Metadata for K9 e-Learning in Taiwan: an Application Profile Approach

Ya-ning Chen, Shu-jiun Chen & Ching-ju Cheng
Computing Centre, Academia Sinica
{arthur, sophy}@sinica.edu.tw
chingju@gate.sinica.edu.tw

Abstract

The study aims to develop a core set of metadata elements for K9 e-learning resources based on a case study of Education to e-Learning Project under auspice of the Ministry of Education in Taiwan. Eventually, a set of 53 metadata elements has been developed as a LOM-based application profile for Taiwan K9 e-learning resources, and two guidelines are also produced for metadata system implementation and cataloguing. Furthermore, three findings are presented as follows. (1) The LOMAP implied the LOM has attained a high acceptance in Taiwan K9 e-learning community. (2) The Taiwan K9 LOMAP covers functional requirements of element attributes, such as mandatory or optional, for system development. (3) A challenge in controlled vocabulary for interoperability among different LOMAPs will emerge. Finally, this study suggests that the Taiwan K9 LOMAP would be a ground to further include more samples and domains, in order to become a Taiwan LOM Core.

1. Introduction

Metadata, as an interoperability mechanism, has been playing significantly roles for e-learning community, because it promotes easy exchange of content or data between different systems based on different technologies [1]. The purpose of the research includes two folds: one is to develop a core set of metadata elements for K9 learning resources, and the other is to learn more about how metadata can be met the needs between interoperability and localization in the context of learning resource repository.

2. Research Methodology

2.1. Sample

This study employs the LOM (Learning Object Metadata) application profile (LOMAP) as an approach to develop a metadata elements set for K9 e-learning resources in Taiwan, because the application profile is an assemblage of metadata elements selected from one or more metadata schemas and combined in a compound schema [2]. In e-learning domain, the IEEE LOM is often selected as a basis to develop a variety of specifications or application profiles, such as CanCore of Canada. In our study, the 'Education to e-Learning' (EtoE) Project is chosen as a case study to develop a LOMAP. EtoE has been initiated by the Ministry of Education （MOE）in Taiwan since 2003 to provide educators at the elementary and secondary levels with an integrated interface of learning objects from distributed repositories among Taiwan [3]. The three major educational repositories of the Project chosen for this study are: The Learning Fueling Station (http://content1.edu.tw/), EduCities (http://www.educities.edu.tw), and SCTNet (http://sctnet.edu.tw/index.php).

2.2. Data Collection and Analysis

The data collection for this case study is conducted in four steps. First, questionnaires are sent to the three educational resources repositories to investigate the current status of usage of metadata elements. Second, five existing international metadata standards, application profiles and specifications are selected as the reference to identify the common core of metadata elements. These are LOM (v.1.0), SCORM (SCO)(v.1.3), IMS Learning Resource Meta-data Specification (v.1.2.1), CanCore Learning Object Metadata Guidelines (v.1.1), and Dublin Core-Education Application Profile. Next, an in-depth

Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)
0-7695-2338-2/05 $20.00 © 2005 IEEE

interview is carried out with educational experts and system managers of the three participated repositories. Finally, the feedback is gathered from the staff of repositories after implementing the metadata set for the EtoE Project based on the OAI-PMH.

This study applies multiple approaches to set up a LOMAP for the K9 e-learning resources in Taiwan. The first, the local needs are analyzed through the metadata mappings from the schemas of the three repositories to produce a common core (set A). Then, a semantic cross-walk among existing international metadata standards, profiles and specifications of e-learning resource is performed to form the common core (set B) of LOM elements from a global viewpoint. After that, the union of above two sets of common core {A, B} is established and reviewed by the educational experts and managers of the repositories to acquire their comments on the metadata elements.

3. Results

Through the above analysis, 53 elements are identified from LOM metadata which conform to both local needs and international interoperability. These 53 elements are integrated by the common core elements (set A, 14 elements) from the research samples, the common core elements (set B, 22 elements) from the international metadata standards, the elements recommendations of the experts, catalogers (set C, 8 elements) and system managers (set D, 16 elements). These elements then are restructured according to the LOM data structure (see Table 1).

Furthermore, in order to provide more information on accepted elements, two guidelines are developed. One is the "Guide to Taiwan K9 LOMAP" which provides the following information for each element as a whole: element name, definitions, data contents (cataloguing recommendation), examples, implementation notes, data values (vocabulary recommendation), metadata crosswalks and learning resource types. The other is the "Guide to the Metadata Implementation" which is a quick guide of system functional requirements. It contains not only cataloging information, such as data attributes (mandatory and optional) and data value supplies (system default, controlled list, or recorder), but also system retrieval information (access and display points). The Taiwan K9 LOMAP has been currently applied to the EtoE Project for K9 schools, and more than 20 thousand metadata records have been input into the OAI based repository.

4. Findings

The following findings are discovered in a review and analysis of the results of this study:

1. The 53 metadata elements adopted from the IEEE LOM standard (77 elements) by Taiwan K9 LOMAP implies that the LOM standard has achieved a high degree (69%) of acceptance in the learning community of Taiwan K9.
2. The Taiwan K9 LOMAP covers functional requirements of element attributes, such as mandatory or optional. This enables the system implementation clearer and easier.
3. Although all the metadata elements of the Taiwan K9 LOMAP can be mapped to IEEE LOM, the controlled vocabularies are difficult to interoperate, such as "learning resource type element", "competency in classification element" This will bring the challenge for interoperability among different LOMAPs.

5. Conclusion and Suggestions

The purpose of this study is to develop a metadata application profile and guideline for e-learning resources. The research has achieved two results. One is the Metadata Application Profile/Guideline, and the other is the Guide for Development of e-Learning Metadata Systems. Both of these are now applied on the installation of the "EtoE Project" of the MOE in Taiwan. The study suggests the following as future research.

1. Extend the scope of application of the Profile toward Taiwan LOM Core. This study aims at the first-stage participants (three major repositories in Taiwan) of the EtoE project to develop the Taiwan K9 LOMAP. In 2005, the test is going to be extending to the official educational repositories in 25 counties of Taiwan. Trials on wider domains can help to shape a more appropriate Taiwan LOM Core.
2. Increase the depth of the metadata application profile. Due to the interoperability among e-Learning systems worldwide, the metadata application profile must be compatible not only data structure standards (like IEEE LOM), but also data content and data value standards. For optimal scale and extensibility of e-Learning in the future, the study would suggest the use of IEEE LOM application profile approach to incorporate local needs and international standards. Besides the data structure, it would be critical to establish both all types of vocabularies

Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)
0-7695-2338-2/05 $20.00 © 2005 IEEE

(such as audience, pedagogy and resource type) and data content standards that can guide the choice of terms used in description, and define the order, syntax, and form in which data values should be entered into a data structure [4]. Although parts of the data content standard have been defined in the IEEE LOM and its derived application profiles like CanCore, it still needs to have a well-established data content standard for e-Learning resources.

Table 1. LOM v.s. Taiwan K9 LOMAP version1.0

1. General		B	3.3 Metadata Schema		D	5.11 Language	
1.1 Identifier		B	3.4 Language		D	6. Rights	BC
1.1.1 Catalog	◎	B	4. Technical		B	6.1 Cost	C
1.1.2 Entry	◎	B	4.1 Format		B	6.2 Copyright and Other Restrictions	C
1.2 Title	◎	AB	4.2 Size			6.3 Description	C
1.3 Language		B	4.3 Location	◎	B	7. Relation	B
1.4 Description	◎	AB	4.4 Requirement			7.1 Kind	B
1.5 Keyword	◎	A	4.4.1 OrComposite			7.2 Resource	B
1.6 Coverage			4.4.1.1 Type			7.2.1 Identifier	B
1.7 Structure			4.4.1.2 Name			7.2.1.1 Catalog	B
1.8 Aggregation Level			4.4.1.3 Minimum Version			7.2.1.2 Entry	B
2. Life Cycle		C	4.4.1.4 Maximum Version			7.2.2 Description	B
2.1 Version		C	4.5 Installation Remarks			8. Annotation	D
2.2 Status			4.6 Other Platform Requirements			8.1 Entity	D
2.3 Contribute		A	4.7 Duration			8.2 Date	D
2.3.1 Role	◎	A	5. Educational		D	8.3 Description	D
2.3.2 Entity	◎	AB	5.1 Interactivity Type			9. Classification	ABC
2.3.3 Date		AB	5.2 Learning Resource Type	◎	D	9.1 Purpose	◎ A
3. Meta-Metadata		D	5.3 Interactivity Level			9.2 Taxon Path	A
3.1 Identifier		D	5.4 Semantic Density			9.2.1 Source	◎ A
3.1.1 Catalog		D	5.5 Intended End User Role		B	9.2.2 Taxon	◎ A
3.1.2 Entry		D	5.6 Context			9.2.2.1 Id	◎ A
3.2 Contribute		D	5.7 Typical Age Range			9.2.2.2 Entry	◎ A
3.2.1 Role		D	5.8 Difficulty			9.3 Description	
3.2.2 Entity		D	5.9 Typical Learning Time		C	9.4 Keyword	
3.2.3 Date		D	5.10 Description				

Note 1: represents a set of metadata used in K9 education in Taiwan educational repositories. A represents the common core elements from the research samples. B represents the common core elements from the international perspectives. C represents the elements recommended by the educators. D represents the elements recommended by the system managers. ◎ represents the mandatory element.

Note 2: [Classification] would repeat 4 times according to the discipline, educational level, competency, and prerequisite.

6. References

[1] MASIE Center, "*Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to Their Adoption*", MASIE Center, March 2002. http://www.digitalconcepts.com/documents/S3_Guide.pdf

[2] E. Duval, W. Hodgins, S. Sutton, and S.L. Weibel, "Metadata Principles and Practicalities", *D-Lib Magazine*, CNRI, Virginia, April 2002. http://dlib.ejournal.ascc.net/dlib/april02/weibel/04weibel.html

[3] Institute of Information Science of Academia Sinica, "*The Proposal of Implementation of Information Integrated Platform Project*", Unpublished, 2003.

[4] Visual Resources Association, "*Cataloguing Cultural Objects: A Guide to Describing Cultural Objects and Their Images*", Draft, February 2005. http://www.vraweb.org/CCOweb

Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)
0-7695-2338-2/05 $20.00 © 2005 IEEE