DESIGN PROCESS OF A MULTILINGUAL VIRTUAL LIBRARY

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ABSTRACT
The AVICENNA VIRTUAL CAMPUS project, championed by UNESCO, has the aim to accelerate the adoption and use of ICT-assisted Open Distance Learning (ODL) in the Euro-Med region. As a backbone of this project, the UNED is in charge of creating a knowledge database, called Avicenna Virtual Library which will contain educational and methodological materials suitable for developing educational modules.

A multicultural and internationalizable e-learning or blended learning can not just rely on its Learning Content repository. The goal of developing content which might be used by students of different countries and in different languages can only be accomplished through the use of an adequately designed course metadata repository. Besides, a consistent course catalog repository must be built so that students can easily find which options they have in each country.

The tool for this Virtual Library will give web access to both course catalogue and content repository. The design process of the metadata structure for these inter-related databases is outlined in this paper. First, an introduction to the Virtual Campus is depicted. Secondly, the design architecture of the Virtual Library is shown, detailing the two repositories with responsibilities from UNED: the Catalogue and the Learning Object databases.

KEYWORDS
Learning Objects Metadata, Metadata Repository, Open Distance Learning, Virtual Campus, e-Learning, Internationalization

1. INTRODUCTION
The UNESCO (SC/AP) and European Commission initiated in 2002 a large project called Avicenna Virtual Campus within the framework of EU MEDIS programme [1]. The aim of this project is to create collectively Open Distance Learning (ODL) training, experience, course content and pedagogical innovation. The existing resources will be combined with the commitment of targeted Mediterranean institutions to build up a strong and cost effective implementation of ICT-assisted ODL in the Euro-Med region.

To fulfill this aim, a network is under construction, capable of transferring knowledge between entry points in each participating country known as Avicenna Knowledge Centres (AKCs). This implies that all the Centres respect a common norm with regard to technology.

The Avicenna network (see figure 1) mobilizes targeted Mediterranean and European Universities, which includes some of EU major Open Universities and ODL providers, as listed below:
Several demands for e-learning in the target Universities and societies are clearly identified, as ODL may bring wider access to University-based initial and continuing education. Therefore, Avicenna campus is meant to build a network which allows for professors, tutors and students the exchange of their contents and knowledge throughout each country’s entry point. The network organisation is stimulated by the engagement of some EU’s leading Open Universities, like CNED (France) or UNED (Spain), under the aegis of UNESCO.

Training for personnel is not avoided. Officers in charge of the knowledge centres will receive instruction in administration skills and in the pedagogy of e-learning: knowledge officers will also be trained to interact with the media engineers and professors, while tutors will be shown how to interact with students for a given course.

Finally, students will benefit from the Avicenna network in various ways: an accreditation procedure will be available for gained credits from one Centre acknowledged by other participating universities. Also, an educational virtual library is included.

UNED (Spain) is in charge of creating this Avicenna Virtual Library. It will contain both a Course Catalogue and a Learning Object Metadata Repository for the benefits of all the partners involved. Therefore, ‘cross-fertilization’ of contents is encouraged by participating universities. This goal is by no means an already-achieved challenge. Even though some other initiatives, such as Ariadne [6], have been working
towards the creation of an adequate LOM adaption, metadata repository, learner interfaces or indexation tools, Avicenna’s multicultural and multistate approach requires for a special treatment on the structure of the course information. The creation of an adequately structure course catalog is one of the keypoints in this project.

2. VIRTUAL LIBRARY ARQUITECTURAL DESIGN

There are two main aspects of this Avicena Virtual Library. In a first step, a basic AVL (Avicenna Virtual Library) access tool is being developed in order to provide the course catalogue information. This tool will allow visitors and students to retrieve information of the courses available in each Avicenna centre and also will give direct access to which courses they have been already registered (see figure 2).

![AVL components and interaction](image)

Figure 2. AVL components and interaction

In a second step, access to a complete pedagogical repository built up on a LOM (Learning Object Metadata) structure will be developed inside this tool. The basic idea for this repository is that it contains all educational and methodological materials required for developing the educational modules.

Soon many problems arise in this designing process [2]. Some come from the interaction with the Open Source e-learning platform selected, called Pleiad [3], and its database structure. The aim is to share as many metadata components as possible for both the structure of the catalogue metadata items and the repository. Therefore, a data integration strategy is needed so that the interaction is as decoupled as possible. This approach will allow for the application to be very scalable and reusable. The different options for this task are the following:

- Use of Pleiad API: the access of a published API (Application Programming Interface) would permit an easy integration, as long as it is consistent and standarized. A typical risk in this type of integration is the creation of a programming language-dependent architecture

- Federated access to Pleiad database and Metadata Repository: as the catalogue and Pleiad’s relational structure can be well-known for the metadata repository system, a simple federated database wrapper could be built such that the addition of course content also populates the metadata repository. The main challenge in this option is the maintenance of data consistency.
Pleiad screen-scraping: the last choice is the direct access to the Pleiad access through its web interface, by using a web data extraction and navigation tool to avoid any data access consistency and coherency risk. Sadly, this type of tools is still very scarce and expensive. Because the catalogue will have access to Pleiad’s relational model, the second choice has been adopted. Also, other key factors greatly influence the design and management of this database metadata. For example, the blended learning method that includes the use of many external sources (personnel and materials) and the complete coverage of different multicultural educational approaches.

3. CATALOGUE METADATA DESIGN

Starting with one of the key documents of ECTS, the regular Information Package/Course Catalogue [4] a new metadata items list has been developed in order to fulfill more adequately the requirements of such a multilingual network.

Basically, the adaptation of the regular Information Package/Course Catalogue consisted in two main areas:

**Information on the Institution**
- Add information on the AKC and staff from each country, avoiding confusion with the entities participating in the project.
- Incorporate future proprietary Avicenna Virtual Campus regulations and credits conversion policy.

**Information on degree programmes**
- Incorporate student mobility policy.
- Add information on Area of knowledge, type of course and academic level, keywords and summary
- Add information on authoring and Copyright laws
- Incorporate some key features given by the blended-learning method selected: tutoring information, off-line materials and assessment methods

With all the above a preliminary version is shown in table I.

4. LOM REPOSITORY DESIGN

Due to the complexity in indexing and retrieval of the pedagogical metadata resources, the adoption of the IEEE LTSC LOM global standard solution is asserted [5]. Therefore, effective queries on learning objects will be allowed. Besides, several data elements have been created in this model, just for the purpose of describing the content and characteristics of the resource during the indexing process. Moreover, the intercultural dimension of cooperation is also one of the strategic aspects of the project, and IEEE LOM is capable of addressing specific Avicenna requirements, such as multilingual and multicultural diversity.

LOM incorporates a large number of fields classified into 9 categories (none of them mandatory). It also incorporates several important features for Avicenna Respository such as 4 categories for different object granularities. The LOM adaptation, that is the application profile for Avicenna, is currently under development.

With all this, the design requirements ask for an open, simple, flexible and light-weight implementation. The object repository will be accompanied by a metadata relational repository, which will be accessed by a well-defined Web Service interface. Specific XML format which allows for this characteristics is being defined for data exchange. This format, although based on the XML Binding for LOM [IEEE1484], is created by using Xlink for the purpose of permitting a decoupled and highly distributed hierarchy.
Table 1. ECTS recommendation adaptation for Avicenna course catalogue

<table>
<thead>
<tr>
<th>Information on the Institution</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of University</td>
<td></td>
</tr>
<tr>
<td>General description of the institution</td>
<td></td>
</tr>
<tr>
<td>Academic authorities</td>
<td></td>
</tr>
<tr>
<td>AKC academic authorities</td>
<td></td>
</tr>
<tr>
<td>List of degree programmes offered in the AKC</td>
<td></td>
</tr>
<tr>
<td>Academic calendar</td>
<td></td>
</tr>
<tr>
<td>Admission/registration procedures</td>
<td></td>
</tr>
<tr>
<td>Avicenna Virtual Campus regulations</td>
<td></td>
</tr>
</tbody>
</table>

**Information on degree programmes**

**GENERAL DESCRIPTION**

- Programme identificator
- Qualification awarded
- Admission requirements
- Educational and professional goals
- Access to further studies
- Course structure diagram with credits
- Examination and assessment regulations: final test, if any, presental,...
- Student mobility policy

**DESCRIPTION OF INDIVIDUAL COURSE UNITS**

- Course title
- Course code
- Area of knowledge (Computer Science, Science and Technology, Management, Diplomacy)
- Type of course (adapter, produced)
- Level of course (Bachelor, Master, Doctorate, ...)
- Semester
- Number of credits allocated (workload based)
- Exchange Universities inside Avicenna Campus + Adapted language
- Authoring
- Copyright
- Name of lecturer
- Tutoring (presental, online)
- Language of instruction
- Keywords
- Summary
- Objective of the course (expected learning outcomes and competences to be acquired)
- Prerequisites
- Course contents
- Recommended reading
- Off-line materials (CD-ROM, videoconferencing, radio, ...)
- Teaching methods (presental, tutoring)
- Assessment methods (tests, labs, ...)
5. COMMON DECISIONS ADOPTED

Some decisions have been adopted for both inter-related databases, the catalogue metadata and the learning objects repository, in terms of indexation process and the use of a common Thesaurus.

On the indexation process, the search will include a keyword search functionality (Google-like search) that searches all metadata fields containing those keywords and their values [6]. Open Source LUCENE indexer from the Apache Jakarta Project has been selected as an open-source software with a full feature “text search engine”.

The use of a Thesaurus is a complicated matter. Available Thesauri applied to different but unique thematic areas, while the Avicenna Campus relies on four different thematic areas: computer science, science and technology, business and diplomacy studies. Therefore, there is currently no Thesaurus that fulfills easily our requirements and of course, the cost of producing and maintaining our own thesaurus is extremely difficult to sustained. As a partial conclusion, Thesauri give usually static aid for searching engines but web searches are more dynamic.

6. CONCLUSION

The Virtual Library presented here aims to create a self-sustainable multicultural framework for an ODL campus that should possibly stimulate the co-operation between high education institutions inside the Mediterranean region. At present, many parallel working threads are alive: complete definition of catalogue and LOM repository metadata items, interaction tools among all databases and the selection of courses to be produced.

But as we all know, creators of courses do not reuse learning objects enough because they don’t succeed in finding relevant material. And the lack of content is due to the time needed for the metadata fields fill-in procedure. Therefore the success of this repository also depends in key matters such as copyright terms and agreements, which must also be addressed.

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