Date : 02/06/2006

Issues In Developing A Repository Of Learning Objects For Lis Education In Asia

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Meeting:	**107 *Off-site:* Education and Training**
Simultaneous Interpretation:	No

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0 WORLD LIBRARY AND INFORMATION CONGRESS: 72ND IFLA GENERAL CONFERENCE AND COUNCIL
20-24 August 2006, Seoul, Korea
http://www.ifla.org/IV/ifla72/index.htm

Abstract

A repository of learning materials is being developed with a view to facilitate sharing of teaching resources among LIS education programs in Asia. Issues involved in developing such a repository are discussed with a focus on content creation, management and organization, as well as accessibility and usability of resources in the repository. Consideration for developing guidelines on metadata, vocabulary & taxonomy, and repository system and accessibility mechanisms are described.

Introduction

Traditionally, library & information science (LIS) schools in Asia have looked to the West for ideas and leadership in LIS education, as well as for teaching materials. However, there is growing awareness among LIS educators in Asia of the need for sharing of teaching materials and other knowledge resources within Asia, to address the Asian context. To that end, we are developing a Web portal for LIS Education in Asia (LISEA) at http://www.ntu.edu.sg/sci/lisea to serve as a gateway to LIS education programs in Asia, and provide a platform for knowledge and resource sharing. This is a collaborative project between the School of Communication and Information at the Nanyang Technological University (Singapore) and the Faculty of Computer Science and Information Technology at the University of Malaya.

LISEA started as a modest project of compiling a directory of LIS schools, programs and faculty members in Asia—aimed at surveying the state of LIS education in the region as well as to facilitate dialogue among LIS educators. At the same time, the Asia-Pacific Conference on Library and Information Education and Practice (Khoo, Singh & Chaudhry, 2006) was organized in April 2006 in Singapore to bring together educators and practitioners to discuss current trends and issues in LIS. Participants of the conference expressed interest in raising the level of collaboration and cooperation among LIS educators. This encouraged us to expand the scope of the project to include, among other things, building a repository of learning objects and teaching materials that can be consulted and re-used by the faculty of LIS schools in Asia. This paper surveys the issues involved in developing a repository of learning objects for LIS education in Asia. It focuses on issues related to content creation, management and organization, as well as accessibility and usability of resources in the repository. Such issues will include quality, size and format of learning objects; metadata, vocabulary, and taxonomy considerations; and repository system, interface, and accessibility policies and mechanisms.

What is a learning object? There is no one definition of what constitutes a learning object or of what size such an object should be to maximise its reusability (Muzio, Heins and Mundell, 2001). ASTD Learning Circuits (2002) defines a learning object as "a reusable, media-independent chunk of information used as a modular building block for e-learning content". The IEEE Learning Object Metadata Working Group, Learning Technology Standards Committee (LTSC) defines a reusable learning object as "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning" (IEEE, 2002). In *The Instructional Use of Technology*, Wiley (2000) defines a reusable learning object as any digital resource that can be reused to support learning.

Potential Contribution

Learning objects are beginning to draw much interest, especially in the context of e-learning. They have tremendous potential to become powerful teaching and learning tools that can be used inside and outside the classroom. The OCLC E-Learning Task Force (2003) asserts that learning objects are at the heart of the learning/technology nexus. Polsani (2003) and Rehak & Mason (2003) noted that learning objects have generated excitement because of their potential reusability. A learning object can be simultaneously shared, reused and placed into multiple courses, disciplines, and course management systems. Wiley (2002) stated that

digital resources available on networks are non-rival resources as these can be used simultaneously by many people.

We foresee that a repository of learning objects for LIS education can be useful in many ways. Some of the expected benefits are as follows:

- The repository will certainly benefit instructors who are teaching a particular subject for the first time. It can show the different perspectives/approaches that other instructors have taken in teaching the subject, the level of detail covered for different topics, amount of material that can be covered in a certain amount of time, types of activities used to enhanced learning and evaluation methods. Course development time is reduced when learning objects are re-used, after customizing them to the local context and the instructor's personal preferences and style.

- The repository will also be useful to instructors who are already teaching a particular subject. It can serve to alert the instructor to new developments and emerging topics that are being covered by other instructors. Instructors can also search for supplementary materials, e.g. diagrams, illustrations, exercises/tutorials and class activities, to enhance student learning.

- For students, the repository can provide supplementary readings, tutorials and practice exam questions to enhance learning.

- For researchers, the repository can provide raw data for research on LIS curriculum across Asia, teaching styles and methods, and national and cultural differences.

- LIS professionals can use the repository for e-learning in new and emerging areas, if the learning objects are detailed and comprehensive enough.

We believe that the repository would be useful both for traditional topics in LIS as well as for new and emerging areas. For traditional topics, e.g. information organization, information sources, information service and information retrieval, we expect the repository to contain more detailed material and multiple versions of the same type of resource. It can serve to alert instructors to new developments and research results that are being incorporated in courses, and new textbooks and readings that are being used. With learning objects on the same topic from different countries, the repository can help educators to appreciate the different national and cultural contexts of LIS, e.g. topics and concepts that receive different emphases in different countries, different terminologies, different applications, different examples and scenarios used, different approaches to teaching and learning, and different presentation styles.

The repository will probably be most useful in new and emerging subject areas to facilitate "pollination". A new subject developed in one school can help other schools to jumpstart courses in the same subject. It can also serve to identify experts in new areas who can be engaged as consultants or invited to give workshops.

It can be seen from the above discussion that a repository of learning objects can help to raise the quality of LIS education. It can help to form communities of practice—for instructors teaching the same subjects. It can help in standards development, and development of competency standards in each subject area. It can also help to identify experts and

experienced instructors in different areas of LIS, and identify areas of strength in different LIS schools.

Issues in the Development of a Repository

Defining and analyzing learning objects and creating repositories to facilitate their use and re-use requires addressing several issues. Issues and problems traditionally associated with the development of large databases apply when we attempt to develop a learning objects repository. These issues include those pertaining to the *information* stored, such as the scope, content, relevance and organization as well as administrative and technological issues such as security, accessibility levels, validation and compatibility. However, aside from the issues that are pertinent to all databases, the development and maintenance of a learning objects repository present some unique challenges.

Content creation and development

The following types of resources are expected to be useful to LIS educators and should be included in the repository:

- Course outlines and syllabi
- Lesson plans
- Presentation slides
- Lecture notes
- Student activities (e.g. tutorial/lab material, exercises, discussion questions)
- Bibliographies and readings
- Exam questions and test bank, and other evaluation tools.

These materials are potentially re-usable and thus can be considered learning objects. The materials can be obtained from the following four sources:

- Licensed from publishers, e.g. NETg by Thomson Learning (which probably means that the learning objects cannot be made publicly available)
- Commissioned and created specially for the repository (if substantial funding is available)
- Harvested from Web sites of LIS programs
- Contributed by LIS instructors.

High-level materials such as program and course descriptions, course outlines and reading lists can often be harvested from Web sites, but materials of smaller granularity such as presentation slides may have to be obtained through contributions from instructors. Agreements will have to be signed with LIS schools for harvesting materials from Web sites, and with instructors for use of the course materials. Instructors could grant permission for the use of their course materials for educational purposes and not for re-publication.

Many schools are already using different types of e-learning systems and online platforms (e.g. Web CT and Blackboard) to make their course materials available online. However, course materials on such systems are available only to staff working in the same institution and to students registered for the course. There will be a need to make arrangements to allow outside users to access materials on these systems through institutional collaboration. Preferably, copies of such resources should be made available on the LISEA portal for more

control and effective access. Once institutional arrangements are in place, resources can be contributed at different levels: individual instructors, programs, schools, and universities.

Since most of the learning objects are expected to be contributed by instructors, it is important for instructors to know how to create learning objects that are relatively context-free, to facilitate re-use in other schools and countries. Resources that are created for a single teaching context and particular student cohort may not be effective in other contexts without adjustments and enhancements. Instructors will have to be made aware of the potential of use of their teaching material in other institutions and, therefore, encouraged to think of ways in which the resources could be used for more than one application.

Guidelines also need to be drawn up for users who are making use of the learning objects. The source and creators (owners) of the learning object have to be acknowledged when the material is re-used. Users who are adapting learning objects for their own courses can be requested to contribute their course materials to the repository so that the repository is refreshed with improved and updated material, and a trail of different versions of learning objects is maintained. While the current intention is to make these resources available to educators as primary users, eventually the repository will be accessible to professional staff (e.g. librarians and archivists), societies and professional forums (e.g. associations), and students.

Content management and organization

Content management includes setting up content management policies and guidelines as well as rights management policies and procedures (ownership, access and copyright). When a learning object is deposited in the repository, the resource needs to be processed and organized. Guidelines, procedures and systems have to be developed for indexing, meta-tagging, storing and providing access to the resource.

Our initial analysis indicates that attention should be paid to the following issues:

- Resources have to be checked for physical integrity and correctness, e.g. a PowerPoint file can run properly on the correct version of the PowerPoint program.
- Metadata have to be created for the resource, and indexing and categorization have to be performed.
- The learning object has to be parsed or de-constructed to identify its components and internal structure. The component learning objects may also need to be processed and meta-tagged.
- Resources in languages other than English need to be translated, preferably with an automatic translation program, or an English synopsis created.
- The resource has to be checked for copyright problems, and processed to replace or remove copyrighted material, or permission sought from the copyright owner. For example, a diagram scanned from a textbook will need to be deleted or replaced with a new diagram.
- If a learning object is based on another learning object in this or another repository, then the different versions need to be referenced or linked together.

Preservation and archiving concerns need to be addressed, e.g. whether to maintain software needed to run the learning objects, and whether to convert the learning objects to new versions of the software or to new formats.

The utility of the learning objects can be maximized by keeping in view the bigger picture. For example, an instructor may have created a learning object for a specific course or application, but other users may be able to make use of the resource or part of it for other purposes. It is therefore important that the content management system take into consideration the wider roles some of these objects might play. Such possibilities include use across different disciplines, student cohorts and education levels. This can be facilitated by use of standard structuring schemes for categorization of resources (e.g. classification schemes and taxonomies) and commonly used vocabularies (e.g. indexing languages and labeling systems). In addition, it will be helpful to use enhanced metadata for resource description to facilitate discovery from multiple views.

Decision also has to be made on the granularity of the learning object for indexing and tagging. It is important to determine for which levels a metadata record should be created. Some possibilities include the following:

- Course level
- Physical file level (e.g. PowerPoint file)
- A presentation slide or page, or set of slides/pages with the same heading
- Objects in presentation slides (e.g. heading, textboxes, bullet points, terms, words, diagrams, tables)

Quinn (2000) suggests that the smaller the learning objects, the more applicable these will be to a range of uses.

Clearly, manual indexing and meta-tagging can be done only for the upper-levels, e.g. course level and physical file level. Automatic indexing may be needed for lower-level or more detailed objects. This presents particular problems with multimedia files, e.g. it is difficult to assign index terms to graphics and diagrams automatically.

While there are numerous learning object repositories already on-line, these repositories are not easily navigable because “there is no uniform system for classifying them” (Nash, 2005). The inability to search for and retrieve the most appropriate learning object for use is hampering use and reuse of learning objects, even though they are stored in the various repositories in large quantities. The OCLC E-Learning Task Force (2003) asserts that semantically consistent and easily created metadata will allow learning objects to be easily found and located, and transported between institutions and repositories. Such metadata and tagging will definitely enhance the value of learning objects. Currier and Barton (2003) suggest that good quality metadata is a key component in the successful implementation of learning object repositories. They further add that the issues surrounding the creation of good quality metadata are not well understood and continue to receive little attention. We realize that effective policies and practices will have to be put in place to assure the quality of metadata and as a result the quality of the repository.

The most well-known metadata scheme for learning objects is the *IEEE Standard for Learning Object Metadata* (LOM) (IEEE 1484.12.1) developed by the IEEE Learning Technology Standards Committee (LTSC). It is meant to enable Internet-wide

interoperability which is seen to be the key to accessibility across geographical locations. It is a detailed scheme with the metadata elements grouped into nine categories: general, lifecycle, meta-metadata, technical, educational, rights, relation, annotation, and classification. The development of a repository needs to take into consideration standards to ensure interoperability especially when the repository is to be used by different institutions. However, the use of such a standard alone does not solve the problem of organizing learning objects for use and re-use. It is too expensive to adopt all the IEEE LOM elements for our repository, but it is not clear which subset of elements would be most effective for facilitating re-use of learning objects for LIS education in Asia. Our understanding is that the LIS community prefers to use Dublin Core (DC). We are looking into the possibility of adding elements from the IEEE LOM scheme to the DC set of elements through extensions and profiles. This will have to be supported by a metadata editor.

It is clear however that appropriate subject taxonomy has to be created for indexing and classifying the learning objects. Categories representing the sub-disciplines of LIS will facilitate browsing of resources. The 10 core areas listed in the IFLA *Guidelines for Professional Library/Information Educational Programs available at* http://www.ifla.org.sg/VII/s23/bulletin/guidelines.htm can serve as the top level of the taxonomy, which can be expanded by adding categories from commonly used classification schemes such as Dewey Decimal Classification (DDC) and Library of Congress Classification (LCC). Also, course categorizations used on the Web sites of the various LIS education programs in Asia will be kept in view in developing the final taxonomy for classification and categorization of course materials. Eventually, a detailed categorization scheme and a working thesaurus will be developed.

Repository System

The design and usability of the repository system is an important factor in the success of the repository. Some important features of the repository system include the following:

- Ease of depositing learning objects in the system
- Good support for metadata creation
- Good support for automatic deconstruction of leaning objects, identifying their structure, and automatic metadata creation
- Automatic translation for non-English materials
- Ease of browsing and searching of learning objects at various levels
- Fast retrieval and display of learning objects. Learning objects that cannot be displayed easily in a Web browser needs to be converted to a format that can be displayed
- Facility to convert a learning object into a format that the user can handle.

We are currently developing a repository system to support some of these features called ReLOMS—**Re**usable **L**earning **O**bjects **M**anagement **S**ystem. ReLOMS is being developed as a practical learning objects management system to help instructors and administrators manage the complexity of construction and deconstruction of learning objects.

Figure 1 shows the ReLOMS system architecture with two major modules to support construction and deconstruction of learning objects:

- *The Constructor Module* is concerned with the creation of learning objects and consists of three components: (i) *LO Search and Retrieval* supports personalized and collaborative searching and browsing; (ii) *Editor* provides an environment to create and edit new learning objects; and (iii) *Control Authentication* incorporates authentication of users and learning objects before allowing them to be stored in the respective databases.

- *The De-Constructor Module* supports the de-construction or de-composition of learning objects into smaller units of components with a learning objective, and consists of three components: (a) *LO Component Extractor* allows meaningful learning object components to be extracted for re-use; (b) *Metadata Tagger* provides a systematic, role-based workflow to complete the metadata details of the learning object components; and (c) *LO Content Management* provides a course content management environment with a proper taxonomy structure to organize the learning object components.

The learning object components are maintained either in a *Static Component Repository* (e.g. text, images, etc.) or a *Dynamic Component Repository* (e.g. video clips, animation, etc.). To store complete learning objects used in different scenarios for teaching, an *Aggregated Learning Object Repository* is created. An *Addressing System* is designed to separate learning object content from location as a matter of good software engineering practice for better maintenance.

Once the system is implemented, effort will be made to add automated tools on creating and harvesting metadata and assigning categories to learning objects contributed to the repository.

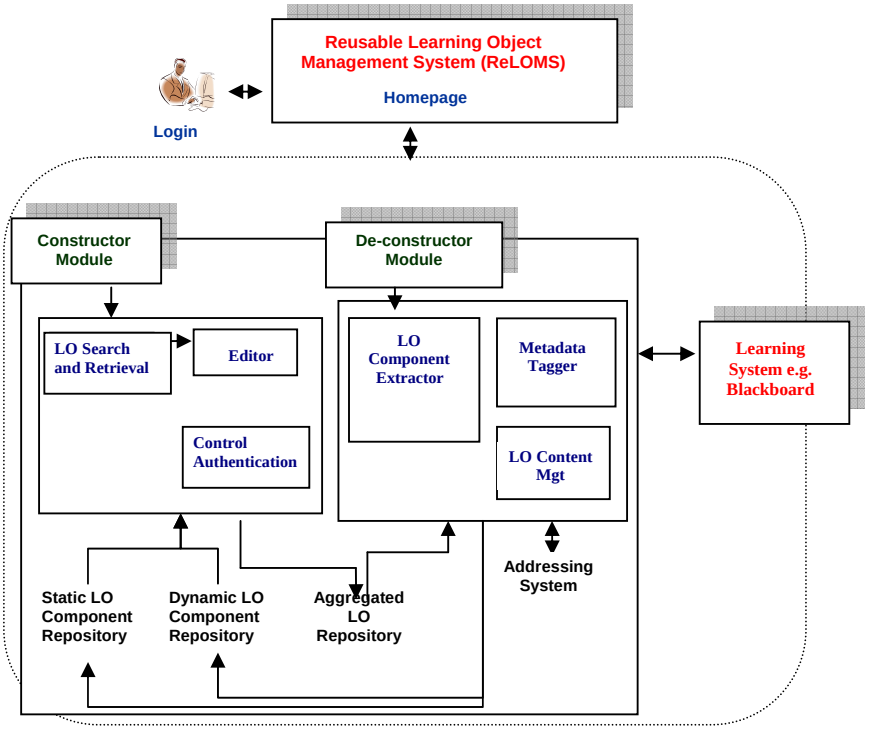

Figure 1. ReLOMS System Architecture

Conclusion and Directions for Research

LIS education programs in Asia have valuable resources that can be shared through a collaborative system to enhance teaching and learning in the region. A repository of learning objects and teaching materials is being developed to support such resource sharing, as part of the LISEA Web Portal Project undertaken by the School of Communication & Information at the Nanyang Technological University and the Faculty of Computer Science & Information Technology at the University of Malaya.

Such a learning object repository will also serve as a research testbed for studying the issues involved in developing, managing and organizing a learning repository. In particular, research needs to be carried out to answer the following important questions:

- how should taxonomies and metadata schemes be designed and developed to facilitate reusability of learning objects
- what features should learning objects have to facilitate reusability
- what features are important in the interface and repository system to facilitate reusability

It is also expected that the repository will provide raw data for research on LIS curriculum across Asia, teaching styles and methods, and national and cultural differences.

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