A tool to enhance the sharing of digital health resources –
the Healthcare LOM Editor

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Abstract

Digital resource sharing is a contemporary trend in Medical Education. State-of-the-art digital resources are incrementally appearing in the majority of curriculums worldwide. Institutional repositories have been initiated and metadata descriptions of digital resources have been turned into standards, however sharing, retrieval and re-use across different institutions are still at infant stage, due to the lack of appropriate tools and the cost of metadata creation. To this extend the aim of this paper is to propose a user-friendly editor for the creation of Healthcare Learning Object Metadata (H-LOM), an ANSI standard by MedBiquitous, to enhance the educational sharing and retrieval of digital health resources.

1. Introduction

Nowadays digital health resources of various types are continuously created worldwide. Teachers are updating their state-of-the-art digital resources and provide them through institutional learning content management system (LCMSs) and learning objects repositories (LORs).

There have been a lot of efforts for creation of wide learning objects repositories. The late come in various types (content repositories; linking or metadata repositories; and hybrid repositories that host content as well as links to external learning objects (LOs)) [1]. Fewer efforts however have been made for meta-LORs that link LORs. Interoperability, maintenance, update and export of metadata are some of the main problems that influence the evolution of meta-LORs.

Descriptions of learning objects with standardized metadata (targeted to a specific scientific field or being general) solve a lot of the aforementioned problems. However, there is a lack of user-friendly tools for many of the existing metadata standards. To fill this gap, we propose an editor that creates and edit Healthcare learning objects metadata (H-LOM) [2], a newly established ANSI standard issued by MedBiquitous [3] for the description of digital health resources (also referred as learning objects).

The long term aim of this system is to ease the procedure of H-LOM creation, reduce the cost and save valuable time for content creators, thereby enhancing the sharing and retrieval of health digital resources.

The reminder of this paper is structured as follows. In section 2 we provide a brief account on current trends and approaches in sharing and reuse of digital health resources with emphasis on the need for metadata. A short summary of existing metadata editors for learning resources follows, while in the next subsection a brief overview of current learning object standards is presented. The following two sections focus on functionalities and development of the Healthcare LOM Editor. In the final section, a discussion on key issues of concern and future work is provided.

2. Background

Numerous research projects have attempted the enabling of educational material sharing across institutions by use of metadata and none examined the interoperability and the maintainability of the metadata [1],[4]-[6]. In this context, "mEducator", an EU

funded best practice network (funded by the European Commission under the eContentPlus2008 programme, Contract Nr: ECP 2008 EDU 418006) [7], aim to elaborate on pedagogical, technical, standardization, cultural, social and legal issues towards a standard-based infrastructure that enables the sharing of state-of-the-art digital medical educational content among medical educators and students in European higher academic institutions.

Metadata is the latent principle behind the scene of sharing, re-using learning objects. Interoperability between systems or components from diverse origins may only be achieved if a "common language" is utilized; metadata may play this very role that large scale deployment of learning technologies enables open base infrastructures when components can be continues plugged into infrastructures [8]. To this extent standardization of metadata reassures, accessibility, communication, and reusability of learning objects.

However arguments against the use of metadata are also present [9]. One of the main issues is the creation and the maintenance of valid metadata. To this notion economics of metadata creation, continues evolution of standards and the required specialized knowledge to edit metadata standards should always be taken under serious consideration [10]. It is imperative that one needs at least user-friendly tools and editors for metadata creation and editing.

2.1. Revising Existing Metadata Editors

There are currently many efforts for developing user-friendly tools for metadata creation. A basic distinction of those tools is whether they are web-based or not. A web based editor uses a database to store metadata and is capable of exporting a metadata file upon request, while a non-web-based solution usually stores the metadata directly into an XML file. The following tables 1 and 2 summarize the most known efforts for such editors.

Moreover there are many tools that are beyond the mere notion of metadata editor either and compose parts of Learning Object Repository (eg. MERLOT and CAREO) or parts of an e-learning environment. Some of the editors are embedded in a content packaging tool (Reload, Weload, eXe Editor, etc.). Such tools create metadata but the export function for the end user is not usually supported (Table 3).

The common ground of these tools is the creation, editing and storage of educational metadata. However, they all use different technologies and approaches at the end user.

Table 1. Web based metadata editors

Editor Name	Source	Standard/ Specification followed
Eleonet- European Learning Object Network	http://www.medra.org/eleonet/area_it-editor.htm	IEEE LOM
SLOOP-Sharing Learning Object in an Open Perspective	http://www.freeloms.org/faces/jsp/dashboards/container.jsp	IEEE LOM
My Meta Maker	http://www.isn-oldenburg.de/services/mmm/	Dublin Metadata Core Element Set
DC dot (Dublin Core metadata editor)	http://www.ukoln.ac.uk/metadata/dcdot/	Dublin Metadata Core Element Set
Editor-Convertor Dublin Core Metadata	http://www.library.kr.ua/cgi-bin/dceditunie.cgi	Dublin Metadata Core Element Set
UKOLN: Dublin Core Metadata Editor	http://www.ukoln.ac.uk/cgi-bin/dcdot.pl	Dublin Metadata Core Element Set
Reggie - The Metadata Editor	http://metadata.net/dstc/	Dublin Metadata Core Element Set It is adjustable to schemas
Biblios.org- Open Source Cataloging,	http://biblios.org/	Built in support for MARC21, MARCXML, Z39.5
DML-CZ Metadata Editor	http://project.dml.cz/docs/mkm08-editor.pdf	Metadata for Digital Libraries
AgMES/DC Metadata Scanner, Generator and Editor	http://lprapp14.fao.org:9090/metamaker/index.html	AgMES/DC

Table 2. Non-web-based metadata editors

Editor Name	Source	Standard/ Specification followed
TreeLom editor	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.106.4151&rep=rep1&type=pdf	IEEE LOM
IMS Editor Vimse (ImseVimse)	http://sourceforge.net/projects/imsevimse/	IMS learning object metadata
Metadata Generator Pro 3.0	http://www.jcasolutions.com/metadata2004.php	IEEE LOM and other
EM2	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.101.7527&rep=rep1&type=pdf	It is adjustable to schemas
IEEE LOM Editor- Aachen University	http://dbis.rwth-aachen.de/cms/projects/LOMEditor	IEEE LOM
The Authorware Learning Object Metadata Editor	http://www.authorwareforum.de/download/datecien/lom%20editor.pdf	IEEE LOM
CatMEdit- Metadata Editor	http://catmdedit.sourceforge.net/	ISO19115. Geographic Information - Metadata

Table 3. Metadata editors contained within tools

Editor Name	Source	Standard/ Specification followed
MERLOT	http://www.merlot.org	IEEE LOM
eduSource Repository-In-A-Box (eRIB) Suite of Tools	http://demo.licef.teluq.uquebec.ca/eRIB/	IEEE LOM
RELOAD Editor	http://www.reload.ac.uk	IEEE LOM
eXe - the eLearning XHTML editor	http://exelearning.org/	Dublin Metadata Core Element Set
CLOMAT	http://etd.lib.fsu.edu/theses/available/etd-08282003-172442/unrestricted/01_evm_thesis.pdf	IEEE LOM
CAREO	Officially its development has terminated	IEEE LOM

2.2. Learning object metadata standards and specifications

A review of Educational Standards (official or de facto), specifications and reference architectures proposed for enhancing the sharing of learning resources through standardized descriptions may be found in [11]. More recent efforts include those taking place within the aforementioned mEducator project in which the H-LOM [12], the MedBiquitous Virtual Patient [13] and the MedBiquitous VA LOM [14] have been extensively analysed. More specifically, for H-LOM, content items or learning objects are described

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through ten (10) general categories; H-LOM is XML based.

3. Healthcare LOM Editor

Target users of the Healthcare LOM editor are medical educators, trainers and individuals who want to describe their digital learning resources so as to upload them in a learning object repository and share them accordingly.
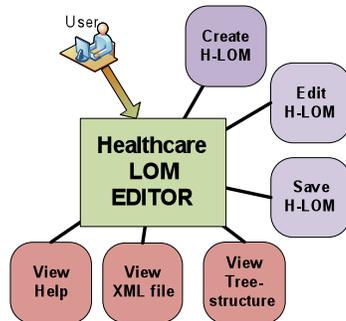

Figure 1. Healthcare LOM Editor overall functionalities

The main use cases for the Healthcare LOM editor are:

- Creating new Healthcare LOM file. The user fills in all the fields that he judge that should be filled in, by changing tabs for each separate category.
- Updating an existing Healthcare LOM file. The user opens an already created XML H-LOM file and updates any fields that he she wants. For example, changing the version of the content item, adding a new author, etc.
- Validation of Healthcare LOM file. While the file is opening a validation of the data occurs.
- Selecting XML view. At a button click the user has the opportunity to see the XML document and to browsing it.
- Expanding/Collapsing the Treeview of Healthcare LOM. By client suitable button the user may view and browse all the metadata in a treeview in a more friendly way. The user can always collapse the treeview and continue with the editing or the insertion of the metadata (Figure 2).
- Asking for Help. While filling in or editing the elements of Healthcare LOM a help-sign and an info box may promptly pop up with relevant instructions. To this extent a mouse roll over for more than 2 seconds on the help sign will make a help note to appear when then vanishes on mouse movement (Figure 2).

The main screen is divided in two main parts. On the left part a tree view of the metadata appears while on the center and the left part a form appears. The first

9 metadata category of Healthcare LOM (aka IEEE LOM categories), appear in separate tabs. The 10th category of "healthcare metadata" exists in the 3 last tabs (two for the "healthcare education" container and one for the "healthcare asset" container), so as to keep the user interface simple and user friendly (Figure 2). The Healthcare LOM editor also supports XML view, which can show an overview of the metadata at a button click (Figure 3). The system has been tested by the mEducator consortium and MedBiquitous initiative for correctness of use and valid metadata output.
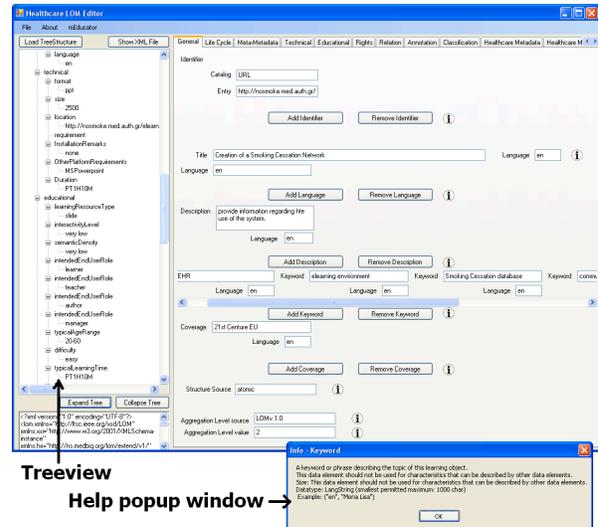

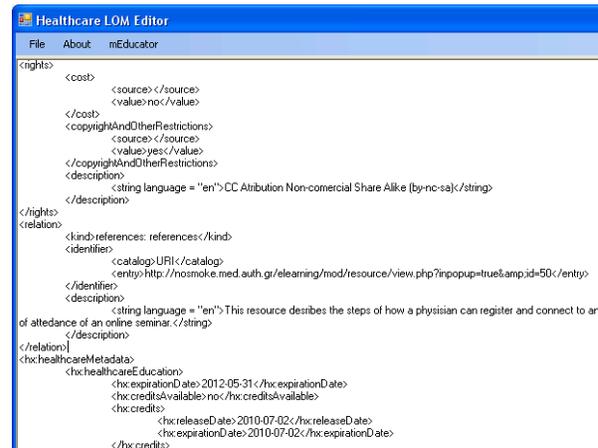**Figure 2. Healthcare LOM Editor - Treeview & Help popup window**

Figure 3. Healthcare LOM Editor – XML view

The Healthcare LOM editor has been using C# in MS Visual Studio. The Healthcare LOM editor is open source and is under Creative Commons GNU General Public License, so that the community of users can further develop, adapt the program to their needs and redistribute copies and new versions.

We have also established an online survey to identify user-friendliness of the Healthcare LOM editor. We have used LimeSurvey (http://www.limesurvey.org/) an online open source php web application to collect responses. It is accessible through the editor site (http://kedip.med.auth.gr/HealthcareLOMEditor).

The procedure of evaluation has just started and some preliminary results indicate that there is a need for "help function" improvement while the editor's environment seems familiar with other computer based applications and the overall feeling seems to be very positive.

4. Conclusion and future work

One of the main problems associated with increase the sharing of digital health objects is the economy of metadata. A recently ANSI accredited new standard that can describe Health digital objects established in 2008 in an effort to empower the aforementioned sharing and enhance the interoperability.

Providing a credible, user-friendly editor for Healthcare Learning Object Metadata could lead to great benefits for the creators of metadata. In this paper has been proposed a new metadata editor for Healthcare LOM. The editor is open source and is being distributed under Creative Commons GNU General Public License.

As full evaluation has not been completed yet, more work is expected to be done towards usability, controllability, error tolerance and efficiency. To this extent a community of users can foster the editor, since it is open source. However, actual use of the editor will identity additional problems that need to be resolved.

Future work will also aim towards the creation of the mEducator metadata editor, which may contain the Healthcare LOM editor as a base, but enhanced with elements for repurposing, education and other developments.

5. Acknowledgement

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