Content Reusability in eLearning
- ICRISAT's experiments with LMS

Sylvester Asil Gerard[1], Dixit Sreenath[2], Boyanapalle Diwakar[1], Sahu Ritesh Kumar[1] and
Venkataraman Balaji[1]

[1]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
[2]Central Research Institute for Dryland Agriculture (CRIDA)

a.sylvester@cgiar.org / gerardsylvester@gmail.com

Abstract

The World Wide Web has drastically changed the way of information dissemination especially in the field of education, and in particular for open and distance learning. The relatively small investment required to set up a website enabled a great many institutions to become instant content providers. After the initial rush to get online, the challenge faced was to develop an efficient methodology to facilitate knowledge management and sharing.

With MIT leading the way with its OpenCourseWare initiative, many other institutions have followed suit by collaborating to form an online grid of educational and outreach materials. The idea of each organization creating monolith digital repositories by using proprietary software and standards without a common data exchange format was a major limitation in collaborative development of e-courses.

The solution rested in the use of a new breed of software suites called Learning Management Systems[1]. LMS were basically designed to provide an application framework that was mainly meant for off-campus, self-paced learning for class-room based learners.

The LMS facilitated interoperability and reusability of the content and learning objects together with giving a more blended eLearning solution, a more coherent total system. This approach of knowledge on-demand has been used by many educational, research and corporate organizations for knowledge reuse with great success.

With more and more emphasis and focus on the creation of 'Metadata' and 'Digital Repositories', standards such as SCORM (Sharable Content Object Reference Model) proposed by IMS global learning consortium will play a major role in defining eLearning standards by bringing interoperability and reusability of the learning objects and content between various LMS environments.

The power of using digital repositories is that they can be searched, imported, shared, reused and exported between various application platforms in a standard way. In other words, SCORM is to LMS what XML is to the future Semantic Web.

Software such as the RELOAD eLearning content authoring tool can be used to assemble and deliver learning content rapidly conforming to SCORM standards. Hence even a 'conventional' author could start creating content for eLearning with ease using RELOAD editor.

eLearning, using LMS fits the idea of Knowledge On-Demand and Service Oriented Architecture which are the building concepts of Web 2.0 perfectly

Keywords: ODL or Open and Distance Learning, Interoperability, Learning Objects Repository, eLearning, ICRISAT, AGrid.

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[1] LMS or LCMS / VLE / MLE etc.,

Sylvester Asil Gerard, Dixit Sreenath, Boyanapalle Diwakar,
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Introduction

The advent of the Internet brought about a significant change in the mode of information dissemination especially in the field of education, and in particular for Open and Distance Learning (ODL). The relatively small investment required to set up a website has enabled many institutions to become instant content providers. After the initial rush to get online, the challenge faced was to develop an efficient methodology to facilitate management of knowledge and its sharing.

Early entrepreneurs and many educational institutions in an effort to follow the open access/content model resorted to creating monolith digital repositories by using proprietary software and standards without a common data exchange format thereby creating a major limitation in collaborative development of e-courses. These online digital repositories have taken the approach of binding the content to the presentation layer, (figure 1). The comfort of reusing objects and modules was missing in this approach. The need to separate the content from the presentation layer, (figure 2), was the thrust behind the concept of learning objects (LO) and learning objects repositories (LOR). The importance of reusing content in eLearning cannot be overemphasized.

A learning object is akin to an atom, which could exist per se as well as in combination with many other entities to give a well defined meaning. Similarly a LO [2] should also possess the ability to survive outside its contextual environment with the help of metadata.

Metadata, defined as "information about an object; be it physical or digital" [1], of a LO is used to facilitate search and reuse of that LOs. Standards for metadata such as the IEEE's LOM (Learning Objects Metadata) and Dublin core metadata initiative [2] facilitate interoperability.

Around a dozen online services exist on the web that facilitates the creation of digital repositories. While the creation of LOR is an efficient way to store digital content, the problem arises when these objects are not sharable, reusable and adaptable in various contexts.
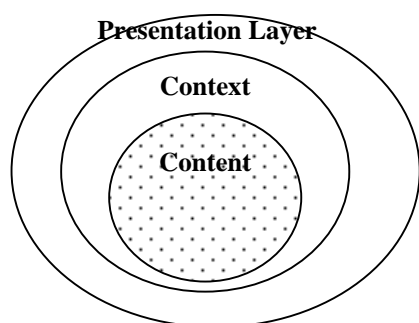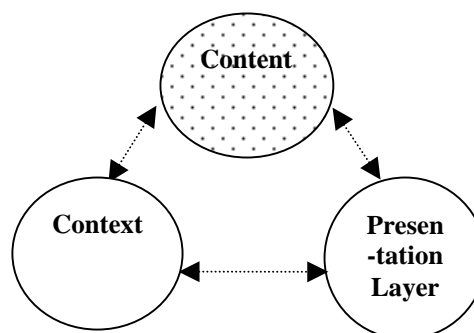

Figure 1: Interdependent LORs

Figure 2: Independent LOs

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[2] SCORM (Sharable Content Object Reference Model)[2] [4] refers to LO as SCO (Sharable Content Object) and is defined as a granular SCORM content.

Importance of Learning Objects

Considering the time and effort expended by experts to create content, reusing content would be prudent for eLearning. Institutions could spend time on improving or localizing existing modules. The very existence of digital repositories holding modular learning objects provides an opportunity to create modules "on-the-fly" to meet various contexts. IEEE defines reusability as: "*the ability of a component to function and integrate outside the environment for which it was primarily designed.*"[3]

With many institutions supporting initiatives similar to Massachusetts Institute of Technology's Open Courseware [5] reusability is the next major issue to be tackled for the creation of digital repositories. Implementation of specifications like SCORM [3] [4] has facilitated searching, sharing and the reuse of learning objects thereby making the task of creating digital repositories easier and for the content to have a much wider reach and scope than the intended audience and purpose for which they were initially created.

The need for reusability, adaptability and interoperability could be greatly backed by the agricultural scenario in India, where the generic content has to be rapidly modified and localized for different agro-ecological contexts. Localization is needed with respect to words, color phrases and terms to suite the local audience. In such situations where culture, language, agro-climate and social milieu are very diverse even within a radius of 100 kms, Adoptability of a module after localizing content is very essential to share the knowledge through electronic medium.

The ICRISAT Experience

Supported by Commonwealth of Learning (COL) [6], International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) [7], engaged various state agricultural and veterinary universities in India and introduced them to the concept of using information technology in distance education to reach out to village communities for enhancing their rural livelihoods. Now, several leading technology institutes like Indian Institute of Technology (IIT) Kanpur, IIT Bombay and the Indian Institute of Information Technology and Management (IIITM) Kerala have come forward to lend their technical expertise to create and maintain a grid of education and extension materials. Many other agricultural and veterinary universities of several states in India have expressed their willingness to join this consortium and contribute learning resources to the grid. The greater emphasis here is on using best practices for developing courses for eLearning and on the reusability of content created by one institute by many others. This web-based digital repository would eventually benefit the global agricultural community.

Food and Agriculture Organization's [8] AGROVOC [4] [9] agricultural thesaurus is used to provide multilingual structured and controlled vocabulary. The LOs are mapped using an ontology which describes the objects together with the relation between them in a formal way and has an explicit grammar for linking it with the vocabulary terms. This follows the ontology based metadata approach and also decouples the presentation layer from the content (figure 2). The repository could be searched, content imported, shared, reused and exported between various application platforms in a

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[3] SCORM specifications are a composite of several specifications developed by international standards organizations, including the IEEE, IMS, AICC and ARIADNE.

[4] AGROVOC is a multilingual, structured and controlled vocabulary designed to cover the terminology of all subject fields in agriculture, forestry, fisheries, food and related domains.

Sylvester Asil Gerard, Dixit Sreenath, Boyanapalle Diwakar,
Sahu Ritesh Kumar, Venkataraman Balaji

standard way. The presentation layer could be something as simple as a HTML page or a Microsoft Word document or something as complex, in terms of features, as a course management system like Moodle[5] [10]. The possibility of reusing the content on various eLearning mode increases significantly by this approach.

The content would be available in the public domain and peer reviewed to ensure highest quality. This approach is very essential to meet the training and capacity building needs of a large number of farmers and extension workers having diverse needs.

As contemporary eLearning requires the understanding of concepts, practices and use of applications such as LMS and repository management systems, the various players in this consortium are given hands-on training on the use of LMS.

LMS were basically designed to provide an application framework that was mainly meant for off-campus, self-paced learning for class-room based learners. It also facilitates interoperability and reusability of the content stored together thereby giving a more blended eLearning solution.

This approach of knowledge on-demand has been used by many educational, research and corporate organizations for knowledge reuse with great success. LOs and repositories with SCORM compliance are aggregated and tagged with metadata thereby facilitating greater reuse. In other words, SCORM is to LMS and eLearning what XML and RDF [11] is to the Semantic Web.

Software such as the RELOAD[6] [12], an eLearning content authoring tool, can be used to assemble and deliver learning content rapidly conforming to SCORM standards. Hence even a course author who does not have expertise creating courses for eLearning could start creating, sequencing and aggregating content with ease.

eLearning using LMS fits the idea of Knowledge On-Demand and Service Oriented Architecture, which are the building concepts of Web 2.0[7], perfectly and with Open Source softwares like ATutor and Moodle, to name a few, providing the apt architecture for creating digital repositories which adhere to SCORM standards, content reusability could well be the watch word of eLearning.

Cost of delivering eLearning content is also greatly reduced by operating systems like LodPup [13], developed under the portable e-portfolio project is a Live CD[8] based on Puppy Linux [14] and Reload's SCORM Player. It is a complete SCORM player system integrated with a Java client and runs on top of PuppyOS. This can be run in a Pentium II PC and used to deliver SCORM based courses with minimum investment in both hardware and software components.

Looking Ahead

The future would allow the luxury of creating personalized digital repositories or libraries from a collection of modules from various applications and sources combined and integrated into ones own favorite platform or LMS. A course packaged following the SCORM specifications can be transported from one LMS to another with minimum modifications. This will bring about a unified and effective learning experience.

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[5] Moodle [10], or any other commercial/open source CMS/LCMS.

[6] RELOAD editor can be used for Content Packaging as well as a Metadata Editor, SCORM Player as well as the Learning Design Editor and Player.

[7] The concept of "Web 2.0" was conceived by O'Reilly and MediaLive International. It envisages a web moving from publishing (Web 1.0) to participating (Web 2.0).

[8] A Live CD is a bootable CD that contains an operating system which could be run from the CD.

With the advent of the Semantic Web coupled with the LO's metadata we might be able to dynamically link learning objects using Web services technology to create content dynamically. The future of eLearning rests in the ability to communicate or impart knowledge without language or technology being a barrier.

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