INTRODUCTION TO THE SCORM

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Abstract

*Emerging courseware standards require instructional designers to create new content or convert existing learning content into small, stand-alone learning objects with metadata so that they can be stored in a learning object repository. An introduction to the Sharable Content Object Reference Model (SCORM) for Web-based learning is given in this paper. SCORM is being implemented in the framework of a Czech Universities development project "**C**ooperation of **u**niversities at the development **sta**nda**rd**ized multimedia educational aids" (CUSTARD).*

1. What is SCORM

The Sharable Content Object Reference Model (SCORM) aims to foster creation of reusable learning content as "instructional objects" within a common technical framework for computer and Web-based learning. The SCORM is a collection of specifications and standards adapted by ADL (http://www.adlnet.org/) from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reuse of Web-based learning content.

CAM and RTE. SCORM defines a Web-based learning *Content Aggregation Model (CAM), Run-Time Environment (RTE) and sequencing and navigation* for *Learning Objects* (LO's). *The CAM* specifies how you should package your content so that it can be imported into an LMS. This involves creating XML files that an LMS can read and learn everything it needs to know about your content. *The RTE* specifies how content should behave once it has been launched by the LMS. A SCORM conformant LMS is required to implement an API consisting of eight functions that content may access to communicate with the LMS.

LMS and SCOs. *Learning Management Systems (LMS)* is any system that keeps learner information, can launch and communicate with *Shareable Content Objects* SCOs, and can interpret instructions that tell it which SCO comes next. SCOs are a standardized form of reusable learning object. Additional components in the SCORM model are tools that create SCOs and assemble them into larger units of learning.

Why implement SCORM? Implement the SCORM for one of the following reasons:

- **Portability.** Ability to deploy content in any SCORM conformant Learning Management System (LMS).
- **Reusability.** Ability to search and retrieve content objects, including lessons, modules, exercises, activities, media, etc. and reuse them.
- **Data tracking.** Ability to track data about the learner and the learner's experience including scores, time, comments, etc.
- **Sequencing.** Ability to combine content objects to achieve sequencing or branching strategies.

2. Instructional design

An instructional designer should know that the typical instructional design process does not change for a project to create SCORM conformant content. Several considerations for analyzing, designing and developing SCORM conformant content are listed below. See http://www.adlnet.org/index.cfm?fuseaction=developer&pageview=viewarticle&ID=4 :

Analysis

- Verify that the content will be deployed in a SCORM conformant LMS. If a SCORM conformant LMS will not be available, re-evaluate the requirement for SCORM conformant content.
- Review the Data Model Element section of the SCORM 2004 Run-Time Environment Version 1.3 to learn about the data tracking opportunities. Determine the data tracking requirements for the content.
- Identify potential secondary audiences for content. Determine which sections of the content can be shared by multiple audiences.
- Identify an appropriate strategy for recording meta-data and storing content in a repository. Meta-data enables learning resources to be described in a common way so that they can be searched in a repository and retrieved for reuse.

Design

- Chunk your content so that sections can be reused.
- Collaborate with technical developers who are familiar with the SCORM to determine the best way to organize the content to meet the project requirements.
- Design Sharable Content Objects (SCOs) for content that requires data about the learner's experience with the SCO to be tracked.
- Design assets for content that is launched by the LMS but does not require data to be tracked about the learner's experience.

Development

For content that will be reused:

- Storyboard the content so that it can stand alone. For example, do not refer to a previous lesson if it appears in a different SCO.
- Determine how the reusable content can be effective without context-specific information. Or, provide context-specific information externally from that content.

3. Czech universities cooperation in the area of standard learning objects

The Czech project "**C**ooperation of **u**niversities at the development **sta**nda**rd**ized multimedia educational aids" (CUSTARD) (see [2]) is financially supported from the developmental program of the Czech Ministry of Education, Youth and Sports for 2004. The main goal of the project CUSTARD is to reduce costs and increase the multimedia learning objects quality and utilization. This goal could by reached by 4 sub goals:

1. Development of the distributed digital library of learning objects.
2. Creation of the educational, information and cooperation portal.
3. Check of multimedia learning objects utilization in e-learning courses.
4. Engagement of other Czech and Slovak universities into the project.

4.1. Development of the distributed digital library of learning objects

Digital library in CUSTARD is a controlled collection of the multimedia digital objects, based on SCORM meta-data. The objects are divided into thematic categories. By [4], the following roles are adopted by users (both human and software) in any digital library:

- *Learner* – a person who is following a specific learning plan and need to discover resources valuable for learning.
- *Creator* – a person responsible for creation of resources. The creator may be a content developer, publisher, librarian or anyone else who participates in content delivery into the library.
- *Infoseeker* – a person seeking to obtain information through the discovery of resources. In the comparison to learner, an infoseeker does not follow defined learning path, but finds objects by his/her own.
- *Agent* – an intelligent software that carries out tasks directly on behalf of a Learner, Creator, or Infoseeker. For example, an agent could be responsible for automatic indexing of metadata from integrated digital libraries.

Library DILLEO (https://e-dilema.uhk.cz/dilleo/) is virtual digital library mainly consisting of materials for e-learning. Objects in DILLEO are, alike in a real library, divided into categories Business, Computers, Economy, Education, Languages, Mathematics, Sport, Tourism, travel and recreation.
For fast and simple access to the objects, a full text search has been provided. This application was realizing with support of the European Commission, Education and Culture Division. Project No. 90683-CP-1-2001-1-CZ-Minerva-M. Nowadays new version of e-library DILLEO is being developed as part of project CUSTARD.

Digital library TELMAE. In the framework of the project CUSTARD, an application of a standardized meta-data schema of TELMAE learning objects is in the process of preparation. At about 20 challenging experiments will be recorded and stored in digital library. Digital library TELMAE is a part of Portal TELMAE (http://telmae.karlov.mff.cuni.cz/indexeng.html). Editor in chief is Zdena Lustigová, Charles University Prague.

The success of a digital library does not depend just on its internal architecture, there are many other issues designers and administrators of the library have to cope with (see [5], page 16).

- First of all, the crucial issue is the *quality of metadata*. Both the design (i.e. what elements to include, choice of controlled vocabulary etc.) and preciseness of filling them out matters a lot. Many digital libraries suffer from the vide variety of different metadata formats and very difficult and unreliable process of normalizing them for the purpose of unified searching. The pain of all libraries is a high cost and very variable quality of metadata construction, since it is highly dependent on the human factor.

- Second, a library architecture can be the most advanced in the world, but if it does not provide *easy-to-use and rich functionality,* users (and customers) would probably choose different one, although not so well-made. Unfortunately, it is the appearance and the first impression that matters most, as we can see all around us.
- Finally, *the cost* of setting up and running the library should be as little as possible. The cost includes development or purchase, hardware infrastructure and maintenance. The maintenance consumes the majority of funds.

DOD Repositories Initiative. By [6] (SCOurse-2003-12-10\viewer.htm) the SCORM addresses the *Accessibility* requirement by providing a standard way of packaging content as re-usable, self-contained objects. Rich, standardized meta-data is associated with the content, containing information about subject matter, design, rights, technical, and pedagogical aspects, and enabling sophisticated searches across distributed repositories.
Course structure information is contained with the content, enabling a Learning Management System to make sophisticated use for the material.
The type of repository described here exists *only in experimental form* at present. However, the SCORM anticipates the availability of such repositories and has many features to support this sort of functionality. That is why we are in process of negotiation about cooperation with *DOD Repositories Initiative* [7], which could be a standard for digital libraries in future.

3.2. The creation of an educational, information and cooperation portal

Educational Portal TELMAE could be find at URL http://telmae.karlov.mff.cuni.cz/indexeng.html. This portal is designed for anyone who is interested in education or personal and professional development, especially for teachers of all types of schools and educational staff from enterprises and other institutions. The TELMAE goals are: to exchange experience in implementation, realization and impact of technology enhanced learning, to present examples of good practice at schools, industry and public administration, to explore the research, development, and applications in this field and to inform about the latest technologies and learning environments.

The Gate to Online Courses on TELMAE informs users about the current offer of online courses developed at the Laboratory of Distance Education in the following areas: Instructional Design, Use of ICT in Science Education, Introduction to Distance Education, Education Management, Tutoring in online education and Test and Testing in online education.

VSPORTAL. This portal is accessible at http://vsportal.osu.cz. Portal contents information about e-learning divided into thematic categories (in Czech). Apache HTTP server is used as a www server (http://www.apache.org). The publishing system Zope (http://www.zope.org) is used for the creation of dynamic portal structure.

VSPORTAL thematic categories are:

- **How to use this portal**
  Book *ABC of e-learning*
  Online course *ABC of e-learning*
- **Starting into e-learning**
  Concept of e-learning
  e-learning standards
  e-learning community
  Information for specialists
- **e-learning participants**
  e-students
  e-teachers
  e-developer
  e-manager
  Information for specialists
- **e-learning technical support**
  Software tools for web based teaching
  University and enterprise infrastructure
  Information for specialists
- **e-learning institutional support**
  Issues to be Addressed by the Institution
  Information for specialists
- **Educational Institutions in e-learning**
  Universities
  Secondary and Primary Education
  Training Centers
  Information for specialists
- **Learning object resources**
  Distance educational courses
  e-learning courses
  Learning object resources
  Educational standards
  Information for specialists
- **misc**
  News and Events
  Grants

Following [8], http://sakaiproject.org/, two main barriers have consistently defeated various efforts to pool higher education software development investments that could leverage obvious economies of scale: First, unique local technical architectures, including heterogeneous hardware, software interoperability requirements, and diverse user interface requirements. Second, inter-institutional timing differences of when a particular software need has mobilization, funding, leading to fragmented efforts, competing and incomplete open source offerings, and weak interoperability.

The technical barriers can now be overcome by distilling the accumulated architectural knowledge and programming experience gained in building these systems into a Technology Portability Profile that provides four essential elements for code mobility. It is expected that in the framework of the project CUSTARD the Czech universities could joint the Sakai project and that will stop fragmented efforts, for example development of unique local portals with weak interoperability.

3. 3. Check of multimedia learning objects utilization in e-learning courses

An open, edited database of online courses will offer:

- *to public users*: detailed information about each course (annotation, dates, outline, general requirements, fee, certification, etc.) and electronic registration.
- *to educational institutions and companies*: the possibility to advertise their own online courses, publish information about them and provide access to registration.

3. 4. Engagement of other Czech and Slovak universities into the project

In the year 2004, 3 smaller Czech universities are cooperating on the project CUSTARD:

- University of Ostrava,
- University of Hradec Králové,
- Silesian University.

In the year 2005, cooperation with other 4 big universities is expected:

- Charles University in Prague,
- Czech Technical University in Prague,
- University of West Bohemia,
- VŠB – Technical University of Ostrava.

As subcontractors, experts from 3 other universities will take part in CUSTARD

- Masaryk University in Brno
- Brno University of Technology
- Mendel University of Agriculture and Forestry Brno

4. References

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