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# ELEONET: The search portal for learning objects

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While the European market of digital Learning Objects (LO) is rapidly growing, the prospective customers still face difficulties searching for an appropriate LO. When traditional learning materials like textbooks are tractable via ISBN identifiers, a Digital Object Identifier (DOI) for LO is still new for many producers of learning content. The EU-funded ELEONET project aims at extending the scope of the DOI to a European learning environment. The Eleonet Portal allows producers to register their LOs with DOIs, the metadata records are indexed and made searchable via distributed search engine. This service is available for LO producers, intermediaries and educational communities.

**Keywords** digital object identifier DOI; learning object LO registration; LO search portal

## 1. Introduction

While the European market of digital Learning Objects (LO) is rapidly growing, the prospective customers still face difficulties searching for an appropriate LO. When traditional learning materials like textbooks are tractable via ISBN identifiers, a Digital Object Identifier (DOI: [www.doi.org](http://www.doi.org)) for LO is still new for many producers of learning content. The ELEONET<sup>1</sup> (European Learning Objects Network: [www.eleonet.org](http://www.eleonet.org)) project aims at creating an European catalogue of educational materials offering an added value service to all the actors involved within the e-learning value chain, like content producers, learning communities and intermediaries.

By offering to the European learning communities an easy and unified access to educational resources, Eleonet increases the content producers' opportunity to disseminate their learning objects at European level, ensuring a wider visibility and thus enhancing the market growth. Digital content available through Eleonet catalogue is identified using the DOI, the international standard for identifying and describing any Intellectual Property in a digital environment.

Eleonet allows LOs producers to assign DOIs and to register metadata onto any content, according to a metadata schema interoperable with the existing standards implemented at EU and international level. The DOI registration system includes an editor for an easy registration of educational metadata. Schools, teachers and learning communities in general can access the Eleonet metadata and DOI repository through a search engine available in four European languages (English, Spanish, German and Italian) allowing both simple and advanced search by widely accepted criteria: educational level, subject, title, etc. Eleonet offers to Learning Object producers an effective solution for standard identification and metadata management of their own contents through a single access point.

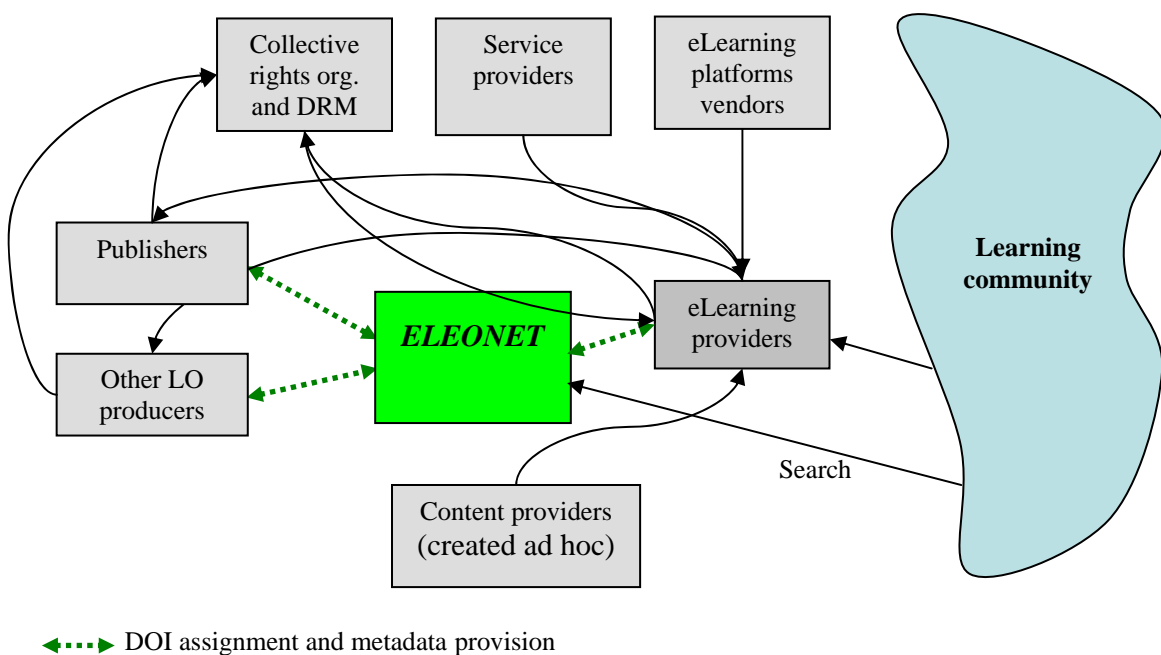
## 2. Eleonet role in the e-Learning value chain

Learning communities are interested in a common catalogue(s) of learning resources in the Internet. The value chain in eLearning may be quite complex, particularly as far as learning content is concerned. It is

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<sup>1</sup> ELEONET project is funded in the framework of the eTEN programme by the EU Commission, started on January 1st 2006 and will last 18 months, closing at the end of June 2007 with the release of the final version of the system.

still very frequent that content are developed ad hoc for every e-Learning initiative. This allows customising content to the specific learning context, but it is not effective from an economic point of view. Content production is actually characterised by high fix costs and the provision of content for a small number of users either is expensive or results in poor material. To bypass these problems, learning organisations (schools, universities, training organisations, etc.) started to negotiate rights for using modular learning objects, designed to be re-used in multiple contexts. The customisation is pursued in this case through the creation of a particular bundle of LOs, and in terms of services provided besides the mere didactic material. This implies the need to negotiate rights on LOs, which can be done directly with the producers (publishers and other rights holders) or through collective rights organisations such as clearing houses, RROs (Reproduction Rights Organisations)<sup>2</sup> or content aggregators usually providing DRM (Digital rights management) services.



**Fig. 1** The ELEONET role in the e-Learning value chain.

Fig.1 shows the role of ELEONET system in the e-Learning value chain. When content producers assign a DOI to a certain LO they can exploit the following advantages:

- They adopt a standard identification system which is essential to facilitate the automatic communication between the IT systems of all the actors in the value chain. Intermediaries require unique and unambiguous identifiers, particularly to handle LOs within DRM systems. The e-Learning providers are also facilitated in managing LOs within existing e-Learning platforms if they are identified with a standard system. In other words, the DOI deals with a new dimension of interoperability that is often under-evaluated: the interoperability between the schemes for negotiating the IP rights.

<sup>2</sup> RROs traditionally licence rights to photocopy printed books and journal to be used in educational environment, and particularly in universities. To a certain extent, this is analogue to the use of LOs in e-Learning and currently several RROs are entering digital market, replicating their business model in the new environment. The case of CAL in Australia ([www.copyright.com.au](http://www.copyright.com.au)) is the most significant at international level, and uses DOIs to identify digital content. European RROs are moving in the same direction and the deployment of DOI will facilitate this evolution.

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- The LOs are also described according to a standard metadata schema. This facilitates all search functionalities along the value chain. Service providers can implement applications using such metadata as well as content aggregators and collective rights organisations.
  - Using the metadata repository resulting from the DOI registration process, ELEONET will also offer directly to learning communities and to eLearning organisations advanced search facilities. Therefore, content producers will have their content more searchable and finally accessible, thus opening new market opportunities.

### 3. Digital Object Identifiers

The ELEONET project aims at extending the scope of the DOI to European eLearning environment. The DOI<sup>®</sup> (Digital Object Identifier: [www.doi.org](http://www.doi.org)) is the new identification standard for any Intellectual Property entity launched by the International DOI Foundation and provided in Europe by mEDRA (multilingual European DOI Registration Agency: [www.medra.org](http://www.medra.org)), Nielsen Book Data (<http://www.nielsenbookdata.co.uk/>) and German National Library of Science and Technology (<http://www.tib.uni-hannover.de/>). It consists of a complex system including:

- An identification scheme, with a standard syntax (ANSI/NISO Z39.84)
- Specific metadata schemas for the description of identified objects.
- A resolution system based on Handle<sup>®</sup> System ([www.handle.net](http://www.handle.net)) that makes the identifiers actionable in the Internet. The DOI identifies the resource and registers within the metadata the URL (or the URLs) where that resource is published or refers to. The Handle System allows to resolve from the DOI to the registered URL(s) and thus it belongs to N2L (from URN to URL) technologies.
- An administration system, which has the IDF as governance centre and the Registration Agencies (RAs) as key actors, being a sort of interface between the IDF and users.

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Using the metadata repository resulting from the DOI registration process, ELEONET will also offer directly to learning communities and to e-Learning organisations advanced search facilities. Therefore, content producers will have their content more searchable and finally accessible, thus opening new market opportunities. It is also to be considered that technologies may create some constraints on the type of content that are accepted, in terms of standard formats, description and identification. The ELEONET project aims at coping with this problem, promoting a well established description and identification standard for LOs.

### 4. Metadata schema

We conducted a survey on current LO metadata standards. The ultimate aim of this survey was to ensure that the metadata schema utilised by ELEONET is rich enough to provide an adequate description of Learning Objects for several different purposes while still ensuring the maximum level of interoperabil-

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ity with other systems. As resulted from the analysis of these projects, the existing and most internationally widespread metadata specifications for LOs are all based on the same standard, LOM - Learning Object Metadata, though with slight customizations<sup>3</sup>. The Eleonet survey took into consideration several national and international projects dealing with learning objects:

- **ARIADNE (EU)**<sup>4</sup>: A European Association open to the World, for Knowledge Sharing and Reuse. The core of the ARIADNE infrastructure is a distributed network of learning repositories. ARIADNE have been collecting learning objects and metadata in the Knowledge Pool System for more than 9 years. Recently, as the XML binding of LOM matured, ARIADNE metadata model has been mapped into LOM XML instances. This increases the interoperability between ARIADNE and other Learning Object Repositories that rely on IEEE LOM.<sup>5</sup>
- **CanCore (CAN)**<sup>6</sup> The *CanCore Metadata Initiative* assists project implementers and indexers in the development of high-quality systems and records to support the use and reuse of digital learning objects. LOs can be as simple as individual web pages, video clips, or as comprehensive as full courses or training programs. CanCore has been working with an expanding community of implementers since November 2000. It provides guidelines for all of the elements in the LOM standard, and identifies a sub-set of these elements for their special utility in resource description and discovery.
- **CORDRA (US)**<sup>7</sup>. CORDRA stands for *Content Object Repository Discovery and Resolution Architecture*. The project aims at creating a standards-based infrastructure for the discovery, sharing and reuse of learning content through an interoperable federation of learning content repositories; in order to enhance interoperability among the federation of CORDRA repositories, the system will be based on the LOM standard. At present the project is under development, focusing on the possibility to use DOIs to register and keep track of learning objects in distributed repositories
- **Curriculum Online (UK)**<sup>8</sup> Started in 2003, the Curriculum Online portal consists of an online catalogue comprising thousands of free and priced multimedia resources indexed and described according to the LOM data model. School teachers can search for resources based on a variety of criteria relevant to the resource such as the subjects, key stages and school years.
- **DIGISCUOLA (IT)**<sup>9</sup> was promoted by the Italian Minister for Innovation and Technologies in concert with the Ministry for Education, Universities and Research. The project will provide for digital content development to support teaching, and the introduction of new technologies in learning processes. This will be achieved through a National Technological Platform for the input, storage and use of Learning Objects. From September 2006 more than 500 upper-secondary schools shall have the access to a repository of educational resources on a trial basis during the whole school year.
- **LON (US)**<sup>10</sup> Founded in 2000, *Learning Objects Network, Inc.* (LON), launched a project in collaboration with the Department of Defence in the US to identify LOs produced by private publishers with DOIs and thus to facilitate the re-use of such content. Moreover, LON offers consulting services to help publishers to create granular, reusable, and interoperable educational content. Through a strategic partnership with the publishing industry's trade association,

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<sup>3</sup> For a detailed comparison between different LOM Application Profiles, see also the International LOM Survey final report (<http://dlist.sir.arizona.edu/403>); this survey on the use of LOM was carried out in 2004 and showed that major educational portals use LOM, though the educational section was generally underused.

<sup>4</sup> ARIADNE documentation is available at: <http://www.ariadne-eu.org/>

<sup>5</sup> For a detailed presentation of ARIADNE work on LOM metadata model, see J. Najjar, E. Duval, S. Ternier, en F. Neven, *Towards interoperable learning object repositories: the Ariadne experience*, available at <http://www.cs.kuleuven.ac.be/~hmdb/publications/publicationDetails.php?id=41268>

<sup>6</sup> CanCore Learning Resource Metadata Initiative: <http://www.cancore.ca/en/index.html>

<sup>7</sup> CORDRA documentation is available at <http://cordra.net>

<sup>8</sup> Curriculum Online portal is available at <http://www.curriculumonline.gov.uk>

<sup>9</sup> DigiScuola website: <http://www.digiscuola.it>

<sup>10</sup> LON official website: <http://www.learningobjectsnetwork.com>

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the Association of American Publishers (AAP), LON is supporting the commercial adoption of SCORM conformant learning objects.

After considering several major projects and implementations concerning learning objects, the study concluded that LOM was the most appropriate standard. However, as there are already numerous Application Profiles (APs) which aim to comply with this standard, careful analysis of these APs was required, as it became evident that not all APs necessarily comply fully with the SCORM standard, or else have been designed to meet differing requirements from those of ELEONET (e.g. to meet the needs of a specific community or to address specific functions). Consequently, a subset of mandatory data elements has been developed for use by the ELEONET implementation according to the SCORM Metadata AP Requirements; it is believed these should enable DOI registrants to participate in ELEONET by supplying a minimum set of mandatory information without excessive effort. Afterwards, in addition to LOM minimum metadata subset for DOI registration, further optional data elements have been selected in compliance with the most widespread LOM application profiles as to enable publishers to provide a more complete description of educational resources and improve their searchability.

#### **4. Users**

There are three expected categories of users:

- Content producers, which will be the customers of the system, assign the DOIs to LOs and register metadata;
- Intermediaries, which will exploit the existence of the standard to facilitate the identification of LOs and metadata collection;
- Final users, which will search the metadata to retrieve appropriate content.

Content producers will include different type of organisations. Educational publishers are the first target group, but not the only one. Many other organisations entered the market in recent years, such as not-for-profit entities, technological and telecom enterprises, media companies other than publishers, multimedia publishers and so on. As Tab. 3 shows, sometimes educational organisations are responsible for content production. Schools or individual teachers, universities, training organisations etc. often produce content. Therefore, they are also an important target group to which ELEONET will give the possibility to register DOIs to their own LOs and thus to increase the possibility to disseminate them to other educational institutes, stimulating the re-use of educational content.

#### **4. Conclusions**

We presented the Eleonet, a European portal for LOs. It provides value to all the participants of the e-Learning values chain, delivers DOI registration capabilities and advanced search over the LO metadata. It is distinct from the previous efforts in the field as it brings higher commercial value to the learning materials.