

Knowledge Management in E-Learning A Critical Analysis

Jui Pattnayak¹, Sabyasachi Pattnaik², Priyaranjan Dash³

¹Research Scholar

Department of I&CT, Fakir Mohan University, Vyasa Vihar
Balasore, Odisha 756020, India

juipattnayak@gmail.com

²Department of I&CT

Fakir Mohan University, Vyasa Vihar,
Balasore, Odisha 756020, India

spattnaik1965@rediffmail.com

³Department of Statistics,

Utkal University, Vani Vihar,
Bhubaneswar, Odisha 751004

prdashjisp@gmail.com

Abstract: *The integration of knowledge management (KM) and e-learning (EL) become inevitable day by day. KM applications focus in providing institutions with tools to enrich knowledge, while the EL focuses on managing the delivery of academic knowledge. But integration of both the areas is far more behind in research. This research proposed a KM model to provide 24x7 hours synchronous collaborative learning. Requirement of KM in EL is the focus of this paper by creating a new approach of KM and emphasizing on various processes accompanying. Several Artificial Intelligence (AI) tools and technologies such as big data, linked data, semantic web, 3D visualization, etc. are incorporated hypothetically to achieve the collaborative learning environment.*

Keywords: VLE, EL, KM, CMS, Collaborative learning, Semantic web, ES.

1. Introduction

Collaboration is the key to organizational research where people can learn and work together. To achieve collaboration numbers of educational institutions are now embedding learning in virtual learning environment (VLE) popularly called e-learning (EL). VLE enables the learners to work together and involving learners in knowledge sharing, and co-construction popularly called as knowledge management (KM). EL only empowers the content management system (CMS) which is the knowledge container. But knowledge should be acquired and shared for the purpose of collaboration. KM is the platform to acquire and share knowledge. Hence KM takes an organizational perspective on learning, and the main problem it tries to address is the lack of sharing knowledge among members of the organization [1]. EL focuses on individual learning to acquire knowledge, where integration of KM into EL creates collaborative learning environment. In this way, knowledge becomes globalized. Through EL the user can acquire and develop knowledge on a specific topic through structured learning content, where KM provides search and sort facilities to various topics along with collaboration through CMS. An EL system within KM is traditionally analysed as a knowledge repository, where the KM methods can be implemented to increase the effectiveness of knowledge dissemination [2]. To describe connection of KM and EL domains, terms “integration” and “adoption” are used with very close meaning. “Integration” is used to describe when KM and EL are two equal, parallel operating disciplines.

“Adoption” may be used, when one discipline is the basis for another, approaches and tools from another discipline are tailored and used to increase its efficiency [3]. KM technologies are essential to provide significant scopes to improve EL system by extending its boundary to wider communities. Integrating KM and EL has become inevitable trend in supporting self-directed and just-in-time learning and the creation of shared organizational knowledge [4].

2. Requirement of Knowledge Management (KM) in E-Learning (EL)

Collaborative learning environment is highly essential to create an exponential growth of knowledge. E-Learning (EL) focuses on individual learning not collaborative learning. For sharing purpose tacit knowledge must be translated into physical form. Knowledge Management (KM) supports the codification of human tacit knowledge into physical or explicit form for the purpose of learning. EL systems provide structured learning contents and intercommunication possibilities to specific topics so that learners are supported to develop their knowledge. On the other hand, knowledge management system (KMS) provides knowledge through content management systems (CMSs) which have search and sort facilities, and also collaboration possibilities with their experts and other users on various topics [5]. Integration of EL with KM processes can create synergies to significantly improve the creation of new knowledge and the performance of learning processes. But the question how to integrate EL with KM is closely related to the underlying KM processes [6]. Integration of KM and

EL has become an unavoidable trend in supporting self-directed and just-in-time learning and the creation of shared organizational knowledge [7]. Codification of human knowledge i.e., tacit knowledge into physical form i.e., explicit knowledge is the indivisible part of learning without which knowledge is of no use. Without codification, knowledge cannot be transferred to society. KM is the field of artificial intelligence (AI) which facilitates the codification of knowledge. Codification is done through set of rules governed by expert system (ES) which is a part of KM. The different KM processes given below take place in a cyclic manner to form a KM framework in the context of learning:

- *Knowledge creation and acquisition:* Knowledge creation and acquisition involves the growth of people with knowledge either individually or in groups or communities of practice to acquire knowledge from intangible tacit knowledge.
- *Knowledge sharing:* Knowledge sharing involves in creating learning process when people are interested to develop new knowledge by helping each other.
- *Knowledge capture:* Knowledge capture is the process of converting tacit knowledge to explicit knowledge and also vice-versa through externalization and internalization.
- *Knowledge storage:* Knowledge is particularly stored in the form of a knowledge repository that includes documents, reports and databases.
- *Knowledge application:* The knowledge created and captured is to be applied in different learning contexts to achieve competitive advantages such as creating KS.
- *Knowledge Evaluation:* Learners will be assessed on a regular basis to verify that knowledge must be relevant and accurate.

3. Existing Knowledge Management Based E-Learning (EL) Architectures

Being the second largest, populated country in the world, the role of knowledge production and acquisition is very much important for the advancement of the society. Now it is the biggest challenge for India to provide some standardized teaching/learning methods both in rural and urban areas through some nation-wide network. Thus, academicians now emphasize in developing suitable e-learning (EL) architectures which can standardize the teaching/learning method. Incorporation of knowledge management (KM) into EL provides group/team learning which helps to accelerate collaborative learning.

3.1 Intelligent Distributed Virtual Training Environment (INVITE)

With the application of KM, this system empowers a good collaborative learning environment. The artificial intelligence (AI) technique provides 3D visualization in which synchronous, asynchronous and collaborative learning. Full body photo-realistic avatars will be used for the visual representation of the users in a realistic way. Again with the application of KM, the system has content

management module-document repository which stores, achieves and retrieves documents. Meta-data support the retrieval of content. The authors stated that users want an EL system that can support three types of training: synchronous training (online lectures from a trainer on a specific time), asynchronous training (autonomous training using educational material and notes from previous lectures or minutes from collaboration), collaborative training (online communication and collaboration between the members of a user group on a specific theme) [8].

3.1.1. System Architecture

The system architecture contains the virtual platform, the language server, the voice server, the agent server, the document repository, the streaming server and the avatar server. The architecture is shown in figure 1.

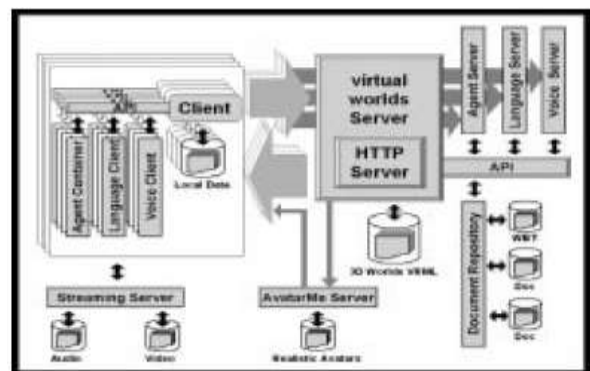


Figure 1: INVITE Architecture (Bouras et al., 2001)

The virtual worlds platform includes all virtual community features and acts on server side as an amalgamation through the extended API. For multiuser language translation services, there is a language server connected to the API of the server for voice communication between clients or group of clients, and an agent server that works as support for client agents and can provide services. A document repository allows managing several kinds of documents and works as a document archive and support versioning. The **AvatarMe Server^a** provides user-specific access to personal avatars, which can be accessed from outside system.

The author has left some of its features for future such as the implementation of the first functional prototype and engage end-users in its evaluation has to be done. Another goal is soft skill training, which will be more in the foreground in the future. The present situation, where one tutor supports many learners needs to be enhanced by the possibility to have many tutors supporting one learner.

3.2 Knowledge Acquisition Model Based E-Learning (EL)

Kende et al. [8] in their research paper "Role of Knowledge Management in modern higher education – the e-learning" described their experiences gathered during EL developments and stated that the need for a lifetime education is connected to the previous phenomena, which need means the basis of a carrier and long term success for

the individual and is a significant condition for knowledge production for the organization. The fundamental factor of and the key to a successful e-learning system is, to clearly see and divide the educational stages built on one another during the design of its modules. Figure 2 presents that the modern teaching and knowledge acquisition are to include not only for the so called tangible (knowledge-based) knowledge transmission, but also for the so called intangible (hidden, problem solving) knowledge transmission – at least on the level of the basic problem solving processes.

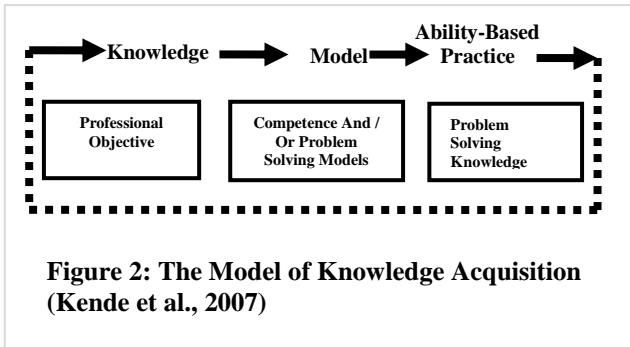


Figure 2: The Model of Knowledge Acquisition (Kende et al., 2007)

The authors presented the following knowledge based e-tutoring through different modules:

3.2.1 Knowledge based e-tutoring

- The e-pretest
- Conventional e-tests
- Knowledge-based e-tests
- The e-tests online
- e-tasks
- The robot tutor

An e-class of e-students and their e-teacher are connected to a workgroup in the e-classroom by way of university’s intranet or internet figure 3.

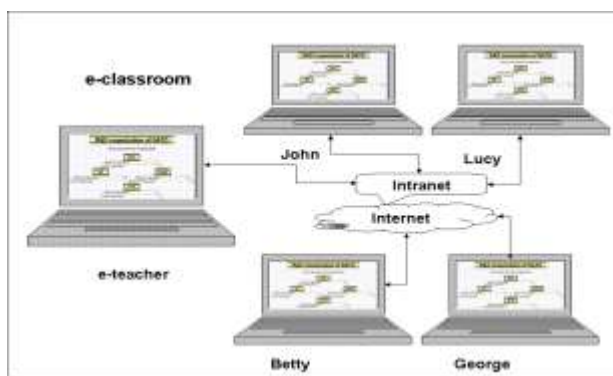


Figure 3: An e-classroom

One of the most common forms of knowledge transfer is EL. But there is a contradiction – especially if the e-student and the e-tutor are located in different time zones. An experimental robot-tutor has been developed for a lecture of author’s multimedia curriculum on the base of Nela assistant robot designed by Technical Director of Robot-Hosting firm Shahin Maghsoudi. This robot-tutor can give verbal answer for 9 questions connected to the lecture. This system is

connected to KM, knowledge integration and knowledge distribution possibly utilized in education, but only a few small steps on this long road. *But the limitation of the system is that the robot tutor is not available for 24x7 hours to provide just-in-time learning.*

SynchronEyes program enables sending e-test to all of e-students simultaneously. After a limited time, e-teacher can control and assess answer of all students on own display figure 4.

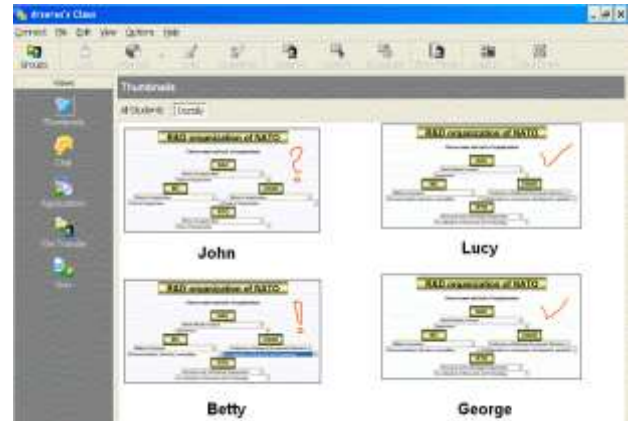


Figure 4: Display of e-teacher for checking of online answers

3.3 Web-Based E-Learning (EL) in India

Ray [9] in his paper “Web-Based EL in India: The Cumulative Views of Different Aspects” presented some innovative ideas to spread web-based EL in India. According to him, the web based education/learning has the potential to meet the perceived need for flexible pace, place and face. The web allows education to go to the learner rather than the learner to their education. As per as India is concerned there are many problems that one will face to use IT in education like funds, infrastructure, etc. Among these a top-level of knowledge model in web-based learning environment (KMWBEL) is the significant one which is shown in figure 5.

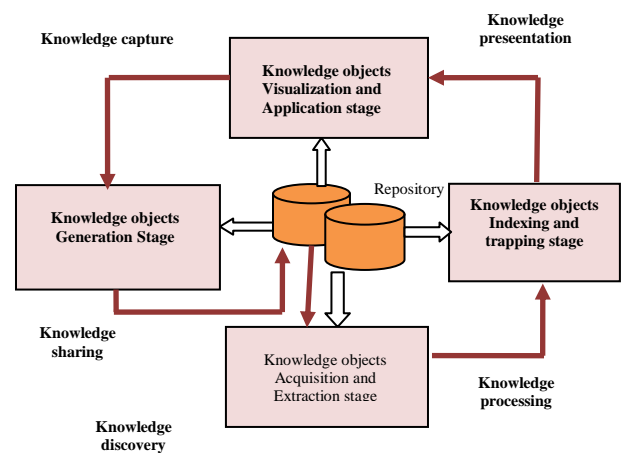


Figure 5: A top-level management model of knowledge objects in Web Based Learning (Ray, 2012).

Based upon the above knowledge-based model the authors developed two web-based e-learning systems i.e., Central State Interactive Education System (CSIES) and the architecture of mobile-based education system (MBES).

India is far behind for the implementation of the above processes, since the percentage of computer literate is much less than expected. Slow internet connection or older computers may make access course materials difficult. Managing computer files and online learning software is another limitation. Lots of motivation is required to attract the learners since all the works they have do at their own responsibility. Instructions are not always available to help learners.

4. The Proposed Architecture of Knowledge Management

Knowledge management (KM) is characterized by its distinguish features which includes people, process and technology as shown in figure 6.

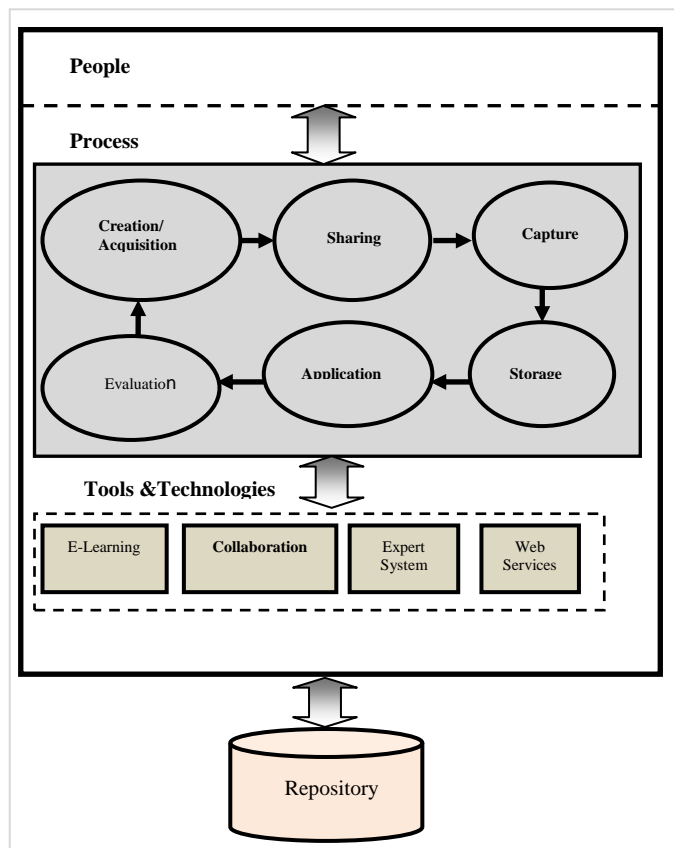


Figure 6: Proposed Knowledge Management Framework

- *Technology*: Internet and ICT is must to support KM. Without the support of above mentioned technologies KM and e-learning (EL) system will become handicapped. Along with these KM tools and technologies will also be applied.

- *People*: People include learners and instructors, Also, instructional designers (IDs), subject matter experts (SMEs)/Authors, administrator, etc. People must be considered as one of the key resources of KM and EL system.

- *Processes*: The KM processes are the essential part of EL environment without which collaborative learning is impossible. Without collaboration knowledge society (KS) is impossible.

Knowledge Management Tools and Technologies

All the observations showed that KM is a software environment to socialize the learning process. It uses communication and collaboration to improve how people apply knowledge in their job within an overall process. It has been observed that *EL* initiates the individual learning process, *Collaboration* will initiate the formation of *KS*, *expert system (ES)* facilitates knowledge codification, and *web service* tools will be incorporated to achieve various learning modalities.

- *Repository*: Repository is the online database which systematically captures, organizes and categorizes knowledge-based information. Knowledge repositories are of two types: both private public. Private repositories manage enterprise and proprietary information and public repositories manage public domain intelligence. The tacit knowledge transformed into explicit knowledge is stored in the repository for reuse purpose. The performance of the Knowledge Seeker i.e., the learner is measured and returned to the knowledge repository as feedback that can be used to help determine if the skills have been learned and to suggest additional e-Learning experiences.

4.1. Benefits of the Proposed Knowledge Management (KM) Model

The adaptation of EL completely depends upon the successful incorporation of all the web services and ES technology into KM. The objective is to create a 24x7 hours synchronous learning environment. Implementation of tools such as mobile computing, big data, linked data, cloud computing, semantic web, etc. can create a more sophisticated virtual learning environment (VLE). The data generated by wiki, blog, etc. can be utilized and extracted using big data and Artificial Intelligence (AI) technique. Institutional or organizational knowledge is the focus of today's ICT world. Learning must ensure effective creation and acquisition of knowledge. To intensify the competences of e-learning (EL), knowledge and learning are to be integrated. Knowledge management (KM) initiates organizational learning and EL is the best method to acquire dynamic, distributed, shared, and collaborative knowledge. The creation of knowledge in EL environment takes place by the conversion of expert's knowledge into content which is stored in the repository for use of the learners. In this way, learners acquire the knowledge from the available content.

4.1.1 Essentiality of Knowledge Management (KM) Processes in E-Learning (EL)

It is the challenge for the learners in the EL environment to acquire new knowledge from the existing knowledge which can only be possible by the *knowledge sharing* process. KM plays a significant role in this regard by incorporating collaborative learning where group of learners avail the opportunity to learn together with the support of various internet-based tools and technologies such as through

podcast the learners can interact by audio/video conferencing. Online discussion forums, live chat, e-mail, etc. also alleviate collaboration to a greater extent. *Knowledge capture* is the key to achieve knowledge acquisition and sharing. Knowledge capture is the process of converting tacit knowledge to explicit form and explicit knowledge to tacit form for acquisition purpose. Expert system (ES) can extract tacit knowledge and codify it into formal language which is then available in the form of learning content. This content can be shared among the learners. Each individual learner can acquire knowledge during learning. Storing of knowledge is another important aspect of learning which is done through documentation of content. Knowledge in EL system is stored through databases and document management systems. The storage and retrieval of knowledge in EL environment is supported by the web tools such as wikis, tags, social networking (facebook, twitter, etc.), bigdata, linked data, etc. Knowledge evaluation of learners must be done on regular basis to ensure the accuracy and correctness of knowledge acquired. The evaluations may be done both in subjective and objective methods. The subjective methods are giving assignments, mid-term examinations, etc. Objective methods include quizzes, verbal techniques such as conversation with students (formal and informal), group discussion, observational techniques such as learner behaviour, attendance, etc. The different web-based tools and technologies such as facebook, e-mail, etc. are used for submitting assignments and for quizzes any synchronous tool such as skype, live chat, and video conferencing may be used. Application of the knowledge is one of the most significant aspects in EL environment to widen the literacy rate in order to achieve economic growth. Knowledge application is supported by collaborative knowledge exchange through discussion forums or through live lectures or mashups.

Semantic Web technology is also a part of KM which is a place where machines can read Web pages much as we humans read them, a place where search engines and software agents can better troll the Net and find what we're looking for. "It's a set of standards that turns the Web into one big database," termed as big data. Semantic Web = Web of Integrated, Linked meaningful Data [10]. KM encourages interoperability i.e., reuse, which is again a form of collaboration. When a person or a software program produces information on the Web and this information is used by another, then the creation of new form of information or knowledge will take place [11]. KM can enrich EL with Media Centric Web. Search engines provide search results on the basis of text inputs as well as objects based on its features such as images or photos. KM also supports *3D visualization* where classes may be conducted in a variety of different settings within a 3D virtual world where they can interact in real like environment of a class. Learners can come together & meet virtually in diversified manner. They can collaborate and work for common objective. Learners and instructors may have discussions, talk, connect, and chat on the common projects. They can even use & work in multiple 3D worlds instantaneously.

4.2. Limitations of the Proposed Model

The challenge is not only the technology but the mind-set of the people to think about accessing, integrating, and leveraging knowledge. Also increasing the productivity of knowledge work and the knowledge worker is challenge. Because experts' knowledge is in abstract form, knowledge sharing is difficult. Again novice learners may face lots of problem to avail KM facility. In developing country like India, IT facilitated learning is difficult to implement due to financial barrier. Also, it is much difficult to connect rural areas into EL system due to lack of internet facility. Setting up nodal centres in each and every village, town and city is another big challenge since huge amount of technological infrastructure is required. Enabling the instructors for online teaching is also a big challenge.

5. Conclusion

The existing component based e-learning (EL) architectures and SOAs provide distributed learning environment for interoperability and modularization of virtual learning environment (VLE) respectively. It has been observed that using artificial intelligence (AI) technique synchronous learning can be achieved. Collaborative learning is achieved using knowledge management (KM) technique in EL. Knowledge-based learning techniques are beautifully presented by Kende. Learners' attitudes, skills are determined with the help of the architectures. The adaptable EL Architectures satisfies the needs of instructors, learners as well as the institution to enhance the teaching/learning process to a significant extent. Due to the shortcomings of existing KM architectures a new KM framework is suggested to fill the gap. Use of AI technique and expert system is suggested to create a 24x7 hours synchronous learning environment. It is expected that the standard of education at secondary as well as post-secondary level in Odisha will be enhanced significantly. With the advancement of standard of education the economic condition of the state is supposed to be improved. Distinct features of KM with their usefulness for learning is also explained. The suggested framework of KM is supposed to speed up the learning process through collaboration. The adoption status of the proposed architecture is left for the future scope.

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