Using Metadata in Packaged e-Learning Content:

Common Practice in the UK

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Introduction

The practical use of metadata in packaged e-learning content is fraught with many more difficulties than simply selecting a metadata schema. The CETIS Special Interest Groups (Educational Content and Metadata) and Learning and Teaching Scotland have agreed to work together to investigate whether a "common practice" could be established across all UK education. This paper is intended to outline the issues that have already been identified and to invite other groups to join this activity.

The proposed scope of this work covers
1) the choice of which metadata fields should be mandatory or optional at different levels of granularity
2) the choice, implementation and support of restricted vocabularies and
3) the way in which metadata is included in packaging e-learning content

The objective of this work is to form a community which can agree on common practice, not to set guidelines of recommended practice. By adopting this approach the group can proceed incrementally as we agree on one aspect that will become the common practice among those who choose to accept it as such. Such a community will benefit from an ability to easily share objects in an educational "object economy".

Metadata fields

Using the IEEE LOMv1.0 as the basis means that we are also, in effect, adopting IMS Metadata 1.2.2 and SCORM metadata as in SCORM 1.2. These different specifications have different mandatory requirements:

- **IEEE LOM** "A LOM instance that contains no value for any of the LOM data elements is a conforming instance."
- **IMS** "The meta-data instance must contain one or more LOM element(s)."
- **SCORM** Different metadata is mandatory or optional for three different levels of granularity in SCORM - assets, SCOs (shareable content objects) and content aggregation. "Note that these requirements do not imply that every Content Aggregation, SCO or Asset must be described by metadata. However, the requirements do apply whenever metadata is used" (see appendix for a full list of requirements)

All three of these specifications consider metadata to be optional. While this is perhaps a practical necessity we propose that "common practice" should be that metadata will always be associated with digital material for learning. Once that decision is made it is necessary to decide which fields should be filled as a minimum in common practice. Although this needs debate a reasonable starting point would be to start with the SCORM mandatory set. The Appendix also shows the fields selected by Learning and Teaching Scotland in its Learning Objects project and by CanCore.

Vocabularies

Many of the metadata fields are of type "vocabulary". These fall into two categories, those for which IEEE LOM has already defined the vocabulary and those for which a "best practice" or "common practice" is expected to be agreed. Some IEEE LOM vocabularies are rather restrictive and it is worth considering if it is worth expanding or replacing these vocabularies as well as developing those "common practice" vocabularies for a UK educational community (or perhaps even for a European educational community).

The vocabularies for which "best practice" is expected to be adopted are:

2.3.1	Lifecycle.role
3.3.1	Metametadata.role
4.4.1	Technical.type
4.4.2	Technical.name

5.2	Educational.learningresourcetype
5.6	Educational.context
7.1	Relation.kind
9.1	Classification.purpose

With the exception of the last all are optional for all SCORM objects and even the last is optional for SCORM Assets.

It is proposed to examine what suitable vocabularies might be adopted in UK education. For example, the classification purpose could be "subject discipline", "educational level" or " accessibility" or several other options. Note that by choosing any one of these, say subject discipline, there is another required adoption of terms to be used to describe each subject. Although taxon entries are of type *langstring* they are not going to reach full usefulness unless these strings form part of a restricted vocabulary. As an example the subject discipline terms could use the LearnDirect classification system which includes about 6500 terms. Or it might use only the top levels of that system or some other such as Dewey. Some work has already been done by UK-MEG on educational level terms. It is suggested that adopting of a common spine that is independent of a particular curriculum framework could be adopted. The SCQF system could be suitable as it has already been designed to span school, further and higher education and is also subdivided into cognitive, numeracy, literacy, communication and IT skills.

Packaging

In order to get maximum benefit from sharing material using a "common practice" set of metadata it will be essential that the metadata is stored in a standard way. There are a number of options including IMS Content Packaging and SCORM specifications as well as the possibility of storing the metadata in the objects themselves, for example as META tags in a web page.

- **IMS CP:** Metadata in an IMS content package is optional and is allowed within <manifest>, <resource>, <organization>, <item>, and <file> elements to more fully describe the contents of a package. Such generality does not help "common practices" to develop. The location of metadata is important when packages are aggregated and disaggregated. Clearly when resources are removed from one package and inserted into another package the metadat must be carried with the resource. No advice on handling metadata is given in the aggregation and disaggregation part of the IMS Content Packaging Best Practice Guide. The following extract highlights some of the lack of direction "Some Content Packages will have their associated meta-data captured in a separate file. When this is the case, manifests *may* include an in-line reference to the external meta-data file." This means that metadata can exist but it *may* be referred to in the manifest where it is expected!
- **SCORM:** SCORM Content Packaging is based directly on IMS Content Packaging. However, SCORM differentiates between context-specific and context-independent metadata. Context-specific metadata is used to describe the Content Aggregation level in which an educational content has been established. Context-independent metadata applies to SCOs which are intended for reuse in different contexts and for Assets. In a Content Aggregation metadata (if it exists) must be in the manifest (inline) although there is also an option to include a reference to the metadata which can be external to the manifest - even as a URL to metadata outside the package. An aggregated package may contain several <items>. Each item should contain metadata in-line or by reference as for the top-level metadata. Within the <resources> section of the manifest each resource should have its context-independent metadata either inline or referred to externally. In all cases the metadata, if it exists, should include as a minimum all the mandatory fields.
- **Other:** Various applications attempt to embed metadata when they save web pages. There appears to be no consistency between these products.

Conclusions

Our ability to share and reuse content is strongly influenced by metadata. The version, fields, vocabularies and location of the metadata are all factors which can break any potential interoperability.

There is a need within any community which expects to share resources to agree a common practice.

The CETIS Metadata and Educational Content SIGs with the collaboration of LTScotland plan to initiate a community discussion. Anyone with an interest on this topic is invited to join in. CanCore has already expressed an interest in exchanging information.

APPENDIX A - IEEE LOM Fields and their use by various groups

Number	Name	Multiplicity	Data type	SCORM Content Aggregation	SCORM Shareable Content Object	SCORM Asset	Learning and Teaching Scotland	CanCore
1	general	1 and only 1	container	M	M	M	M	M
1.1	identifier	reserved	string	R	R	R		M
1.2	title	1 and only 1	langstring	M	M	M	M	M
1.3	catalogentry	0 or more	container	M	M	O		M
1.3.1	catalogentry	0 or 1	string	M	M	O		M
1.3.2	entry	0 or 1	langstring	M	M	O		M
1.4	language	0 or more	string	O	O	O	M	M
1.5	description	1 or more	langstring	M	M	M	M	M
1.6	keyword	0 or more	langstring	M	M	O	M	
1.7	coverage	0 or more	langstring	O	O	O	M	M
1.8	structure	0 or 1	rvocabulary	O	O	O	M	
1.9	aggregationlevel	0 or 1	rvocabulary	O	O	O	M	
2	lifecycle	0 or 1	container	M	M	O	M	M
2.1	version	0 or 1	langstring	M	M	O	M	M
2.2	status	0 or 1	rvocabulary	M	M	O	M	
2.3	contribute	0 or more	container	O	O	O	M	M
2.3.1	role	0 or 1	vocabulary	O	O	O	M	M
2.3.2	centity	0 or more	string	O	O	O	M	M
2.3.3	date	0 or 1	date	O	O	O	M	M
3	metametadata	1 and only 1	container	M	M	M		M
3.1	identifier	reserved	string	R	R	R		M
3.2	catalogentry	0 or more	container	O	O	O		M
3.2.1	catalog	0 or 1	string	O	O	O		M
3.2.2	entry	0 or 1	langstring	O	O	O		M
3.3	contribute	0 or more	container	O	O	O		M
3.3.1	role	0 or 1	vocabulary	O	O	O		M
3.3.2	centity	0 or more	string	O	O	O		M
3.3.3	date	0 or 1	date	O	O	O		M
3.4	metadatascheme	1 or more	string	M	M	M		M
3.5	language	0 or 1	string	O	O	O		M
4	technical	1 and only 1	container	M	M	M	M	M
4.1	format	1 or more	string	M	M	M	M	M
4.2	size	0 or 1	string	O	O	O	M	M
4.3	location	1 or more	string (restricted)	M	M	M		M
4.4	requirement	0 or 1	container	O	O	O	M	
4.4.1	type	0 or more	vocabulary	O	O	O	M	
4.4.2	name	0 or 1	vocabulary	O	O	O		
4.4.3	minimumversion	0 or 1	string	O	O	O		
4.4.4	maximumversion	0 or 1	string	O	O	O		
4.5	installationremarkes	0 or 1	langstring	O	O	O		
4.6	otherplatformrequirements	0 or 1	langstring	O	O	O		M
4.7	duration	0 or 1	date	O	O	O		M

5	educational	0 or 1	container	O	O	O	M	M
5.1	interactivitytype	0 or 1	rvocabulary	O	O	O	M	
5.2	learningresourcetype	0 or more	vocabulary	O	O	O	M	M
5.3	interactivitylevel	0 or 1	rvocabulary	O	O	O	M	
5.4	semanticdensity	0 or 1	rvocabulary	O	O	O		
5.5	intendedenduserrole	0 or more	rvocabulary	O	O	O	M	M
5.6	context	0 or more	vocabulary	O	O	O	M	M
5.7	typicalagerange	0 or more	langstring	O	O	O	M	M
5.8	difficulty	0 or 1	rvocabulary	O	O	O		
5.9	typicallearningtime	0 or 1	date	O	O	O	M	
5.10	description	0 or 1	langstring	O	O	O	M	
5.11	language	0 or more	string	O	O	O	M	M
6	rights	1 and only 1	container	M	M	M	M	M
6.1	cost	1 and only 1	rvocabulary	M	M	M	M	M
6.2	copyrightandotherrestrictions	1 and only 1	rvocabulary	M	M	M	M	M
6.3	description	0 or 1	langstring	O	O	O	M	M
7	relation	0 or more	container	O	O	O	M	M
7.1	kind	0 or 1	vocabulary	O	O	O	M	M
7.2	resource	0 or 1	container	O	O	O	M	M
7.2.1	identifier	reserved	string	R	R	R		M
7.2.2	description	0 or 1	langstring	O	O	O		M
7.2.3	catalogentry	0 or more	container	O	O	O		M
7.2.3.1	catalog	0 or 1	string	O	O	O		M
7.2.3.2	entry	0 or 1	langstring	O	O	O		M
8	annotation	0 or more	container	O	O	O	M	
8.1	person	0 or 1	string	O	O	O	M	
8.2	date	0 or 1	date	O	O	O	M	
8.3	description	0 or 1	langstring	O	O	O	M	
9	classification	0 or more	container	M	M	O	M	M
9.1	purpose	0 or 1	vocabulary	M	M	O	M	M
9.2	taxonpath	0 or more	container	O	O	O	M	M
9.2.1	source	0 or 1	langstring	O	O	O	M	M
9.2.2	taxon	0 or more	container	O	O	O	M	M
9.2.2.1	id	0 or 1	string	O	O	O		
9.2.2.2	entry	0 or 1	langstring	O	O	O	M	M
9.3	description	0 or 1	langstring	M	M	O		
9.4	keyword	0 or more	langstring	M	M	O		M