

Need of Semantic Knowledge in E-Learning System for its Performance Improvements and Fruitful Realization: A Comprehensive Analytical Report

S,BASKARAN^{#1}, G.MURUGAN^{#2}

[#] Head, Department of Computer Science

Tamil University

Thanjavur-613 010, India

sbaskarantj@gmail.com

[#]M.Phil Scholar, Department of Computer Science

Tamil University

Thanjavur-613 010, India

gowshik0706@gmail.com

Abstract— If the learning content is delivered or enabled by means of electronic technology then it is known as E-Learning. E-Learning System is of two types: [i] synchronous and [ii] asynchronous. These two terms refer to “the extent to which a course is bound by place and/or time”. Synchronous means that two or more events occur at the same time. Here, synchronous means the E-Learning System that is led by instructor/teacher. Asynchronous means that two or more events don't occur at the same time. E-Learning can occur in and out of the class room. E-Learning is the effective learning process. Hence, it becomes a promising paradigm in education. The effectiveness of this system makes us to consider the ‘e’ in E-Learning, which stands for Electronic, to represent ‘Effective’. Some important characteristics of E-Learning System can be listed as: Interaction, Personalization, Adaptation, Intelligence, Interoperability, Accessibility and Security. The architecture for E-Learning System which posses the above mentioned characteristics

consists of various components or layers for supporting instructional design, for retrieving relevant learning materials, for processing and analyzing data to enable meaningful E-Learning recommendations to instructors and learners. This paper deals with the existing architecture of E-Learning, the need of semantic knowledge, Interaction Layer and the practical usability of such system.

Index Terms— *E-Learning, Semantic Web, Service-Oriented Architectures, Synchronous Learning, Asynchronous Learning, Ontology.*

I. INTRODUCTION

Learning is an active process of constructing knowledge. E-Learning System is the teaching and learning activities that carry on through Internet. This system has three main things namely learner, teacher and admin. E-Learning is defined as “the

effective learning process created by combining digitally delivered content with support and services" [1]. It can also be defined as the use of computer and Internet Technologies to deliver a broad array of solutions to enable learning and improve performance [2]. E-Learning system has to support instructional design, retrieve relevant learning materials, process and analyze data to enable meaningful E-Learning recommendations to be made to instructors and learner. This paper provides a survey, analytical report and need of service based architecture for E-Learning system.

II. SURVEY ON EXISTING ARCHITECTURE FOR E-LEARNING SYSTEM

In general, the E-Learning architectures can be classified into: (i) Intelligent Agent-based E-Learning System; (ii) Distributed E-Learning System; (iii) Adaptive E-Learning System; (iv) Interactive E-Learning System; (v) Extensible E-Learning System; (vi) Double Agent Based E-Learning System; (vii) Multi-Agent based E-Learning System; (viii) Web Services E-Learning System. Let us outline some of them briefly.

A. Intelligent Agent-based E-Learning System: This E-Learning environment consists of E-Learning platform Front-End, Student Questioner Reasoning and Student Model. These parts are distributed geographically in scattered computer servers. This environment focuses on the design and development of the subsystems through the use of new and emerging technologies. These parts are interconnected in an interoperable way. The web services are employed for this integration of subsystems.

B. Distributed E-Learning System: This architecture provides users the ability to collect,

analyze, distribute and use E-Learning knowledge from multiple sources.

C. Adaptive E-Learning System: This has a framework for adaptive E-Learning based on distributed re-usable learning activities. This architecture anticipated the presence of at least three kinds of servers, namely, activity servers, learning portals, and student model servers.

D. Interactive E-Learning System: This E-Learning system consists of a number of components. The users interact with the system through a character enabled user interface. Some components of this model are: User Knowledge Tester; Natural Language (NL) Parser; Virtual Assessor (VA); Data Mining & Knowledge Discovery; Knowledge Base (KB); Lesson Plan Generator (LPG); Virtual Teacher; User Performance Testing (UPT); Information Visualization.

E. Personalization in E-Learning System: This is a genetic-based personalized system. This generates appropriate learning paths according to the incorrect testing responses of an individual learner in a pre-test. This architecture incorporates the Problem Based Learning (PBL) activity into an open software E-Learning platform, which is known as Moodle. In addition, a learning diagnosis tool is also included in this platform to alleviate the loading of the instructors. The learners' transcripts posted on discussion board and chatting room are first pre-processed by the learning parameter extraction module to truly reflect the learners' planning on the solutions to the designated problem. The extracted parameters are further fed into a classification algorithm to examine the quality of the learners' suggestions. Based on these suggestions some suitable feedback is given to the learners/instructor if need be.

F. Interoperability in E-Learning System: This framework is designed with the objective of presenting a flexible integration model. This imparts intelligence and adaptiveness to each individual learner in the E-Learning environment. This framework has two parts: [i] portal framework and [ii] Web services framework. Portal framework has presentation component, portal engine component and port let container. Web services framework includes a service provider, a service broker, and a service requester. A Service provider delivers any learning information, material, or process as a self-contained, self-describing modular service across different platforms. The advantage of this framework is that Instructor/Learner uses this framework to their learning objects or services. The key values of this architecture are interoperability and accessibility. These two key values enhance the future collaboration E-Learning portal systems to communicate more efficiently and share data more easily.

G. Security in E-Learning: Security is a crucial issue for E-Learning. This system provides two solutions for improving the security. First, a framework for secure testing is provided and second, a solution is presented to deal with the problem of confidentiality and protection of copyright. This system examined privacy and security issues associated with E-Learning. They present the basic principles behind privacy practices and legislation and investigate the E-Learning standards to determine their provisions and limitations for privacy and security.

III. PROBLEMS IN EXISTING SYSTEM

The problem in the existing E-Learning system is the lack of personalization. This is due to weak-semantic learning resources. This weakness is in turn due to lack of semantic parts in web services technologies. The lack of personalization is one of the major reasons for the learners to become dissatisfied with E-Learning courses. Hence this problem should be solved and this problem could be solved by an intelligent system through the implementation of Semantic Web and Service Oriented Architecture (SOA).

“The semantic Web is a mesh of information linked up in such a way as to be easily processable by machines, on a global scale”. “The Semantic Web approach develops languages for expressing information in a machine processable form”. These two remarks highlights the essentiality of the Semantic Web. [3] The semantic web is called the third generation intelligent network. This is a kind of network which can make computer discover semantic meaning of data according to the label defined by semantics and logic reasoning rules, and makes intelligent judgment according to semantics. The most advantage of semantic Web is that it can make the computer have the ability of intelligent valuation of the data stored in network cyberspace. So, the computer can serve as an “*intelligent agent*”, that means the compute can “comprehend” the meaning of information just like human’s brain [4]. Service-Oriented Architectures (SOA)[5] for E-Learning describe an architectural concept which defines the expression of processes and logic in E-Learning system as individual services. This is in turn publish or expose facets of their functionality in a standardized way allowing other services to access and use their functionality in a flexible manner.

The services and semantic worlds come together in two ways. The first is that services provide a semantically rich description of their functionality. This helps applications to reason about them in the same way as that of data on the semantic web. The second is that the applications that use the data from the semantic web could actually be services themselves. The addition of semantics to the Web facilitates the information finding, extracting, representing, interpreting and maintaining records according to the individual needs of the user.

IV. SUGGESTED TECHNIQUE

The main objective of the suggested technique is to adapt the content for Personalized E-Learning. To improve the personalization in E-Learning system, semantics and web service technology are included in it. The proposed system structure includes four layers. They are: *Presentation layer*, *Adaptation layer*, *Database layer* and *Instructional layer*.

The underlying idea of the system is to identify the user requirements, student's preferences and characteristics. The Learner Model would be created based on the information provided by the user. The system could be designed in such a way that it conducts objective type test for each topic of the subject based on the Learner Model. Reasoning mechanism is employed so that the system will decide what to adapt to the learners. Then, it provides the decisions to the adaptation service. Then the decisions and modifications are performed and integrate the materials according to the needs of the user.

A. Database layer

The database layer consists of profile database, ontology library, resource library, and some label

documents. Profile database, which is managed and maintained by administrator, includes user ID and authority information. The resources library stores various teaching materials and exercises for a particular course needs. Learning contents and other resources are stored in different types like html page, video, and word document, etc.

The term ontology can be defined as an explicit specification of a set object, concepts, and other entities that are presented to exist in some area of interest and the relationships that hold them. The ontology is classified in various ways using criteria such as the degree of abstraction and field of application. The upper ontology is the concepts supporting development of an ontology and meta-ontology. Domain ontology is the concepts relevant to a particular topic or area of interest. Interface ontology is concepts relevant to the juncture of two disciplines. Process ontology is concepts of inputs, outputs, constraints, sequencing information, involved in business or engineering processes. The ontology library gathers various resources descriptive information. This mainly has grammar as well as semantic functions. This library is built for share and reuse of knowledge. This library is designed and implemented under the expert's help. Architecture of personalized E-Learning based on SOA and semantic Web.

B. Adaptation layer

The content of this layer is adapted according to the learning characteristics and knowledge specified by the learner. The student model makes reference to course concepts. Related with the student model the objective test will be conducted. This test determines student's knowledge about the associated concepts. Reasoning Model computes the learning progress of a student and to known

which concepts are well understood and learned by learners. Depending upon the knowledge scored by the learner, the system integrates the course content according to the individual needs.

C. Presentation Layer

Presentation layer provides the entry point to access the E-Learning web services. It also generates adaptive interface to the particular learner.

Web services: Web services give a solution to a major problem in the computer world known as interoperability. Interoperability is provided by allowing different applications from different sources to communicate with each other without time-consuming customized coding.

D. Instructional layer

Interactivity is a major concern in educational environment. It refers to the interaction of a learner with the learning material, the instructor, or with peers in the process of learning. A clear definition, which makes the instructional design for the evaluation of interactive teaching and learning environments issues of ongoing concern. Instructional design in the context of E-Learning and other computer-supported teaching and learning is how learners interact with educational materials. Interaction is a concept that has meaning on different layers ranging from the learning domain to the educational infrastructure. Three perspectives on interaction are: [a] learning and interaction, [b] human-computer interaction and [c] interactive educational materials.

IV. CONCLUSION

Learning is an active process of constructing knowledge. It is individual in nature. Now-a-days, E-Learning becomes a part of education. The advancement in Information Technology has made teaching and training possible anywhere and anytime. This paper gives a comprehensive analytical report on E-Learning System. It is needless to say, E-Learning takes place in open and dynamic learning environment. This emphasizes the personalized support for learners in E-Learning System. This paper dwelt on E-Learning personalization based on an ontology and SOA. The use of SOA and Semantic Web technologies facilitate the information finding, extracting, representing, interpreting and maintaining in an effective and dynamic intelligent way.

REFERENCES

1. Hasan Al-Sakran, "An Agent-based Architecture for Developing E-Learning System", Information Technology journal, pp.121-127, 2006.
2. Rajayogeswari R., Katherin Nithya D., Baskaran S., "An Interaction between Data Mining Concepts and E-Learning Systems in Higher Education", National Conference on Recent Advancements in Technologies-RAT-2013, International Science & Research Journal, ISBN 978-1-62840-454-6.
3. Rajayogeswari R., Katherin Nithya D., Baskaran S., "Simplified E-Learning Systems Using Ontology Rules", International Journal of Technology



Enhancements and Emerging Engineering Research", Vol 1, Issue 4, pp 57-60

4. Konstantinos C. Giotopoulos, Christos E. Alexakos, Grigorios N. Beligiannis, and Spiridon D. Likothanassis, "Integrating Agents And Computational Intelligence Techniques in E-Learning Environments," Proceedings of World Academy of Science, Engineering and Technology, Volume 7, August 2005.
5. Khalil El-Khatib, Larry Korba, Yuefei Xu, and George Yee, "Privacy and Security in E-Learning, 'International Journal of Distance Education. Volume 1, Number 4, October-December 2003.