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	<p>Enhancing the quality of LIS education in Asia: organizing teaching materials for sharing and reuse</p> <p>Abdus Sattar Chaudhry and Christopher S.G. Khoo Division of Information Studies Nanyang Technological University, Singapore aschaudhry@ntu.edu.sg; assgkhoo@ntu.edu.sg</p>
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Abstract

The paper describes continuing effort to develop a repository of teaching materials for sharing and reuse in LIS schools in Asia. The development of an Information Studies Education taxonomy and metadata scheme to support searching and browsing in the repository is described. The potential for reuse of teaching materials in the topic of information organization is examined by analyzing how various aspects of this topic are covered in three Master's programmes in Information Studies, Knowledge Management and Information Systems at Nanyang Technological University, Singapore. A framework is proposed for carrying out a user study to validate the taxonomy and metadata, and evaluate how they support the reuse of teaching materials in four Asian countries.

Introduction

Repositories of teaching materials and learning objects are considered important to facilitate sharing and reuse of digital content to enhance the quality of teaching. Until recently repositories were used by institutions mainly to store items associated with research output. Resources for teaching and learning were more commonly accessed via Web pages and virtual learning environments such as Blackboard, WebCT, etc. There has been a realization among academic communities that capturing and storing of assets related to teaching and learning in one place (a repository) help provide examples of best practices and facilitate sharing across and within disciplines (Hayes, 2005). Moron-Garcia (2006) highlighted the potential use of repositories to support the sharing of digital content (teaching materials and learning objects) and stressed the important role of these repositories to promote wider sharing of teaching materials.

A project has been initiated to develop a repository of teaching materials in Information Studies as a follow-up to the first Asia-Pacific Conference on Library and Information Education and Practice (Khoo, Singh & Chaudhry, 2006). An initial report on this project provided an overview of the initiative (Chaudhry & Khoo, 2006). The repository is expected to promote sharing of teaching materials among faculty of LIS programs across Asia. A Web Portal is being set up for this purpose and work on support systems including content management system, taxonomy, and metadata is in progress.

Enhanced description of teaching materials and learning objects has been considered an important step in this effort. Among other things, use of metadata and taxonomies are being explored for enhancing access to promote use and reuse of learning objects. A discussion list (lisea@mlist.ntu.edu.sg) was also set up for exchange of ideas among educators and researchers in the region. An Information Studies Education taxonomy has been developed and a metadata schema is being finalized as part of the development of the repository.

This paper describes the steps taken to develop the taxonomy and metadata, and to identify resource persons willing to share their course materials and contribute to a prototype repository of teaching materials. The paper also discusses the potential for reuse of teaching materials in the area of Information Organization, and a framework for carrying out a user study to validate the taxonomy and metadata scheme and evaluate how they support reuse of learning objects.

Taxonomy Development

A faceted taxonomy for Information Studies Education has been developed drawing on a variety of bibliographic tools (classification schemes and thesauri). The initial categorization scheme was based on *A New Taxonomy for Information Science* by Hawkins, Larson and Caton (2003). A number of bibliographic tools were used in identifying additional categories and related terms. The taxonomy was further enhanced using the following sources:

- IFLA Guidelines for Professional Library/Information Educational Programs (2000)
- Course descriptions from the Master's programs at the Division of Information Studies, Nanyang Technological University, Singapore
- Course outlines of LIS programs in Malaysia, Pakistan, and India.

The draft taxonomy comprised four facets: resources, people and organizations, courses, and subjects. Detailed categories are listed in the subject facet. These are still being refined. An outline of the draft taxonomy is given in Table 1. The draft taxonomy is being circulated among faculty colleagues in four LIS schools in Asia for validation. Feedback is sought in terms of comprehensiveness of the taxonomy, particularly for tagging of teaching materials expected to be contributed by resource persons from these schools to the Web Portal of LIS education.

Table 1. Outline of Information Studies Education Taxonomy

- **RESOURCE S**
 - Lectures
 - Exercises
 - Assignments
 - Projects
 - Case Studies
 - Exam questions
 - Readings
 - Discussions
 - Text Books
 - Tools
- **PEOPLE AND ORGANIZATIONS**
 - Educational Institutions
 - Professional Associations
 - Conferences
 - Instructors

- COURSES
 - Undergraduate
 - Graduate
 - Continuing education
- SUBJECTS
 - Foundations
 - Management
 - Research
 - Information Organization
 - Collection Development
 - Information Retrieval
 - User Services
 - Information Technology (& Systems)
 - Knowledge Management (& Document Management)

Categories and sub-categories in each facet have been determined with different levels of breadth and depth. A categorization scheme for the subject facet is given in Appendix A. To start the project, two classes of subjects were selected for detailed categorization. These include *Information Organization* and *Collection Development*. These are core areas expected to be taught across LIS schools in Asia. It was decided that initially the categorization should not be too deep. Therefore only two levels of hierarchy were used.

A quick review of Web sites of LIS schools indicated that there is a great variety of courses in these two areas. Some schools list these courses under traditional titles of *Cataloguing and Classification* and *Selection and Acquisition*, while others use new names—*Information Organization*, *Collection Development*, *Information Resource Management*, etc. Likewise, some schools offer more than one courses in each area, e.g. information organization, knowledge organization, advanced cataloguing and classification, indexing and abstracting, subject analysis, etc. Also, in the area of collection development, there are specialized courses such as *Children's Literature*, *Business Information*, *Music Libraries*, etc. For the purpose of taxonomy, we have tried to capture major topics included in the two categories of courses, information organization and collection development. Topics covered in different courses are listed as sub-categories.

The repository of teaching materials is expected to have a broad scope – containing materials in all areas of information studies. The field of Information Studies has been defined to include knowledge management and information systems in addition to the traditional fields of library & information science and archives & records management.

Metadata

The taxonomy described in the preceding section will be used in conjunction with metadata in the description of teaching materials to be added to the repository. We reviewed various metadata formats that can be deployed in the development of repositories. Metadata standards development initiatives for educational electronic resources include the Dublin Core (DCMI, 2006) initiative, the IEEE-LOM (Institute of Electrical and Electronics Engineers–Learning Object Metadata) standard (IEEE/LTSC, 2002), the SCORM (Sharable Courseware Object Reference Model) standard (ADL, 2004) as well as the GEM (Gateway to Educational Materials, 2004) effort. Dublin Core Metadata scheme was an obvious starting point due to the manageability of its core elements as a foundation for the formulation of an application profile. The LIS community is expected to be more familiar with this format.

A DC-Education Application Profile has been developed for describing usage of those DC elements specifically relevant to education including best practices within the context of education and training. This profile has also included some metadata elements of the IEEE Learning Object Metadata. Work is in progress on a basic application profile describing how to combine the specified terms in a way that is compatible with the structural constraints of the IEEE LOM Standard. Table 2 shows the primary elements included in our metadata schema. To keep it manageable, we have decided to include only those elements which are necessary for the discovery of the resources. When instructors contribute their teaching material to the repository, they will be asked only to tag their resources to the basic elements. This metadata will be enhanced later to cover most of the elements included in the template.

The proposed metadata template is also being circulated to the core group of instructors from four LIS programs from Singapore, India, Malaysia, and Pakistan for their input for validation before it is used for tagging resources to be added to the repository.

Table 2. Metadata Template for LIS Education Repository

#	Element	Definition	Description
1	Title	dc.title	Name give to the teaching material by the contributor
2	Contributor	dc.contributor	Resource person responsible for contribution of teaching material
3	Creator	dc.creator	An entity responsible for preparing the material – it may differ from the contributor
4	Subject	dc.subject	The topic of the content of the resource – subject will be assigned by the contributor
5	Description	dc.description	A brief summary of the content of the resource
6	Taxonomy	taxonomy	Categories to be assigned from the taxonomy
7	Date	dc.date	Time period when teaching material were designed
8	Type	dc.type	The nature or genre of the content of the resource
9	Format	dc.format	The physical or digital manifestation of the resource.
10	Identifier	dc.identifier	An unambiguous reference to the resource within a given context
11	Source	dc.source	A Reference to a resource from which the present resource is derived
12	Coverage	dc.coverage	The extent or scope of the content of the resource.
13	Rights	dc.rights	Information about rights held in and over the resource.
14	Resource	resource	Type of resource – lecture notes or exercise
15	People	people	Name of the instructor or contact details
16	Course	course	Name of courses to which teaching material relate to

Potential for Learning Objects Reuse in *Information Organization*

We are carrying out a study of the potential for reuse of learning objects within an LIS school and across LIS schools, factors that promote reuse, and issues involved in developing a learning objects repository to support reuse.

For a start, we are focusing on the area of *information organization* and examining how various aspects of this topic are covered in three Master's programmes at the Division of Information Studies, Nanyang Technological University:

- MSc in Information Studies
- MSc in Knowledge Management
- MSc in Information Systems.

The main courses that teach information organization in the Information Studies programs are

- The *Information Organization* course
- The *Cataloging & Classification* course.

Both courses, taught by the first author, cover traditional information organization including bibliographic description, classification schemes (Dewey Decimal Classification and Library of Congress), subject headings list (Library of Congress Subject Headings), bibliographic and authority control, cataloging and cataloging standards, and encoding schemes (e.g. MARC). *Information Organization* is an introductory course that serves as a semi-core or foundation course in the Information Studies program, and *Cataloging & Classification* is the follow-up elective course for training professional catalogers. This second course covers the material in greater depth—theoretical depth with regard to the philosophy and issues of bibliographic control, practical depth in handling more complex cases and new media, and more detailed coverage of tools and standards.

Two core courses in the Information Studies program cover more introductory material on information organization:

- *Information Storage & Retrieval* provides an introduction to bibliographic description, Dewey Decimal Classification and LC Subject Headings. Compared to the *Information Organization* course, it covers the technical aspects of encoding and MARC records in more technical detail. It also has a more detailed coverage of machine indexing and thesauri structure. There is thus a slant in the coverage towards aspects that are more relevant to computer storage, indexing and retrieval applications.
- *Information Sources & Searching* covers the use of thesauri and classification schemes for the purposes of online searching.

Two elective courses also cover aspects of information organization:

- *Web Based Information Systems* covers in some depth XML and XML encoding schemes (e.g. RDF and OWL), metadata standards, ontology, and application to Web services and the Semantic Web.
- *Digital Libraries* also covers metadata standards and encoding schemes (e.g. METS) relevant to organizing digital collections.

These courses cover the more technical aspects of information organization.

In the Knowledge Management program, *Knowledge Organization* (jointly taught by the authors) is an elective course that focuses on taxonomy construction, metadata and metadata standards, XML encoding schemes, ontology and topic maps. There is a focus on application in enterprise portals and knowledge repositories for the purpose of knowledge sharing.

In the Information Systems program, *Information Architecture* (taught by the second author and another faculty member with expertise in human-computer interaction) is a core course that covers user interfaces, human computer interaction and the information organization topics of taxonomy, navigation structure, metadata and metadata standards, ontology and XML encoding, with an emphasis on designing more usable enterprise systems, portals and repositories.

There is some overlap between the courses but the courses focus on different aspects of information organization. For example, whereas *Information Organization* and *Cataloging*

and Classification cover Dewey Decimal Classification (DDC) in some depth, the *Knowledge Organization* course and the *Information Architecture* course in the Knowledge Management and the Information Systems programs provide only a superficial, introductory treatment of classification schemes and DDC, showing the high-level outline of the DDC scheme. The *Knowledge Organization* and *Information Architecture* courses cover metadata and encoding schemes in some depth for students from the corporate and IT sector, whereas they are covered in less depth in the *Information Organization* and *Cataloging and Classification* courses designed for librarians and catalogers.

Framework for User Study of Learning Object Reuse

A user study is being planned to find out how the Information Studies Education taxonomy and metadata scheme actually support reuse of learning objects by instructors, and how they should be improved. We discuss a framework for studying this learning objects reuse.

The main types of leaning objects that can be reused are:

- Course syllabi, comprising several re-usable components: course description, course objectives, learning outcomes, course outline, reading list
- Sets of lecture slides (e.g. Powerpoint file) for a topic, comprising individual slides and objects within a slide, such as bullet points (text) and images
- Exercises for a topic (including thought questions, problem sets, quizzes, and lab instructions), which can have multiple parts and sub-exercises.

We recognize that instructors seldom reuse a learning object wholesale, but often adapt them to the context, including the objectives and learning points for the lesson, and the surrounding material in which the learning object is embedded. The learning object is also adapted to the particular medium used (e.g. transfer from Web page to Powerpoint slide), and to the style of the instructor.

The types of modifications to a learning object include the following, listed in order from minor to major changes:

1. Reformatting (e.g. different font and re-arrangement)
2. Change of medium (e.g. converting text to image)
3. Lexical/grammatical changes—replacing words and changing the grammatical structure without adding new semantic content (e.g. paraphrasing)
4. Translation to another language
5. Deletion—deleting parts of the object
6. Addition—adding material to the object, including additional semantic content, illustration/example, explanation, diagram, or more details.

Though reformatting and change of medium are “cosmetic” changes without new semantic content, they may be important for improving the presentation of the content and the learning experience of the students. Lexical/grammatical changes are used to adapt the language style to a different genre or to the instructor’s personal style. Translation to another language makes the learning object accessible to another culture or country. Deletions might reduce the value of the learning object and the range of situations in which the learning object may be reused. Deletions are probably used when adapting material to a more limited context, e.g. shortening an in-depth lecture for students majoring in the subject, to a brief introduction for non-majors. Additions add value to the learning object and expand the possibilities of reuse in new contexts. These are hypotheses to be verified in future studies.

The type and degree of adaptation probably depends on several factors:

- *Same vs. different instructors.* Reuse of own materials by the same instructor vs. reuse of materials from other instructors. Different instructors will have different teaching and presentation styles, teach from different perspectives or slants, and focus on different details.
- *Same vs. different courses.* Reuse of materials in different instances of the same course (e.g. from year to year) vs. reuse the materials in a different course. Different courses will treat the same topic at different levels of detail, and in the context of different applications.
- *Same vs. different genre,* e.g. reuse of materials from a journal article and incorporating them in a set of lecture slides. Genres include syllabi, lecture slides, exercises (tutorials), lab instructions, textbooks, journal/conference papers, and different Web genres. Materials in different genres are written in different styles and different levels of detail.
- *Same vs. different programs,* e.g. library science vs. information systems. Students in different programs have different backgrounds, expectations and interests. Information Systems students would be able to handle a more technical/mathematical/algorithmic treatment, Information Studies students might expect a more practical procedural treatment, whereas Knowledge Management student might expect a more management or strategic treatment.
- *Same vs. different library school.* Different library schools are likely to have students of different backgrounds and capabilities, and different regional, cultural and economic environments.
- *Same vs. different language.* Different languages imply the need for translation and adapting to different cultures. Different cultures might require different teaching approaches, different explanations, illustrations and examples, and different presentation styles.

Hiddink (2001) proposed three main factors that determine reusability:

- *Accessibility,* which depends on the metadata system, search capabilities, use of search history and user ratings, and the user interface.
- *Genericity,* which refers to how specific the learning object is to a particular subject, educational setting, class and teacher, and the number of references to the context in which it is used.
- *Opportunities* for reuse that exist in the institution. A subject that is taught at different levels or from different perspectives in different programs present opportunities for reuse. However, social relationships and the institutional culture will affect the amount of reuse.

To promote reuse of learning objects, the learning objects have to be indexed and tagged with metadata for searching and browsing. The indexing can be at different levels and address different aspects of the learning object. We conjecture that the most important attributes of learning objects that should be indexed is the subject/topic of the learning object followed by the treatment level: introductory vs. intermediate vs. advanced. This is often related to the degree of detail. Introductory/overview material tends to be shorter and have less detail, and is more likely to be reused in other courses in the same program or other types programs (e.g. reuse of material between Information Studies and Knowledge Management programs). Advanced materials are likely to be covered only in one course within a program, but could include advanced or state-of-the art material that may be useful for improving similar courses in other LIS schools. Technical or mathematical treatments are also accessible to a smaller number of students in more technical-oriented courses or programs. Diagrams (images), illustrations and examples are also likely to be reused to enhance a lecture presentation and so should be indexed.

It should be kept in mind that a learning object can be reused in a different context or purpose from the intention of the author. For example, an image illustrating building construction

might be reused in a computer science lecture to illustrate building an information system. Though the digital object remains unchanged, the semantics or learning point assigned to it has been changed. We would like to design the indexing/metadata system to promote this kind of cross-context use.

Conclusion

We have described our continuing effort to develop a repository of teaching materials for sharing and reuse in LIS schools in Asia, focusing on the development of an Information Studies Education taxonomy and metadata scheme to support searching and browsing in the repository. The next step in the project is to validate the taxonomy and metadata scheme, and evaluate how they support the reuse of teaching materials in four Asian countries. A framework outlining the issues to investigate in the user study was discussed.

The potential for reuse of teaching materials in the topic of *information organization* was examined by analyzing how various aspects of this topic were covered in three Master's programs--Information Studies, Knowledge Management and Information Systems. We are planning to extend this study to include the topic of *Collection Development* and to compare how different LIS schools in Asia cover these two subjects.

Our focus in this phase of developing the repository of teaching materials is on LIS instructors as the users of the repository, rather than on students using the repository as an e-learning platform. Plodzien & Stemposz (2006) found some differences in the attributes of learning objects that teachers and students consider important. Students value the presence and quality of a recapitulation and a dictionary of key concepts, whereas teachers value the presence and quality of the literature (reading list). An e-learning platform also has to provide more functionalities for selecting appropriate learning objects and customizing a learning path for a student based on preferred learning styles and other student attributes (Santally & Alain, 2006). Such issues are deferred to Phase 2 of the project.

We expect that the taxonomy and metadata scheme will be useful in identifying resource persons in given areas and eventually facilitate emergence of communities of practice in different areas of LIS. Repository building tools will help identify experts who contribute content, use materials, and forward materials to other colleagues to promote sharing of knowledge resources.

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Appendix A. Information Studies Education Taxonomy—*Subjects Facet*

FOUNDATIONS

Information Society

Information theory; Information infrastructure; Information policy; Information literacy; Social context of information

Electronic and Digital Services

Electronic commerce; E-business; E-Government; Digital divide

Impact of Technology

Legal aspects; Computer crime; Hacking; Copyright infringement; Information security; Censorship; Intellectual property (information law); Information overload

Information Profession

Archivists; KM professionals; Librarians; Information scientists; Certification; Professional ethics (Ethics); Associations

Information Disciplines

Archives and Records Management; History of Information Services; Library and Information Science; Information Science; Knowledge Management; Information Systems

MANAGEMENT

Principles of Management

Planning; Financial Management; Budgeting; Personnel Management (HRM); Space Planning (Library Buildings); Evaluation & Measurement

Management of Information Organizations

Archives; Libraries (Public, Academic, Special, School, etc.); Information Centers

Management of Automated Systems

Library automation; Integrated systems; Automation vendors; Automation as a source of management information

RESEARCH

Research design

Research methodologies: Qualitative research (Action research, Case study, Ethnography, Field studies, Focus group discussions, Interviews, Observation)

Quantitative research (Experiment design, Surveys (telephone, email, web); Questionnaires

Statistical Analysis

Bibliometrics;

Scholarly writing

Research proposals; Research reports; Research papers; Dissertation & Thesis

INFORMATION (& KNOWLEDGE ORGANIZATION)

Cataloguing & Classification (Bibliographic Organization)

Resource Description (Descriptive Cataloguing); Authority Control

Cataloguing Standards (& tools)

ISBD; FRBS; AACR; MARC; Metadata Formats (Dublin Core, LOM, GEM, OAI);

Encoding Scheme (RDF, XML, OWL)

Bibliographic Utilities (OCLC, SILAS)

Subject Analysis

Controlled Vocabularies (Subject Headings – LCSH, Sears and Thesauri (ERIC);

Classification Schemes (DDC, LCC, BBC, UDC); Indexing and Abstracting

Online Public Access Catalogues

Taxonomies

Ontology

Topic Maps

USER SERVICES

Reference Services

Reference Tools; Reference Desk; Electronic Reference; User Instructions; Special services

References Sources

Business Information; Science and Technology Information; Health Informatics; Children Information Sources

Circulation Services

Librarian loans; Interlibrary Loan; Document Delivery

INFORMATION RETRIEVAL

Information storage

Searching (online)

Online Databases (Bibliographic Databases); Search Engines; Information Needs; Information Seeking (User Behavior)

Information Retrieval Systems

Bibliographic Retrieval Systems; Full-text Retrieval Systems; Image Retrieval; Multimedia Systems; Web-based Information Systems

Digital libraries

Use Studies

COLLECTION DEVELOPMENT (& Management)

Acquisitions

Approval Plans; Firm Orders; Subscriptions; Standing Orders

Selection

Sources; Criteria

Fund management

Gifts & Exchange

Weeding (collection maintenance)

Information Materials

Audio Visuals; Books; Electronic Resources; Journals

Suppliers

Aggregators (Subscription agents); Book Jobbers

Policies

Selection Policies; Acquisitions Procedures: Collection Development Guidelines; Weeding Criteria

INFORMATION TECHNOLOGY (& SYSTEMS)

Fundamentals:

Hardware; Software; Operating systems

Programming

Object-oriented Programming; Programming Languages; Internet Programming; Software packages

Databases

Distributed databases; Relational databases; Database Management Systems

System Design and Analysis

Human-computer interaction

Intranets and Portals

Artificial Intelligence & Expert systems

Knowledge Engineering; Knowledge Representation; Machine Learning

Knowledge discovery

Data Mining; Information Extraction; Text Mining; Web mining; Natural language processing

Neural networks

Semantic networks

Telecommunications

Internet Telephony; Message Systems: Bulletin Boards; Chat Rooms; Email; Listservs

Web blogging

Mobile Communications

Wireless Communications

Information Security

Computer Security; Data Security; System Security; Security Policies

INFORMATION AND KNOWLEDGE MANAGEMENT

Business Intelligence (& competitive intelligence)

Communities of Practice

KM Measurement (Impact of KM)

ROI; Performance Measurement

KM Principles and Practices

Best practices; Implementation Strategies: Knowledge Creation and Use

Knowledge Sharing

Organizational culture; Social Networks

Learning Organizations

Records Management (used for information management)

Archiving; Conservation; Digital preservation; Document management; Electronic Records;

Multimedia Systems