



A Framework of Functional Model of a University Consortium Information System

Wasefer Zaman, Pramatha Nath Basu

School of Education Technology
Jupiter Building, Jadavpur University
Kolkata - 700 032, India

Abstract – In this paper, it has been discussed the functional model of University Consortium Information System which consists of LMS for tracking students' activity and LCMS for managing the process of assembling and delivery of learning content and credit calculation and credit transfer. The University Consortium information system is a conglomeration of service architecture and functional model. During design of the functional model e-learning standards have been taken into consideration. Service architecture of university consortium information system has been designed using web services. Functional model consists of SCORM compliant LMS (learning management system) for tracking students' activity and LCMS (learning content management system) for managing the process of assembling and delivery of learning content and credit calculation and credit transfer. In the service architecture, web services have been incorporated for the communication between consortium and member universities to maintain the interoperability of the systems. In the proposed framework of University Consortium Information System both quality of education and quality of the system functioning are taken into consideration.

Keywords – LMS, LCMS, University Consortium, Pedagogy, E-learning.

I. INTRODUCTION

With the advancement of ICT (Information and communications technology) for the customized and anytime-anywhere learning, there is a need to develop a formalized academic cooperation between providers. University Consortium would offer courses by providing common portal. According to this approach all consortium members contribute to the management and administration. All member universities act as local learning centers and attend to students' face to face whenever required [2]. The institutions under the umbrella of a consortium, must determine the academic framework to resolve the issues like which institution will be the administering institution, what happens if two institutes offer courses by the same name, which institute gives the degree/diploma if there are cross modules opted by the student across the institutions. This would also answer the basis of eligibility qualification criteria, the process of counseling, admission, academic inputs, distribution and evaluation of assignments, conduction of examinations, evaluations, credit transfer, publication of result, award of certificates etc. To keep the autonomous nature of institutions academic coordination norm should be developed and would be applicable to only those courses and modules offered through the consortium [1]. The proposed functional model of the University Consortium Information System is developed keeping in mind the current existing standards of the e-learning.

II. LITERATURE SURVEY

In any e-learning system, the following functions are mandatory: Content Authoring/Acquisition, Structuring of content (logic and format), storage, processing, distribution and access. Based on the effective uses of these functionalities, the nature and effectiveness of the system can be determined. In most of the e-learning system pedagogical design objectives of a course of study and its purpose are poorly met, even when the presentation of the contents are excellent. In most of cases, they are not flexible and assume all learners are the same and do not cater for learning styles and personal differences in ability of the learning community [7]. The design and development of the portal framework are based on the following overall objectives: (1) it should have basic features of portal such as single entry point, organization configuration, authority and role settings;(2) it has support for proven effective basic learning tools and functionality such as online audio and video support, various knowledge construction communication facilities, structural knowledge management; (3) it has configuration supports for learning community, knowledge organization, and learning tool settings; (4) it should support integration of new components without modifying and redeveloping the software as long as the new components confirm the interface protocols. The interface protocols are based on the underlying database design and support web service methodology [8]. Using (SOA) one can build durable e-learning contents, regardless of changes or evolutions in technology. This means that new content should be added to existing content without costly redesign, reconfiguration, or recoding. The web services component is used to transfer the data as xml from the database. All of these components form the web components of the application. Web services architecture aims to provide a standard based platform for Service-Oriented Computing. It defines itself as a set of specifications that support an open XML-based platform for description, discovery and interoperability of distributed, heterogeneous

applications as services. It is based on the interactions between three roles; service provider, service registry and service requestor. These interactions involve publishing, find and bind operations and these roles and operations act upon the Web Services artifacts [9]. Many custom e-Learning platforms can only present their material inside the platform; and on the other hand, Internet-based Web Services are becoming ubiquitous, both at a professional and at a personal level. A service-oriented e-Learning system results from a perception of the various tasks and activities that are contained in such a system as processes or as work-flows; using appropriate encodings of objects and tasks in UDDI and WSDL forms and documents enable broad exchanges, flexible compositions, and highly customized adaptations possible. We also identified the essential services in the functioning of a typical e-Learning based. These services (with real time Web Services technology) would provide a common interface between various components leading to platform independence and interoperability between learning systems [10].

III. FUNCTIONAL MODEL OF UNIVERSITY CONSORTIUM INFORMATION SYSTEM

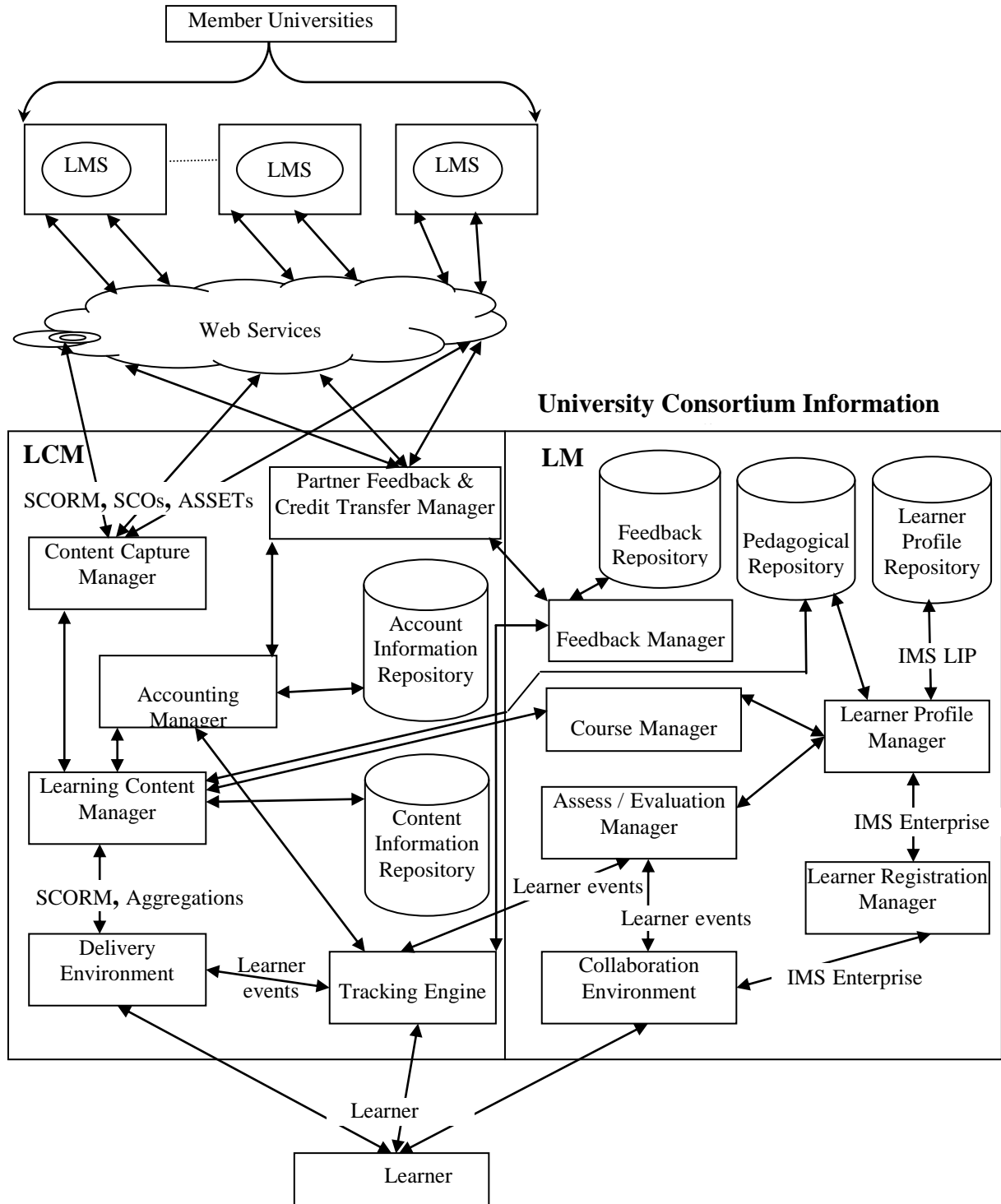


Figure 1. Functional Model of University Consortium Information System

A visual representation of how individual systems might work together in the University consortium environment is depicted in figure - 1. It is assumed that all member universities would have SCORM compliant LMS that supports interoperability across systems. In a simple learning delivery system, a SCORM compliant "Learning Management System" (LMS) manages the delivery and tracking of learning content to a learner. It needs to be supplemented with some more functions to make it cover most of the functions a University Consortium information system should have, because SCORM only focuses on the function of delivery and tracking of learning content in LMS. The added functions, in effect, form an LCMS (Learning Content Management System). In other words the LMS gets modified to the basic LMS functions plus the LCMS functions. This division makes the system's functionality more focused and clear. LCMS manages the process of assembling and delivery of learning content and credit transfer calculation, including the business accounting model.

Among the member Universities there will be a continuous data exchange related to the personnel, students and course materials. Students will access the course materials developed by member institutions through the infrastructure. All these type of information exchange and information storing follows e-learning standards. Some of the relevant standards and their applicability in the proposed system are discussed here. Every Organization exposes and registers its services with a registry (e.g. UDDI). The service provider publishes specifications, and the messages it can exchange, about the service namely access point (where it's been hosted and deployed), methods implemented, input/output parameters, negotiable quality of service parameters and other service related information.

IMS Learner Information Package (LIP) specification deals to standardize learner profile information. Learner profile standards allow different system components to share information about learners across multiple system components. Learner profile information includes personal data, learning plans, learning history, accessibility requirements, certificates and degrees, assessments of knowledge (skill and competencies), and the status of participation in current learning. E-learning systems require a component that manages this profile. The learner profile manager makes learner information available to other components and retrieves and updates learner information on the basis of data reported by other components. The learner registration manager component provides learners with access to instructor approval, checking seat availability, prerequisite checking, payment calculation, payment processing, cancellation and refund policies, etc. The IMS Enterprise specification deals with learner registration information. Learner registration information allows learning delivery and administration components to know what offerings should be made available to a learner, and provides information about learning participants to the delivery environment. When content is launched, there is the need to communicate learner data and previous activity information to the content. As a learner interacts with content, he/she generates some type of activity result, score or course grade. Course grades are often called completion status. Delivery environment provides the learner with access of learning content and other components of a learning environment such as chat, e-mail, quizzes, multimedia players, collaboration tools, application sharing, shared whiteboards, equation editors, etc. The delivery environment also provides navigation through the content, sometimes under learner control, sometimes under instructor control and sometimes under control of the delivery system itself. Some e-learning delivery systems are built almost exclusively around synchronous delivery and collaboration. Many collaborative environments include the ability to capture the audio, video and other content associated with informal events. Asynchronous collaboration tools can provide: discussion groups, e-mail group management, and audio/video reply. Synchronous collaboration tools can provide: audio and video conferencing, application or screen sharing, synchronous web browsing, shared white board, hand raising and pooling.

Assessment engines typically include assessment, authoring capabilities and can be used to create question banks from which assessments (and surveys) are assembled. The use of standardized learning metadata structures plus standardized learning object import and export formats also allow learning objects to be created and shared by multiple learning repositories. SCORM compliant LCMS has been considered to support this interoperability across systems. University Consortium Information System and information system of the participating universities exchange messages through the interaction of web service agents. It is assumed that the LMS of the Member Universities and LMS of the University Consortium Information System are SCORM enabled learning systems. To make the system function technically without any problem across all users, the system framework takes help of implementing system log files, users' feedbacks about the system etc. Clear and explicit teaching strategy (sequence of the learning objects [4]) of the learners need to be designed according to the learner types, needs and context using pedagogical design principles. The framework suggests storage of these strategies in the pedagogical repository. During delivery of the content to the learners, teaching strategy of that type of learners would be taken into consideration by taking input from pedagogical repository. The framework supports would remain so that necessary paths for the experts to update pedagogical inputs regularly are provided in the proposed framework.

Pedagogical content design and structuring into separate activities, our solution acknowledges that learning is a dynamic process that must not only consider the subject matter being taught but also the prior knowledge of the audience [3] and the dynamics of the learning environment. In order to streamline the learning activity to integrate personalized assessment with learning,

The framework provides the required units and their interconnectivity so that subject content is updated and maintained purposefully. For these it is assumed that whenever the system wants to develop and deliver a new learning resource (module), it aggregates all the required SCOs (Shareable Content Object) using SCORM (Shareable Content Object Reference Model) Aggregation Model. The system first searches its own repository and then it searches the UDDI (Universal Description, Discovery and Integration) registry using standard metadata to collect the SCOs. The system also checks the UDDI registry for the updated SCOs for this module.

During design of the system framework, interactivity features are taken into consideration, to increase the level of interaction of learners with the learning process. In the proposed framework, tracking engine module tracks the learners activity (last login time, time spent in last session, how much content is read during last session etc.) during going through the content. Assess / evaluation manager module measures the learners performance. According to the learners performance appropriate feedbacks and suggestions are given. After creating a new session, taking inputs of these two modules, the appropriate content is served to the learners.

IV. CONCLUSION AND FUTURE WORK

The proposed University Consortium Information System has two parts – functional model and service architecture. In functional model, e-learning standards have been incorporated and in service architecture, web services concept has been taken into consideration. There are many challenges for implementing such University Consortium Information System because web services, e-learning standards and both quality of education [5] and quality of the system functioning [6] are all emerging and promising technologies and are undergoing rapid changes and developments. In this paper, the functional model of University Consortium Information System has been discussed. Service architecture of the University Consortium Information System will be discussed next in details.

REFERENCES

- [1]. Rahul Ujjainwal, Wasefer Zaman, Pramatha Nath Basu, A Web Services Oriented Architecture for University Consortium, Proceedings 2nd National Conference on Recent Trends in Information Systems (ReTIS-08), Jadavpur University, February 7-9, 2008.
- [2]. Wasefer Zaman, Pramatha Nath Basu, A Framework of a University Consortium Information System, Proceedings Best Practices in Engineering Education, Pune, India, 2nd and 3rd February, 2007.
- [3]. Wasefer Zaman, Partha Ghosh, KalyanKumar Datta, Pramatha Nath Basu. "A Framework To Incorporate Domain Knowledge Modeling In An Education System", Proceedings International Conference on Mathematics, Statistics and Computer Engineering, ICMSCE 2013, Kochi, Kerala, India, 09-10 August 2013.
- [4]. Partha Ghosh, Wasefer Zaman, "Improving Search And Retrieval Of Reusable Learning Resources In A University Consortium Environment By t-Concept Lattice And Fuzzy Graph", Proceedings International Conference on Mathematics, ICM 2013, Kochi, Kerala, India, 09-10 August 2013.
- [5]. Wasefer Zaman, Pramatha Nath Basu, Kalyan Kumar Dutta. "A Framework to Incorporate Quality Aspects for E-Content in a Consortium Environment", Proceedings Annual International Conference on Education & e-Learning EeL 2011, Hotel Fort Canning, Singapore, November 7 – 8, 2011.
- [6]. Wasefer Zaman, Partha Ghosh, KalyanKumar Datta, Pramatha Nath Basu. "A Framework to Incorporate Quality Aspects for E-Learning System in a Consortium Environment", Proceedings International Conference on Information and Education Technology, ICIET 2012, Hotel Suba International, Mumbai, India, 14-15 January 2012.
- [7]. Kadry, S. and Kassem, H. Web Service Technology for Distance and Open Learning. Journal of Theoretical and Applied Information Technology. 2009, ISSN: 1992-8645. Indexed in DBLP.
- [8]. Jian Chen, Hongyuan Wang, Kangping Wang, Yafei Yan, and Jinguo Teng (2012), A Configurable and Extensible Portal Framework for E-Learning Environments. International Conference on e-Education, e-Business, e-Management and e-Learning. IPEDR vol.27 (2012) © (2012) IACSIT Press, Singapore.
- [9]. Mohammed A. Jabr and Hussein K. Al-Omari. 2010. e-Learning Management System Using Service Oriented Architecture, Journal of Computer Science 6 (3): 285-295, 2010 ISSN 1549-3636.
- [10]. Ahmad Luthfi (2010), "Intelligent Learning Objects (LOs) Through Web Services Architecture", International Indonesia Journal, Vol. 2/No. 1, pp. 17-22.