

PROPOSING A KNOWLEDGE MANAGEMENT SOLUTION FOR THE BEST OUTCOME OF E-LEARNING

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Abstract

Knowledge Management (KM) is one of the evolving research areas of Information technology extending its applicability without boundaries. Knowledge driven organizations tend to bloom with Knowledge management solutions and so the technology naturally probes its way towards implementing the best practices of E-learning, which has been always the delivery of the academic knowledge. In this paper, a KM solution is proposed for the best results of E-Learning involving Universities and Academic institutions by identifying the convergence of four knowledge management processes with the E-learning domain and indicating the tools and techniques in implementing the processes. The purpose of the proposal is to emphasize the need of knowledge management in E-learning, improving the learning processes and organization knowledge learning leading to knowledge sharing, knowledge discovery and knowledge updation.

Keywords: E-learning, Knowledge Management, Concept Map, OWL, XML

1. Introduction:

Learning and Education have always been bounded together and many paradigms of education and learning systems have been followed in the learner's community and now the focus is upon E-learning which is always viewed as the management of academic knowledge[1]. "Knowledge" is defined in the Oxford Dictionary and Thesaurus as: "awareness or familiarity gained by experience (of a person, fact, or thing)". Knowledge can also be stated as "justified true belief".

Knowledge Management(KM), which seems to be always being with the business solutions and best practices of Knowledge driven Organizations where when the right information is delivered to the right people at the right time, the intangible information transforms into knowledge based on which rational decisions can be made [2], extends its applicability in Learning Systems also. Earlier researches of Knowledge Management and Learning recommend KM solutions for E-Learning environment.

This paper proposes such an intelligent solution for E-learning and is organized as follows: Section 2 reveals Knowledge Management Issues, Section 3 gives an overview of E-learning, Section 4 deals with the integration of the KM process with E-learning, and Section 5 pertains to the future issues regarding the work.

2. Knowledge Management (KM):

Knowledge is a mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information. In general, knowledge is categorized into two: tacit and explicit knowledge. Knowledge that could not be expressed explicitly is termed as tacit knowledge. For example, how to play a piano is something that is difficult to express, which should be learnt by trial and error. Explicit knowledge is knowledge that can be easily represented and easily observed. Knowledge management enables the enterprise to maintain, develop, and distribute

the knowledge expertise of its people and it has been the essential tool that drives organizations to success in their operational platforms.

3. E-Learning – an overview

Earlier are those days of blackboards and boredom lectures. E-Learning as a package of technology enhanced education tends to replace the standard practices of learning. Convenience and the ability to learn at any place and at one's own pace have brought E-learning as a generally acceptable learning system. The introduction of computers and information technology in the education domain has been found to massively reshape the method of delivery of educational knowledge [12]. The World Wide Web has increased the intensity of technological play in the development of higher education. This Internet Enabled E-learning even brings socially excluded communities to be in the lime light of higher education and connects different societies, communities, learners and resources [13]. Knowledge enhanced educational tools are the key areas of inventions in the present educational scenario to improve the higher education. .

4. Junction of KM with E-learning

Knowledge management puts in place processes and systems to ensure it retains knowledge assets even when expertise leaves. Earlier researches on education have found knowledge management as a comprehensive method to discover, manage and analyze the resource of the educational discipline [2] [3] [6]. The field of E-learning with its greatest asset of academic knowledge in the form of audios, videos, text, tutorials, problems and solutions and knowledge skills, easily go in pace with Knowledge management since both deal with knowledge exchange and creating knowledge sharing communities[6]. Earlier literature studies on KM promote a 4-phase KM approach: Knowledge generation, Knowledge representation, Knowledge sharing, and Knowledge application [10]. This section gives a detailed vision of these KM processes converging themselves towards E-learning.

4.1. Knowledge acquisition / Creation – Object based model with OWL

Knowledge acquisition is about extracting knowledge from sources of expertise information and transferring it to a knowledge base [8]. Further knowledge can be acquired through Socialization and Combination resulting in hybrid knowledge [8][9].

The Universities and Educational institutions always imply a closer cooperation with E-learning community emphasizing on the fields of knowledge integration, management of knowledge bases and distribution of knowledge. The Universities involved in framing their knowledge domain may serve as the major knowledge bases for the domains they propose by creating the knowledge bases for each courses with the objectives, syllabus and course contents and populating with learning content, understandable prototypes, interactive learning methods, problem solving knowledge synergies, evaluation methods, improving skills, virtual class rooms and discussion forums [5].

Object based knowledge bases (OSM MODEL)[15] with their everlasting support for concepts as classes and implied relationships are suggested for creating knowledge bases in Educational domains. Object oriented structures with its primitives—the elements of its knowledge model—provide classes, instances of these classes, slot representing attributes of classes and instances, and facets expressing additional information about slots [14]. Classes are abstract representations of domain concepts and describe objects that share similar attributes relationship, semantics and operations. Relationships among concepts are specified

with tasks or methods over which all the decision making strategies are being stipulated. At its core, this approach implements a rich set of knowledge-modeling structures and actions that supports the creation of the learning ontology. OWL (Web Ontology Language) which creates the “Semantic Web” is identified to represent the learning ontology in this proposed solution. OWL provides representation of classes and relationships with its constituent elements “Class, Instance, datatype property, object property, Value and type of values “[16] [18] [19] [20] .

Protégé, an open source Knowledge Editor from Stanford University is chosen to enter the educational ontology. Knowledge bases of a particular subject, entire curriculum , Learner model , educator model, test models are some examples of educational ontology that have to be created with OWL and Protégé. For example, a knowledge base for a learner model could contain the classes of LEARNER PROFILE, PREFERENCES, SKILLS and the knowledge base of any subject would contain classes for OBJECTIVES, SYLLABUS, QUESTION BANK, RESEARCH AREAS, PROBLEM EXERCISES, LEARNING MATERIALS, TEST MODELS, FEEDBACK, TEST RESULTS, and REFERENCES etc. Table 1 shows a sample of relationship between the identified classes.

Classes	Related Classes	Relationship remarks
LEARNER PROFILE	PREFERENCES	Interest of learner
SKILLS	PROBLEM EXERCISES, TEST MODELS	Level of learner - indication
PREFERENCES	LEARNING MATERIALS	Mode of study
SKILLS	TEST MODEL	Setting of testing levels
TEST RESULTS	SKILLS, PROBLEM EXERCISES	Learners’ Knowledge level decision

Table 1. Classes and relationships for LEARNER and SUBJECT

The whole teaching-learning process gets embedded with the created knowledge bases enabling transformations in the knowledge, based on industry demands, learners’ reviews and educators’ reviews. Real time response of the knowledge bases must be designed during acquisition and the knowledge bases must be framed in a way that they do not contain data but only meaningful knowledge that can be represented, shared and deployed.. Digital libraries and knowledge repositories are to be formulated for specific areas of the learning domain. Educators’ knowledge network is likely to be implemented to share their personalized domain knowledge.

4.2. Knowledge Representation – Concepts maps and XML

Knowledge representation is best understood in its roles in KM as a theory of intelligent reasoning, a medium of human expression and efficient computation, and a set of ontological commitments [17]. Knowledge is always viewed as concepts and their relationships and relevant works in the area of conceptual structures have proved that a graphical formalism is easier to master than a linear one since it allows conceptualization of the domain through graphical objects that are directly associated with concepts [3, 26,27] influencing our proposal of using concept maps.

Earlier studies on concept maps confirm their support for process oriented learning and their suitability for Context management of learning domain which reconstructs the knowledge context and spans its applicability in representation, domain ontological support by negotiating meaning and meta cognition, progressive exploration of knowledge and structured placement of documentary resources [1][3][23]. Thus, concept maps support a

systematic assessment which leads to improving teaching-learning strategies and also serve as an educational tool by demonstrating the subject concepts with a diagrammatic representation thereby improving the understandability of the learners. Concept maps represent concepts and uses linking words to establish relationships between the concepts.

The Education knowledge base assumed with OWL ontology commitments needs to be transformed into Concept Maps and many similarities identified between them strongly recommends the ease of transformation[18]. In Fig.1, a mapping of OWL and Concept map elements are shown.

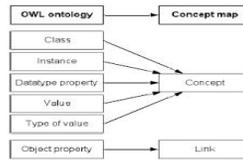


Figure 1 Mapping of elements from OWL into Concept Map

With the identified concepts of E-learning, the knowledge base is populated with concept maps which are generated from the OWL for academic domain. Fig 2 shows a simple concept map for initial design of Learner OWL connecting itself with a course. CMap, an open source tool will be used for generating concept maps from the given set of concepts and relations.



Figure 2 Mapping of OWL into Concept maps

4.3 Knowledge Codification/Sharing - Common practices

Knowledge, tacit or explicit, needs to be shared to benefit knowledge processing communities and are interrelated. It is easy to share data; it is much harder to share knowledge [1]. Figure 3 shows the knowledge life cycle. .Since explicit knowledge is more likely shareable, our focus is upon Externalization, converting tacit into explicit which makes informal, invisible and unrecorded knowledge into a shareable form.

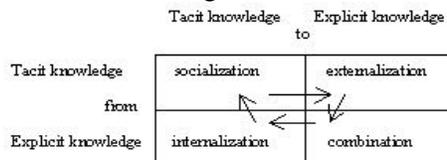


Figure 3 Knowledge Life Cycle

Hence to achieve knowledge sharing, the sharable knowledge has to be compartmentalized and departmentalized based on the context and rules on which it is being

codified [4][10]. Knowledge centric codification techniques are very specific about the contextual (object oriented approach) and conceptual representation (conceptual graph approach) of knowledge. An earlier survey on knowledge sharing practices have listed Communities of practice, Intranet, Web portals, Discussion forums, teleconferences, search engines as major knowledge sharing techniques[24].

A case study on knowledge sharing puts emphasis on technologies for knowledge sharing and transfer and identifies five knowledge processes [25]. Our proposal for E-learning with its strong support for Ontology and web based sharing fits itself into the process of "Ontology and Semantic web". The knowledge shared in the specific ontology through intranet portals, web portals or discussion forums and even through e-mails need to be codified to form denser ontology specifications for an educational domain. A unified knowledge network for knowledge preservation and sharing has to be implemented by connecting all the knowledge experts, installing knowledge sharing portals, developing digital libraries and recording the common practices and lessons learnt.

Increasing the exposure to online discussion in a learning context enabled by technology is vitally important for lifelong learning and knowledge sharing. Protégé with its plug-ins again finds its applicability in easing the transfer of expert knowledge into the learning system [11] without the need of experts to have syntactical knowledge thereby easing the process of modification of knowledge bases.

4.4. Knowledge Deployment – XML, SCORM for E-learning

The realm of knowledge management centers on knowledge deployment where the strategic decisions over knowledge issues are exercised with the existing knowledge bases. The implementation of Knowledge management strategies will not drive the competence to success but only the exploration and deployment of knowledge lead to cross the milestones. The knowledge stored in the concept maps must be compared against mapping rules to generate decisions over the stored concepts by capturing useful information in a usable form, and supporting refinement and reuse of the information in service of the organization's goals [9].

Being the concept map essentially a cognitive and logical structure XML is used to represent the structure of concept maps. The resulting XML file contains a mapping of the structure of the map through its fundamental components. The knowledge encapsulated in the E-learning application throughout its lifetime is stored in XML documents as concept maps in a database or repository. XML being capable of instantiating multiple notations on the same information set to describe "different" knowledge based on context[21] [23] is more useful in terms of "Context Management", a desired process in learning domains with many learners with different set of skills and preferences. RDF organizes, interrelates, classifies, and annotates this knowledge, thereby increasing the aggregate value of the stored data [22].

The proposed E-learning solution should be made compatible with SCORM (Sharable Content Object Reference Model) , a technical specification for developing e-learning content which is proposed by ADL (Advanced Distributed Learning) provides a standard way to reuse and share learning objects and to describe the structure and behavior of the content[7]. The content packaging and meta data specification techniques of SCORM specified in the root file of "imsmanifest.xml" of SCORM describe the structure and characteristics of a Learning Management System. E-tests, Test models, Learner based approach, Intermediate assessment packages, Discussion forums(E-mail, Usenets, Chats) are the advanced and presentable techniques identified in the proposed e-learning solution based on SCORM .

5. Implications and Future Issues

E-Learning perceived as the method of education in future needs to be fine tuned to improve its potential of imparting theoretical and experimental knowledge to the learning community. Knowledge Management solutions pave way for the development of the learning technologies and find success in effective implementation of the learning management system. Figure 4 identifies the knowledge processes of E-learning.

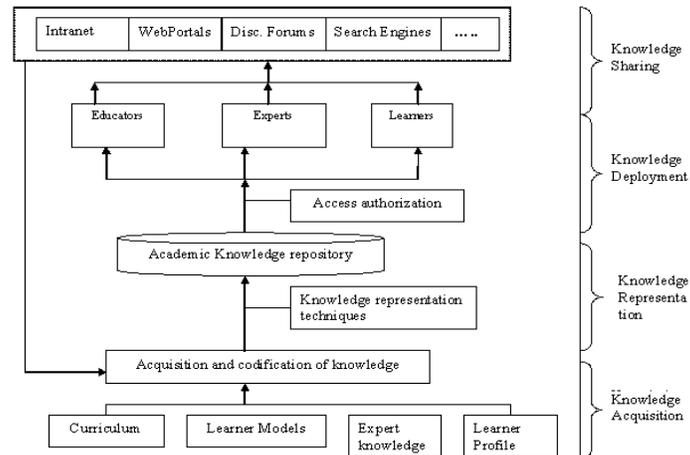


Figure 4 Proposed solution of E-learning with KM

E-learning considered to be a greater educational source in the future, researches in bringing the best out of it are continued to improve the outcome of the technology. In this paper, Knowledge management has been identified to be a better solution for the technology enhanced learning.. The complete ontology of the learning domain has to be created by domain experts and the ontology mappings into concept maps populate the knowledge bases making the knowledge shareable and utilizable. This work may be concluded with implementation of the proposed KM solution and the future issue pertains to the realization of the proposed solution.

6. Conclusion

This paper reports on the knowledge management practices over E-learning and identifies the KM processes supporting the domain. It also discusses the various issues in each of the processes and tools and techniques for converging the processes to learning domain. The effective technology is very important to the sustainable development of the education and the knowledge gained during learning is the most important factor for measuring the quality of education. This proposal may be an opening for the effective utilization of academic knowledge by streamlining it towards the ultimate goal of knowledge discovery, reuse and gain.

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