Online sharing educational content on biodiversity topics: a case study from organic agriculture and agroecology

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Abstract — E-Learning Technologies and Standards are emerging as the dominant way to make educational content widely available. Approaches to these technologies should be domain-independent and easily adaptable to different contexts. Organic.Edunet aims at making content on Organic Agriculture and Agroecology widely available through a single point of reference. To achieve this, the project has adopted and adapted Open Software solutions and has built upon them to offer the Organic.Edunet Web Federation Portal and the Repository Suite of Tools. This paper presents the tools that were developed in the frame of Organic.Edunet project, serving as a guide for all individuals that aim at establishing similar tools in a field such as the biodiversity.

Index Terms — repositories, education, open access, metadata.

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1 INTRODUCTION

The Organic.Edunet project aims to facilitate access, usage and exploitation of digital educational content related to Organic Agriculture (OA) and Agroecology (AE). From the technical viewpoint of the project's objectives, Organic.Edunet aims to support stakeholders producing content about OA & AE in order to publish it in an online federation of learning repositories and describe it according to multilingual, standard-complying metadata. This objective is accomplished through the deployment of the Repository Suite of Tools.

Also on the same basis, the project has deployed a multilingual online environment (the Organic.Edunet Web portal) that facilitates end-users' search, retrieval, access and use of the content in the learning repositories. Both tools deployed (the Repository Tool and the Web Portal) are already running smoothly on the web while

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small changes are being made to ensure a smooth operation. Having completed the biggest part of the work involved, the Organic.Edunet partners have a clear view of all the complexity, problems, issues and challenges that were faced during the deployment of the tools.

This paper aims to briefly describe the tools produced in terms of their main characteristics and to present a part of the work that was carried out for launching them successfully. More specifically, the metadata application profile that was used to deploy the Repository Tools will be described, and the main parts of the Organic. Edunet Web Portal will also be analyzed. Overall, this proposal aims to demonstrate a complete process of making educational content available online through the use of e-learning technologies and standards. This paper also aims to serve as a reference point for ongoing or future projects that will deal with the issue of making educational content available, regardless the application domain. The proposed methodology and tools can be deployed in order to support education on biodiversity.

2 TOOLS AND PROJECT RESULTS

2.1 APPLICATION PROFILE

The IEEE LOM standard has been chosen as the basis for the metadata application profile to be used in Organic.Edunet. The schema is therefore termed as Organic.Edunet Application Profile (AP). It adopts many of the elements of LOM, specializing several of them in order to better describe learning resources on organic agriculture and agroecology. In each one of the nine (9) categories of LOM elements, a number of elements have been refined, in order to be used in Organic.Edunet [1].

2.2 REPOSITORY TOOL

The Organic.Edunet AP is implemented in a repository management tool that is being used for the organisation and management of learning objects. The repository tool can be used by content providers to create learning resources, collections, and complex learning objects such as online exhibits and educational paths. Moreover, the tool allows content providers to design and integrate educational templates that implement specific educational paths and digital exhibits. Using the repository tool, content providers can generate complex learning objects by reusing existing learning objects in their repository.

The repository tool is used to describe resources with appropriate metadata, and to publish resources in their own learning repository. When the resources are published in the individual repositories, they can be harvested from the Organic.Edunet Portal. When a resource is harvested, it is published on the portal where users can access it.

The repository tool allows content providers to connect their repository to the Organic.Edunet federation of repositories. In addition, the tool supports the connection of the repository with other federations of learning repositories. This is achieved through the adoption of open standards and specifications for the

exchange of search queries and the harvesting of metadata. These standards and specifications include the Open Access Initiative Protocol for Metadata Harvesting (OAI-PMH, http://www.openarchives.org) and the Simple Query Interface (SQI) [2].

2.3 THE PORTAL

The Organic.Edunet Web portal (http://portal.organic-edunet.eu) aims to facilitate access, usage and exploitation of digital educational content related to Organic Agriculture and Agroecology. It is a multilingual online federation of learning repositories, populated with quality content from various content producers. Its main purpose is to facilitate end-users' search, retrieval, access and use of the content in the learning repositories.

The development of the Organic.Edunet Web portal addresses one of the main objectives of the project. That is to integrate and specialize state-of-art technologies of the World Wide Web, in order to provide end-users with a single European reference point that will offer advanced services such as ontology-based searching and social recommendation and facilitate search, retrieval and use of the collected content. The global architecture of Organic.Edunet is thus composed of 2 major subsystems (shown in Fig. 1):

- **Organic.Edunet Web portal (top part):** It provides services to the portal users (such as learners, teachers, professionals, etc.), ranging from searching through the content in various ways (different search functionalities), to tagging of resources and bookmarking of resources in a personal online space. The users are able to see the resources and their metadata because this information is fed into the portal from the federation of repositories.
- **Federation of Repositories (lower part):** This subsystem includes the repositories containing either the learning resources uploaded by the content providers of the project, or their metadata or both.

The potential users of the Organic.Edunet Web Portal include: teachers, students, pupils, researchers, OA&AE professionals, general public, etc. The Web Portal is internally made of four components: the semantic repository Ont-Space, the semantic navigation module, the portal infrastructure and the social navigation module.
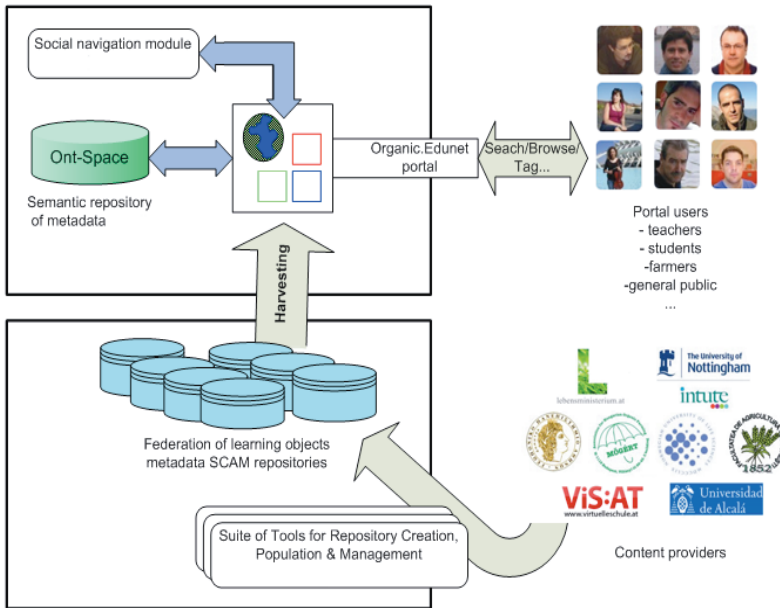
Fig. 1 – Overview of Organic.Edunet technical architecture.

2. 4 SEMANTIC REPOSITORY ONT-SPACE

Ont-space is a software framework for the deployment of semantic Learning Object Metadata Repositories. Ont-space is based on LOMR [3] a semantic learning object metadata repository developed as part of the LUISA project. The semantic repository is driven by ontologies that contain the specification of the learning object schema used such as Dublin Core, IEEE LOM, etc. Ont-space enables specialized components, such as custom query managers and result composers, to benefit from the availability of different, heterogeneous ont-space instances.

2.5 SEMANTIC NAVIGATION MODULE

The semantic navigation module is responsible for the semantic search capabilities integrated in the architecture. The main objective of the semantic navigation module is to provide an ontology-based semantic interface for performing interactive searching sessions. This is carried out through the navigation of ontology elements (classes, individuals and properties) and their relations. This process is totally ontology-independent, so any valid ontology in OWL format can be navigated, and particularly the OA&AE ontology developed for Organic.Edunet [4]. This type of semantic search provides more accurate and meaningful results, eliminating non-relevant results and avoiding the existence of long lists with repeated elements in the search outcomes.

2.6 PORTAL INFRASTRUCTURE

The Organic.Edunet Web portal has been designed to be used by non-expert users (usability has been a priority) and developed over a customized Joomla CMS (Content Management System) installation. The technical partners of the project developed some Joomla add-ons in order to provide customized functions in the Organic.Edunet Web portal architecture.

As the Web application based on Joomla needs to communicate with other architecture elements, there is a need to establish some communication guidelines. The interaction between the Ont-Space module and the Joomla-based Web portal is asynchronous and it takes place through the new components developed and integrated in Joomla. Those components have been implemented in PHP and AJAX, follow the Joomla MVC guidelines. The communication between Ont-Space and Joomla is based on the exchanging of JSON objects that contains the information sent from Ont-Space in an asynchronous way as result of a request from Joomla to a concrete remote servlet in Ont-Space.

2.7 SOCIAL NAVIGATION MODULE

The Web Services API of the Organic.Edunet Social Navigation Module are available only within the scope of the OrganicEdunet's suite of tools. The available methods of this Module's API that are exposed as Web Services are grouped in 5 categories: General Methods, Resource Annotation Methods, Prediction Methods, Recommendation Methods, and Population Methods.

3 DISCUSSION

The Organic.Edunet Tools are fully deployed and are being used by the Organic.Edunet partners. More specifically, the repository tool has been set up and is used by the project partners to upload resources and links, also annotating them with metadata. Presently, a translation of the repository tool is underway to include more languages (i.e. French, Czech, Slovenian, Bulgarian, Turkish, Dutch and Hindi).

The Organic.Edunet Metadata Application Profile is also completed and deployed in the repository tool. Some work is also being carried out for the translation of the AP, so that the repository tool can be set up for different languages, thus helping additional communities connect their material with Organic.Edunet. The same languages that are being added for the repository tool are also translated for the metadata AP.

As far as the Organic.Edunet Portal is concerned, this is currently being used by a great number of users, as the Organic.Edunet Open Days are underway. The participants of the Open Days are also asked to provide their feedback using an online questionnaire. All the results are being evaluated by the responsible Organic.Edunet partner, making the necessary revisions to the portal. Additional languages are also being deployed, building on the existing support offered by the Joomla community. More specifically, all the portal texts

are being translated to open the Organic.Edunet Portal to stakeholders that are interested in connecting their collections to Organic.Edunet Portal.

4 CONCLUSION

This paper presented the basic tools – technologies that were developed during the Organic.Edunet project. Its main aim was to provide a brief overview of the whole system deployed through Organic.Edunet that can serve as a reference point for institutions trying to open their content to the world, by setting up learning repositories and by making their content available through open access portals. A possible direction to take advantage of the finding of this paper, is to adapt the process to biodiversity, in order to explore how well will this approach fit to this domain.

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