

Metadata for learning objects containing cultural objects

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Extended Abstract

Standardised metadata for the development and storage of learning objects (LOs) that draw on cultural content (CC) have not been provided as yet. There are well established standards for documenting LOs, such as the IEEE/LOM and the LRE/LOM, and for documenting cultural content, such as the CIDOC-CRM and the SPECTRUM. However, these standards do not provide for descriptions of the type *Alpha is a LO made by X and contains a digital image of Joconda made by DaVinci* nor for a solid framework for building a DB that could answer to questions such as

- a. *Provide me with LOs supporting Geography lessons about Greece that are addressed to 14-year olds and contain pictures by one of Papaloukas, Vassileiou, Tsarouhis*
- b. *Provide me with either LOs or digital pictures of pieces of art on harvesting wheat*

Furthermore, existing large repositories of digital objects do not provide for such hybrid objects. Thus, EUROPEANA¹ contains only cultural content while the LRE² and the national Φωτόδεντρο³ only LOs.

In the overall, it is clear that if education at a European level is meant to profit from culture according to EU plans (Eurydiki 2009), the process of developing and storing LOs that contain cultural content should be strengthened with standardised full documentation and storage tools.

We report here on the development of an ontology that is the unification of LRE/LOM and CIDOC-CRM. We will call this ontology LRE/CIDOC from now on. We also report on the development of a database that conforms to the LRE/CIDOC ontology.

CIDOC Conceptual Reference Model (CRM) provides definitions and the necessary formal structure for the description of concepts and relations used in the documentation of cultural content. A newer version of the standard was published on 15/12/2014⁴.

LRE (Learning Resource Exchange) is an international repository with own national portal⁵ supported by the Ministry of Education. Its functionality rests on an combination of **IMS LOD E Information for Learning Object eXchange specification (ILOX)** with **IEEE Learning Object Metadata (LOM)** IEEE 1484.12.1 – 2002 Standard for Learning Object Metadata. LOM describes LOs and resources for the education aiming at facilitating retrieval. It is an open standard with wide acceptance.

CIDOC-CRM ontology comprises two main branches, that of objects (concrete or abstract) and that of events that involve the objects. In this way, CIDOC-CRM offers a more general conceptual model that can incorporate the LRE/LOM model.

We proceeded by unifying those classes of the two ontologies that could be unified. To start with, the top class of the new ontology CIDOC+LRE is the class CRM Entity_LRE WORK; it is the unification of the top class E1 CRM Entity of the CIDOC ontology and the top class ‘WORK’ of the LRE/LOM ontology. Table 1 shows the definitions of the two classes in the

¹ <http://www.europeana.eu/portal/>

² <http://lreforschools.eun.org/>

³ <http://photodentro.edu.gr/lor/>

⁴ [ISO 21127:2014](http://www.iso.org/iso/21127.html)

⁵ <http://lreforschools.eun.org>

respective frameworks and the definition of their unification in CIDOC+LRE. The unified classes are both very general and their content could be described as “all what one can say about a LO or a cultural object”.

Table I. Definition of the top node of the three ontologies

CIDOC+LRE	CIDOC	LRE-MAP ‘WORK’
CRM Entity_LRE WORK: Anything that can be said to describe a cultural object or a LO.	E1 CRM Entity: This class comprises all things in the universe of discourse of the CIDOC Conceptual Reference Model. It is an abstract model providing for three general concepts: 1. Identification by name or appellation, and in particular by a preferred identifier 2. Classification by type, allowing further refinement of the specific subclass an instance belongs to 3. Attachment of free text for the expression of anything not captured by formal properties”	LRE-MAP ‘WORK’: ‘Work’ corresponds to the abstract concept of LO”

We also introduced new classes, if it was necessary. For instance, CIDOC-CRM, being a standard for the description of cultural objects, does not contain LOs. CIDOC+LRE ontology is defined to include the new class LO as a subclass of E90 Symbolic Object of CIDOC. A set of properties of LO are derived from its integration in the ontology or are defined locally.

Both the LO and the cultural objects can be documented in the database that was developed in accordance to the CIDOC+LRE ontology. The database is completed with a set of controlled vocabularies. For LRE vocabularies have been drawn from the Vocabulary Bank for Education – VBE⁶. There are several controlled vocabularies for cultural objects. We have been developing Greek controlled vocabularies that are compatible with the established Getty Vocabularies⁷.

The GUI is an expandable, platform-independent Java application for storage and retrieval of Cultural and Learning Objects that is being created on the NetBeans Platform. It can use many Relational Database management system (e.g. Apache Derby, MsSQL, MySQL) and makes full use of the underlying database schema.

References

- [1] CIDOC-CRM <http://www.cidoc-crm.org/>
- [2] EUROPEANA <http://www.europeana.eu/portal/>
- [3] Getty Vocabularies <http://www.getty.edu/research/tools/vocabularies/>
- [4] LOM <https://standards.ieee.org/findstds/standard/1484.12.1-2002.html>.
- [5] LRE <http://lreforschools.eun.org/>
- [6] SPECTRUM <http://www.collectionstrust.org.uk/spectrum>
- [7] Vocabulary Bank for Education – VBE [<http://aspect.vocman.com/vbe/home>]
- [8] Φωτόδεντρο <http://photodentro.edu.gr/lor/>
- [9] Arts and Cultural Education at School in Europe Education. Audiovisual and Culture Executive Agency (EACEA P9 Eurydice), 2009. http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/113EN.pdf

⁶ <http://aspect.vocman.com/vbe/home>

⁷ <http://www.getty.edu/research/tools/vocabularies/>

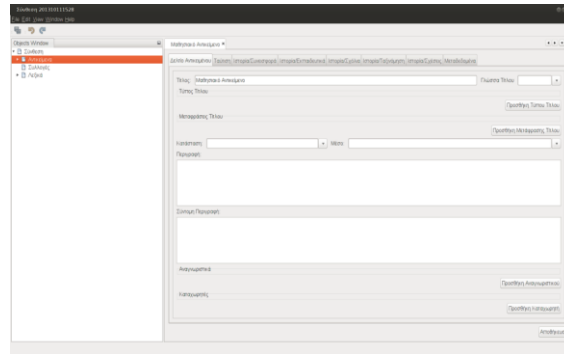


Fig.1. Documentation of Learning Object

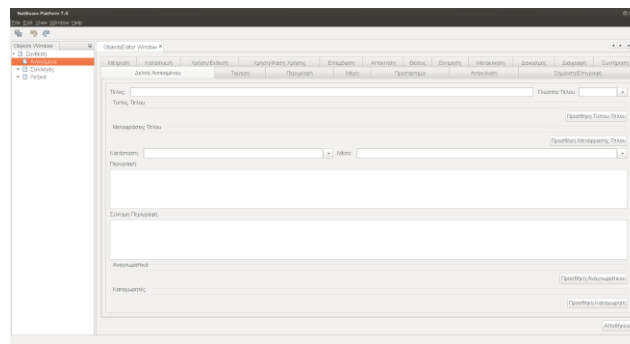


Fig.2. Documentation of Cultural Object

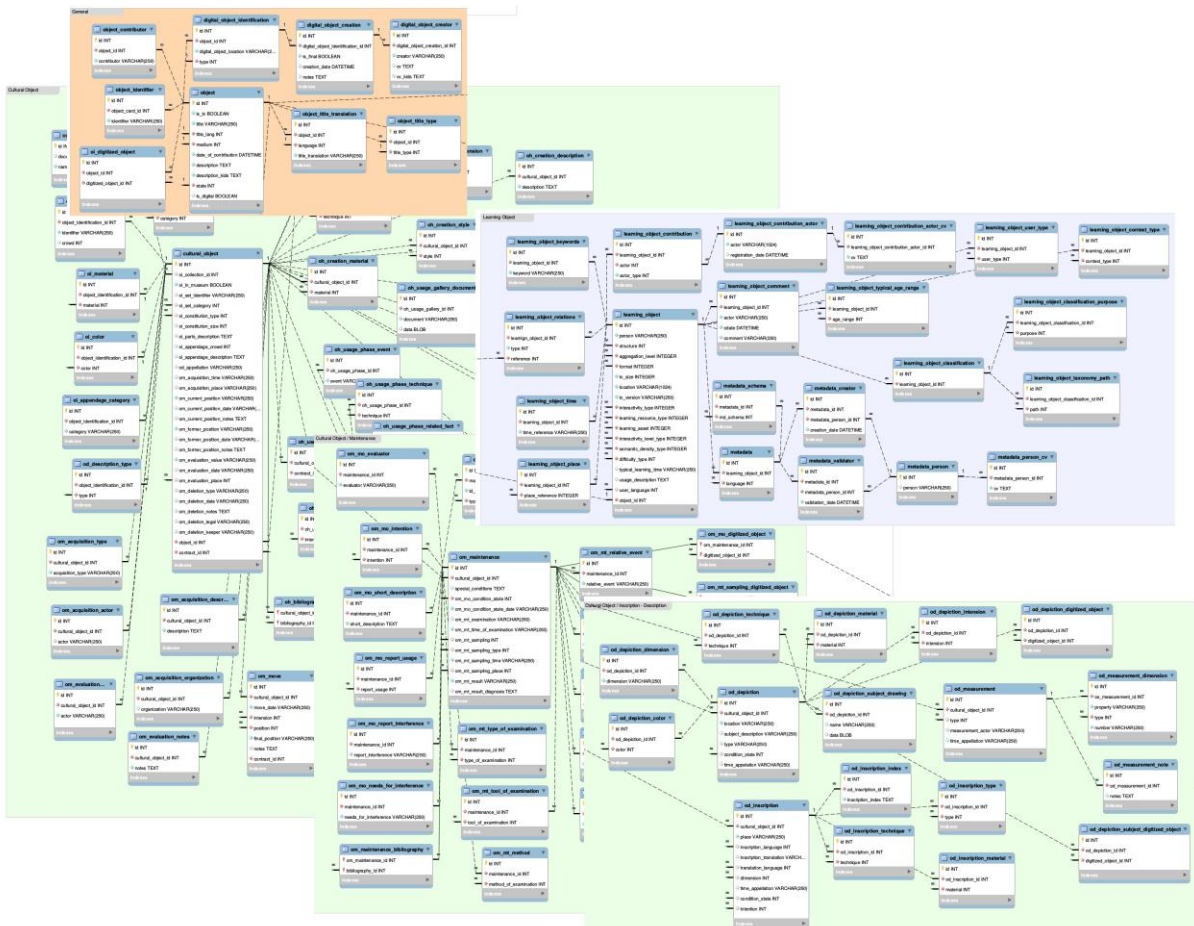


Fig.3. The database schema