A SEMANTIC APPROACH FOR ENHANCING KNOWLEDGE MANAGEMENT BASED E-LEARNING SERVICES

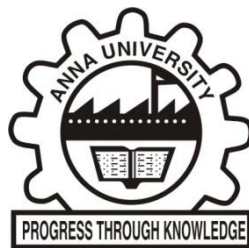## A THESIS

Submitted by

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ABSTRACT

E-Learning can be viewed as a learning process created by interaction with digitally delivered content, services, and support to learners. It involves intensive usage of Information and Communication Technology (ICT) to serve, facilitate, and revolutionize the teaching learning process. The rapidly growing use of ICT in e-learning, is, changing the way in which knowledge is created, organized, stored, managed, and disseminated. Knowledge Management and e-learning are closely related, since, e-learning learners need a suitable amount of knowledge management that can help them to obtain the related, relevant and complete content they require. Knowledge Management oriented e-learning has become the effective tool that improves the learning experience of the learners.

E-learning systems in combination with knowledge management techniques are accepted and well appreciated in the field of education. Their co-existence is required to make the learning process comfortable. In order to acquire knowledge, learners need to go through different processes namely knowledge collaboration, exchange, sharing, acquisition, creation, distribution, dissemination, storage and personalization. Knowledge management tools also assist learners to learn in a context aware learning environment.

Knowledge management based e-learning services are Collaborative e-learning, Social Interaction, Search Engine and Taxonomy Tools, Adaptation / Personalization, Context Management, Content Management, Adaptive access to e-resources, and Cognitive e-learning.

The main objective of this thesis is to enhance the knowledge management based e-learning services using semantic approaches. The following services of e-learning systems are considered in this thesis:

collaborative e-learning, e-assessment, adaptive access to e-resources, searching for subject experts, and taxonomy tools for screening candidates for e-recruitment.

Learning is an interactive process where learners have to discuss, reflect, collect and analyze information. They are active partners in the community of learners. Collaborative learning in e-learning can take the form of discussion among the whole class or within smaller groups. A collaborative learning environment provides opportunities for learners to engage in interactive activities with their peers. It also gives the learners better learning outcomes, higher order thinking skills, self-reflection, and co-construction of knowledge. In a collaborative learning environment, knowledge is shared or transmitted among learners as they work towards common learning goals; for example, a shared understanding of the subject at hand or a solution to a problem. Merely, corralling learners into groups does not assure ideal collaborative learning. Forming an effective group is a must to achieve ideal collaborative learning. Groups cannot simply be formed by identifying similar learners' profile and the teacher's constraints. It is also necessary to consider the learner's interest and learners interaction behaviour to form the groups. In this research, an approach to form learner groups that uses both structure and context information of learners, is proposed. The experimental result shows that the proposed approach can form groups with 92% of accuracy.

Bloom's taxonomy is a hierarchical structure representing six levels of thinking and learning skills that range from basic learning objectives such as knowledge of content through higher-order learning such as synthesis, evaluation, and creativity. This taxonomy can also be used in learning assessment. Assessment is of two types: summative assessment and formative assessment. The goal of summative assessment is to assess the learner's learning at the end of the course and that of formative assessment is to

monitor a learner and provide ongoing feedback that can be used to improve teaching and learning process. Formative assessments help learners to identify their strengths and weaknesses, and this can be used by the e-learning system to personalize and recommend suitable learning directions or learning materials. Formative assessment is used to assess the learners in the higher order of Bloom's taxonomy. Tests, quizzes and assignments are not suitable for formative assessment. Concept maps allow evaluation of higher order levels of cognitive development in Bloom's taxonomy. To automate the formative assessment in e-learning, this research has proposed a concept map and ontology mapping based approach. The proposed method gives an accuracy of 94.14% in assessing the learning of learners.

Today's e-learning environment concentrates much on delivering the learning content through the electronic media and less attention is spent on understanding the learning level of the learner and provides suitable content to the learner. There is a demand in improving e-learning in order to provide easy and personalized access to learning resources. It is necessary to classify learners, taking into consideration, their differences in skills level, perspectives, culture and other educational contexts. This classification is used adaptively to provide relevant content for the various categories of learners. A fuzzy inference engine for ontology is proposed to classify the learners into different category and provides adaptive access to learning resources. The proposed method provides the adaptive access with an accuracy of 95.8%.

Easy and successful location of experts, in a domain, can improve learning processes by having collaboration and discussion, and also enhance the quality of the e-learning environment for all learners. The key requirements for the Expert Locator are the ability to: identify experts, classify the type and level of expertise, validate for relevant expert, and

recommend experts by ranking. Since, experts and their skills and knowledge are rare, expensive, (unevenly) distributed, difficult to qualify, continuously changing, varying in level, and often culturally isolated and oversubscribed, it is very difficult to identify experts. People's expertise cannot be judged using one or two parameters. This research proposed a model that uses multiple parameters like qualification, teaching experience, subjects taught, department, research interest, context of their activities like publications as author and co-author, associations, patents and awards received, member in any board / panel, involvement in discussion forums, and the like, to identify the expert. The proposed model ranks the experts using relative ranking. Results are encouraging with accuracies existing between the range of 84% and 92%.

To widen the facilities of e-learning systems, it provides service for screening the candidates for the job requirement. In expert locator, system locates the experts in a particular domain. To screen the candidates, the system finds all the candidates who match the job criteria. In this research work, the proposed model represents the details of the candidates and job criteria as ontology documents and maps both candidate ontology and job criteria ontology to find the suitable candidates based on the weight given for each criterion by the employer.