal, open source tools JOOMLA, PHP programming language, MySql as database and Apache Tomcat as a web server.</td>
</tr>
</tbody>
</table>

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4. Findings & Suggestions:

From the above table it is clear that to facilitate more expressive exchanging, sharing and dissemination of knowledge and its management, effective implementation of knowledge management in higher education is required. Colleges and universities have significant opportunities to apply knowledge management practices to support every part of their mission. Good ICT infrastructure is an inevitable precondition for any successful introduction of KM approaches and methods into higher education. Commonly used KM tools/technologies are Information and Communication Technology (ICT), Knowledge-Based Systems, Data Mining, Artificial Intelligence, Modeling, together with their applications on different research and problem domains. Faculties and students in higher education use ICT tools such as PPT, LCD, General application software, Internet, Intranet, CDs, DVDs etc. to distribute and share their knowledge. In higher education institutions, web based application tools used are Web Portal, Search Engines, Blogs, Wiki, Chat session and Discussion forums to share and generate knowledge. ICT Tools and resources allow, ubiquitous and multi channel access and delivery of information, storing and retrieval of data/information, development of interoperability between systems, communication and exchange of information in computer supported collaborative learning. Also the approaches like data mining and knowledge discovery open new avenues in higher education for understanding the phenomenon and more importantly in devising methods which will ensure better teaching and learning process. Kidwell et al (2000) asserted that if knowledge management tools are applied effectively, they could result in better decision-making capabilities, reduced product development cycle time (for example, curriculum development and research), improved academic and administrative services, and reduced costs.

5. Conclusion:

To face the competition and diminishing supply of students, colleges can only survive by creating core competencies in today’s environment. Along with the technology to succeed in the usage of knowledge management in higher education, it is necessary that the mind-set of people should change from my knowledge to our knowledge. We must try to make the institutional information base accessible to all the members of the institution. If we can develop collaboration and knowledge sharing, it will be a great boon for institutions. The requirement is proper cooperation, coordination and collaboration among the employees in the higher institution.

References


Network in Distance Education: Collaboration is the Key”, Paper presented at 17th Annual Conference of Asian Association of Open Universities, Bangkok, Thailand, 12-14, November 2003.


