

# Exploring a European Market of Learning Objects with ELEONET

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**Abstract.** ELEONET<sup>1</sup> is an emerging European search portal for Learning Objects. ELEONET allows creators and publishers to obtain Digital Object Identifiers for their Learning Objects and to upload the corresponding metadata. Within the E-learning value chain, ELEONET is aiming to connect the major national learning object repositories in Europe and to provide interoperability between all organizations involved. We present findings from the European market analysis and an overview of the portal registration and search facilities.

## 1 Introduction

While the European market of digital Learning Objects (LOs) 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, the persistent Digital Object Identifier (DOI)<sup>2</sup> is still new for many producers of learning content. The ELEONET project (European Learning Objects Network) aims at creating a 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.

The current situation among national learning object repositories (LORs) suffers from three main problems:

- *Market Lock-In.* LORs contain the learning objects which can be used outside the local market. At the same time, there are no facilities to allow such a Europe-wide exchange of learning information.
- *No central search.* When users are aware that many LORs can be relevant for finding an appropriate LO, they still do not have a single, unified search interface to query all of them at once, especially for school materials.
- *No standard identifier for LOs.* Even when a LO is known, its URL can be outdated so user cannot access it. We need a standard identifier with a persistent connection to the object which will help to find it at any time.

ELEONET is an 18-months project, which started in January 2006 within the EU-funded eTen programme. The ELEONET consortium consists of six partners: CINECA,

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<sup>1</sup> <http://www.eleonet.org>

<sup>2</sup> <http://www.doi.org>

AIE and Indire from Italy, L3S Research Center from Germany, Editrain from Spain and Nielsen BookData from the United Kingdom. By offering the European teaching communities an easy and unified access to educational resources, ELEONET increases the content producers' opportunity to disseminate their LOs at the European level, ensuring a wider visibility and thus enhancing the market growth. Digital content available through the ELEONET catalogue is being tracked using DOI, the international standard for identifying and describing any intellectual property in a digital environment. ELEONET allows producers of LOs to assign DOIs and to register metadata onto any content, according to a metadata schema interoperable with the existing standards implemented worldwide. The DOI registration system includes an editor enabling the easy creation of educational metadata. Schools, teachers and learning communities in general can access the ELEONET metadata and the 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, such as educational level, title, etc. ELEONET offers LO producers an effective solution for standard identification and metadata management of their own contents through a single access point.

There are three expected categories of users:

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

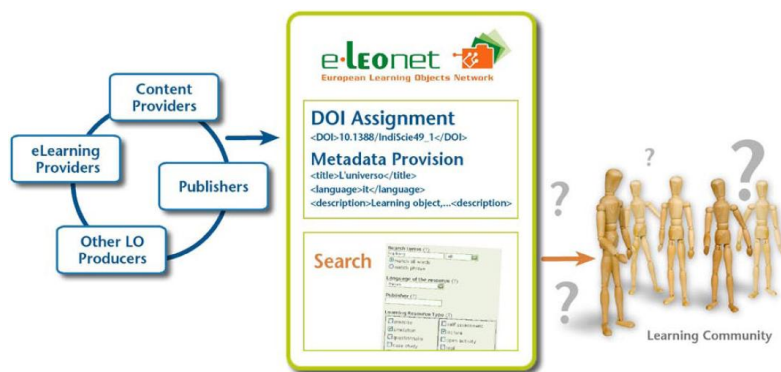


Fig. 1. ELEONET's role in the E-learning Value Chain

## 2 Background

The important characteristics of each LOR are its size and metadata schema. Below we give some pointers to related LORs and compare ELEONET to them. We also motivate our choice of metadata schema and DOI usage.

## 2.1 Learning Object Repositories

LOs that share a common topic, provenance or target audience, are usually stored as collections in LOR. For example the Deutscher Bildungsserver (<http://www.bildungsserver.de>) and Lehrer-Online (<http://www.lehrer-online.de>) are typical examples of German national LORs. The LORs may again be grouped as networks, where collections are being searched simultaneously via Federated Search as in the European Schoolnet [7] or CORDRA [6] initiatives.

ELEONET is a middle-size network where three LORs, maintained by the DOI registration agencies, are synchronized via ELEONET's main server. It is difficult to compare the size of different LORs, since often such numbers are not publicly available. In [5] it was reported that four sample mid-size LORs contain from 5,000 to 11,000 LOs in 2005 and the number of institutional members of Ariadne Foundation according to its Web-site ([www.ariadne-eu.org](http://www.ariadne-eu.org)) is around 20. ELEONET currently contains about 12,500 LOs collected from about 30 early adopters. By definition, ELEONET is a registry, not a repository, as we do not store the actual LO but the metadata only. The special focus of ELEONET is to serve as a marketplace for commercial LO producers, however, as many other LORs, it also accepts the LO producers from the public sector. Regarding the target learning audience, ELEONET also does not have content limitations, but preference is given to school materials.

Currently, new large scale integration processes started and new mega-networks like *GLOBE* (<http://www.globe-info.org/>) appear, to provide common access to several Federated Search networks worldwide including *ARIADNE* in Europe [3], *EDNA* ([www.edna.edu.au](http://www.edna.edu.au)) in Australia, *LORNET* in Canada ([www.lornet.org](http://www.lornet.org)), *MERLOT* ([www.merlot.org](http://www.merlot.org)) in the US, and the *NIME* ([www.nime.ac.jp](http://www.nime.ac.jp)) in Japan. It would be interesting to connect ELEONET to such a global initiative in future.

## 2.2 Metadata Schema and DOI Usage

There are multipurpose and LO-specific metadata schemas suitable for LO description. As far as multipurpose metadata schemas are concerned, the *Dublin Core* schema (DC) [1] and *ONIX* [4] format have been widely adopted. While Dublin Core was developed to provide a very simple "lowest common denominator" set of elements that could be used for the description of any types of online resource, ONIX is the international standard for representing and communicating the book industry's rich product information in electronic form between business partners in the supply chain. The most commonly used LO-specific metadata schema is IEEE LOM [2], which has been extended and integrated into several projects: *ARIADNE* (<http://www.ariadne-eu.org>), *SCORM* (<http://adlnet.gov/scorm>), *CANCORE* (<http://www.cancore.ca/>), *CURRICULUM ONLINE* (<http://www.curriculumonline.gov.uk>), *CELEBRATE* (<http://celebrate.eun.org/>), *DIGISCUOLA* (<http://www.digiscuola.it>) and others.

LOM provides a good base for describing LOs. However, in its existing form it still has limited LO copyright and cost information, which has been implemented as plain-text and boolean fields respectively. Like the majority of the LORs, ELEONET uses LOM but extends with DOI-specific information.

A DOI consists of two prefix and suffix, where a prefix is assigned by a DOI Registration Agency. The suffix can be any string defined by the DOI owner (it may also be a URL, ISBN or other identifier). Each DOI is resolvable to a URL, which is specified at registration time and can be easily updated in future. For example, a DOI 10.2449/Lehrer\_Online\_dyn/510611.htm consists of the registrant's DOI prefix 10.2449 and a local part which is derived from the registrant's internal identifier. The DOI can be converted into a browseable (HTTP-)URL using a DOI resolving service. For this, the user only needs to navigate to the URL [http://dx.doi.org/10.2449/Lehrer\\_Online\\_dyn/510611.htm](http://dx.doi.org/10.2449/Lehrer_Online_dyn/510611.htm) — and she will be redirected to the DOI-registered URL.

This resolving system is convenient for producers as they can register unique DOI once, no matter if the content is later on going to be relocated to another URI. Whenever the original location is updated, the content provider only needs to change the new URL at the DOI Registration Agency, and all links to the DOI will be updated automatically.

### **3 Market Study**

ELEONET is a market validation project so the research of the E-learning market is a crucial aspect. To better understand the current market trends we interviewed a number of market players in each of the project's four countries, using both telephone calls and questionnaires. The results support the claim that the market is still at its early stage, while different segments have some particularities which we outline below.

#### **3.1 Producers and Publishers**

The traditional publishers are aware of the emerging E-learning potential but have no well-defined business plan how to explore it. The vast amount of learning resources is produced in traditional forms like textbooks and video DVDs, so only relatively few LOs are available on the market. Most of the school publishers still do not consider LOs as their main business and sell them only as an addition to textbooks. This fact, of course, decreases their interest in participating in online learning portals for the purpose of providing LOs directly and thus may slow down the adaptation of E-learning in schools.

In contrast, the E-learning products for the industry like training courses for large companies become more and more popular. These courses are usually customized for each particular client, and while a producer surely re-uses the same LO's core for many similar products, each modification often cannot be sold twice due to methodological and legal limitations. In turn, new innovative companies are highly interested in E-learning solutions, but they often do not have enough resources to produce a wide range of materials.

#### **3.2 Intermediaries**

The majority of intermediaries are the LORs ; they disseminate E-learning material via online shops or make them available free of charge. They perceive the need for accumulating a critical mass of LOs and benefit from standard identifiers like the DOI, while often being oriented on the national market only. The DOI dissemination here is burdened by the absence of a rights agreement between portals and authors of LOs.

### **3.3 Learning Community**

The usage of E-learning materials in schools is mainly driven by public funds and government programmes. E-learning is a highly innovative area, while the school administration is reasonably conservative about it. It forces local authorities to launch different projects to support and increase usage of E-learning in schools. The bottleneck here is an absence of sufficient amount of high quality LOs, as publishers do not consider it as their top priority.

Universities are interested in E-learning more than other market segments, but they prefer to create their own modules internally. They do not need to pay for it and materials are customized for the particular study programme. The main drawback is that often, these in-house LOs are not distributed outside the university. It means that a lot of efforts are duplicated and the quality of LOs is lowered in absence of competition.

In general, several companies and public institutions expressed an interest in ELEONET's services, but only given that it is free of charge. The ELEONET market research comes to the conclusion that the European E-learning market is still immature, and currently this service must rely on the public funds.

## **4 Technical Infrastructure for DOI Registration and Search**

In this section we briefly describe the technical approach for ELEONET's registration and search facilities. The main web site gives a single access point to the three European DOI Registration Agencies: mEDRA, Nielsen BookData and TIB, both for DOI registration and LO search.

### **4.1 DOI Registration Facilities**

Each registration agency (RA) involved in the project is capable to receive and validate DOI registration requests. A registration request comprises an XML document formatted according to the ELEONET metadata schema for LOs, which is based on IEEE LOM v1.0 and compliant with SCORM CAM v1.3.1. The XML file covers metadata about the resource itself (type of resource, title, language, keywords, target audience, classification codes, revision, etc.), about the registrant and the target RA, the persons that have contributed to the resource (author, editor, publisher, translator, etc.), the technical document format as well as rights information (cost and licensing), and of course the DOI assigned to this resource. The information is used for tracking a resource's life cycle as well as for search. In order to ease usage, ELEONET provides a multilingual Web-based metadata editor that allows a valid registration message to be quickly created in a few steps.

Submitting DOI registrations requires a valid login to an RA and a unique DOI prefix which will be allocated through the RA as well. The files may be uploaded batch-wise via a SOAP-based Web service or via the Registered Users' web site. Here, the users may also monitor and modify the resources they have registered and request new DOI prefixes.

## 4.2 ELEONET Search Facilities

ELEONET provides a public search engine for registered DOIs on the web site. The search criteria are the same as in the original registration files. For example, one can narrow the search to free English publications in the context of lower secondary school, containing specific keywords and consisting of one of the following resource types: exercise, simulation or questionnaire. The search results are displayed in a short form, allowing direct access to the digital resource using via the DOI link resolving mechanism.

While we tried to keep it at a reasonably high level, as in other similar projects, the LO's metadata is of heterogeneous quality. In order to let the user find specific LOs, however, it is obvious that some registrants still need to provide a certain quality of LO's descriptions.

## 5 Conclusions

This work presents ELEONET, a portal for LO registration, DOI assignment and search across more than 12,500 LOs from about 30 companies and organizations; content producers span educational publishers, non-profit entities, media companies, etc.

ELEONET's market research suggests that the European E-learning market is still immature, so this service currently needs to rely on the public funds. ELEONET's registration and search facilities give the possibility to visibly disseminate LOs, stimulating the re-use of educational content. In future, it would be interesting to enrich ELEONET with federated search capabilities and connect it to a major LOR network, for example to the GLOBE initiative.

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