XML AUTHORING TOOLS IN LEARNING CONTENT MANAGEMENT SYSTEMS

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Abstract: E-Learning platforms aim to provide learners with the most appropriate activities and tools that best fit their needs. This article presents our approach for designing an e-Learning platform that complies with several standards. The work described in this paper has been conducted in the framework of the XESOP project.

Key Words: XML, e-Learning, Authoring Tools, Content Management System.

1. INTRODUCTION

E-Learning platforms are used to give IT support for managing learning process, learning content and to virtualized learning environment by increasing accessibility of traditional education, by facilitating learning efficiency and collaboration. There exist today many projects in the e-Learning field and the platforms resemble each other by their functionalities and their multiple extensions. That is due especially to the fact that the standardization organizations (LOM, IMS, SCORM) concentrate their efforts on the structuring and the re-use of the pedagogical documents by defining a basic element called Learning Object (LO). On the other hand, the problems of the contents of these objects and the re-use of the functionalities of the applications which animate them are not treated. The principal objective of e-Learning is to improve quality of teaching by introducing a collaborative knowledge creation and diffusion. From a pedagogical point of view, content creation and delivery are the two key factors in web-based learning systems.

E-Learning content management systems (CMS) face the challenge of collecting, organizing, managing, maintaining, re-using, delivering and targeting the content. We should make difference between a content-management system and authoring tools for content creation that is organized into a course. This may be animations, graphics, and text, audio, video or other multimedia segments. These learning objects are organized and catalogued by the learning content management system (LCMS) and this creates units of study or on-line courses that can be navigated and perhaps monitored.

2. LEARNING OBJECTS

Learning content embodied in the form of learning objects makes content reusable, portable, shareable and adaptive. Learning objects helps separating content from context and are defined as [2]: self-contained where each learning object can be taken independently; reusable which means that a single learning object may be used in multiple contexts for multiple purposes; aggregated where learning objects can be grouped into larger collections of content, including traditional course structures; tagged with metadata which means that every learning object has descriptive information allowing it to be easily found by a search.

These characteristics are realizable by the use of common standards and advanced technological means of Internet. The family of XML languages offers excellent possibilities for a semantic structuring and a separation of the contents from presentation.

XML metadata has become the de-facto standard for indexing, defining and searching learning objects and many repositories use metadata standards developed under the IEEE's Learning Object Metadata (LOM) project [5].

To affect the greatest reuse of LOs, shareability standards are essential. The Advanced Distributed Learning (ADL) Initiative [3] has identified a Sharable Content Object Reference Model (SCORM). The SCORM [4] provides specifications for the technical underpinnings of e-Learning in relation to: the packaging of learning content, the metadata, and an application programming interface (API) for enabling communications between learning content and the system that delivers it.

3. E-LEARNING SYSTEMS REQUIREMENTS

Generally, an e-Learning system comprises three key components: infrastructure, services and content. Infrastructure is the software that allows learning to be created, managed, delivered and measured. It can be divided into a Learning Management System (LMS) and a Learning Content Management System (LCMS). Services involve the planning, customization, integration and management of the e-Learning application. These services can be carried out by a Web Server based on the Client-Server model or by the Web Services based on a distributed model of interaction. Content can be categorized according to subject, selected and used at very granular level. The creation of the teaching contents can be done by external tools (Word, Flash, Dreamweaver, or others), or by authoring tools (HTML, XML, MathML, SVG, QTI, SMIL, and other editors) included as plug-ins in the systems and accessible by the offered services.

E-learning system’s infrastructure, services and content are complementary to each other. Content is the core of LMS and LCMS and most services are delivered through the LMS and

authored in the LCMS (Figure 1). The general requirements for an e-Learning system are [1]: knowledge can be access at anytime and anywhere; the e-Learning environment can be customized to an organization's needs; the system must allow for additional components to be integrated easily; content can be reused by creators or consumers; the system should allow content and other data to be exchanged and shared by separate tools; the system should permit access to potentially hundreds of thousands of users and large content repositories; the security of data, information, or knowledge should be promise in the system.

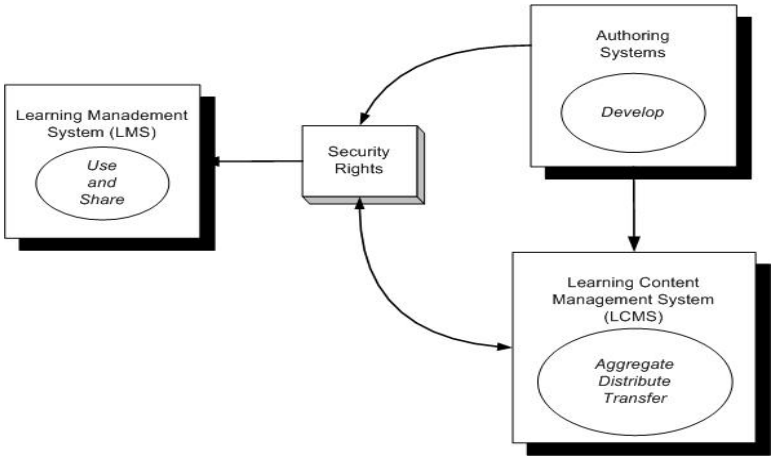

Figure 1: The content management in an e-Learning system architecture

4. CONTENT AUTHORING TOOLS AND SYSTEM IMPLEMENTATION

During the past two years, we have been successively working on the system implementations of our XESOP project with the purpose of exploring efficient approaches to improving the reusability and interoperability of learning resources. While the system implementation employs a proprietary design using a self-defined XML XML Schema to represent the course structure, and take an open-standard-oriented approach, which are LOM and SCORM conformant.

In addition, in order to effectively manage the learning resource metadata, we choose a native XML database [6] to store: Course content, SCORM metadata (Manifest), and Application Profiles. As a so-called native XML database, Apache Xindice provides a natural way to store, retrieve, update, search, and discover metadata. In Xindice, all documents are stored in their original XML format without the need for any pre-processing. The search and update of metadata can be easily accomplished, taking advantage of W3C XPath language and XUpdate language from XML:DB Initiative. This approach will greatly facilitate the exchange of learning resources between different LMSs.

Our experiment in this field and our participation in several projects [7] brought us to the following conclusion: teachers are in need of a generic and standardized environment, related to new technologies supporting the exchanges, such as XML technologies. The design of such an

environment can be based on the existing standards treating the structure of a teaching document (SCORM, IMS, LOM). For example, using an XML semantic editor, the teacher can, independently of his colleagues or with their collaboration, create the contents of his course using the learning objects of LOM [5]. That generates the tree structure design of a generic teaching document and a validation grammar of type XML Schema.

It is rare that the contents of a course are only made of raw text. According to the courses, the teacher may need to present diagrams, mathematical formulas or data in tables. For these purposes we found around XML practical meta-languages for the design of an editor of mathematical expressions (MathML), or for the creation of a vector graphics editor (SVG) and a schema for table producing.

5. CONCLUSIONS

The main objective of our XESOP project is to provide to existing LCMSs a set of tools for the creation of pedagogical contents in a XML format according to a structure (a grammar) defined by a XML Schema. The basic design of a XML semantic editor is enriched with plug-ins for mathematical formulas creation, vector graphics and questionnaires. The XML documents are stored in a native XML database. They become accessible via Web services for a collaborative mode of creation and diffusion of these learning objects.

6. REFERENCES

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