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Online Web portal of competence-based training opportunities for Organic Agriculture

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Abstract

A number of Information and Communication Technology (ICT) tools such as web portals, learning portals and course management platforms have been developed and used in order to support EU-funded research and training projects in the area of Organic Agriculture (OA). This tools transfer the technological infrastructure needed in order to facilitate specific tasks, such as the organization of educational, research and information content, like the competences, learning opportunities, certificates and vocational opportunities. This paper presents the case of the CerOrganic Web portal (http://portal.cerorganic.eu), which is used for providing access to resources related to vocational education and training in the context of OA.

Key words

Competences, competence model, organic agriculture, OA, ICT tools, web platform.

1. Introduction

Organic agriculture (OA) is a rapidly developing sector of agriculture. According to statistical information from the Research Institute of Organic Agriculture FiBL (2011), there has been an increase of about 36% in the organically cultivated land in European Union (EU) from 2005 to 2009. A corresponding increase is also noted to various aspects regarding OA, such as the land in conversion process, the number of OA producers and processors, as well as the research made and published in the context of OA comes as a reply to intensive and polluting forms of agriculture, and as a suggestion for healthy living and a different approach of both producers and consumers. OA in EU is supported by a corresponding legislation and a framework based on the "European Action Plan for Organic Food and Farming", which "sets out 21 initiatives to achieve the objectives of developing the market for organic food and improving standards by increasing efficacy, transparency and consumer confidence. It follows the rapid increase in the number of farmers producing organically and strong demand from consumers during the past few years" (Commission of the European Communities, 2004).

In order to support this ever-growing movement of OA, a number of research projects have been funded by EU, in order to scientifically support the research made in the context of OA, as well as to provide solutions and increase opportunities for the vocational education and training of the actors involved, including OA trainers, advisors, extension officers and farmers. In order to meet the constantly increasing training needs of the aforementioned groups as well as for facilitating the delivery of education and information to geographically remote stakeholders, these projects have produced a number of ICT tools, such as web portals (Šimek et al., 2010), learning portals (Manouselis et al., 2009), course management platforms (Mylonakis et al., 2011), e-commerce platforms and other tools that make use of the latest technological advances. The main aim of such tools is to make the information available to all stakeholders, by removing geographical and other barriers. In addition, these tools facilitate the organization, classification and publication of digital informative, educational and scholarly resources in an organized manner. However, despite the wealth of information related to vocational education and training in the area of OA, it seems that there is no central point of access to information related to job profiles and the corresponding competencies, training opportunities and the corresponding certificates as well as the related learning outcomes.

Competence-based development of vocational education and training supports the design of improvements to Human Resources Management

systems, including job redesign, recruitment, internal organizational training, career management, performance improvements and compensation systems (UNIDO, 2002) in several professionals sectors, as well in OA.

This paper presents the CerOrganic Web portal, a portal that was developed during the CerOrganic: Quality-Certified Training of Farmers on OA project (www.cerorganic.eu), a 24-months project, supported and co-funded by the European Commission through the Lifelong Learning Programme as a Leonardo da Vinci, Development of Innovation (DoI) project. The overall aim of CerOrganic was to develop and test a quality assurance procedure for the continuing vocational education and training of agricultural experts, based on the European Quality Assurance Reference Framework (EQARF, 2009). One of the major products of the CerOrganic project is the CerOrganic Web portal, which supported the aims of the project by providing a point of access to the aforementioned material related to the context of vocational education and training in OA.

2. Background

2.1 Definitions

Based on the European Qualification Framework for Lifelong Learning (EQF, 2012) and the German Reference Framework, PAS 1093 (Publicly Available Specification), competence is defined as the ability to reasonably and intentionally perform a specific job and task in an unknown situation with success: Competences encompass a combination of knowledge, skills, and (intentional) behaviour and are constituted by defined activities for the observation and measurement. Competences are built and are normally demonstrated by individuals (but also by teams and whole organizations) (PAS 1093, 2009).

Knowledge is defined as one of the "outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. Knowledge depicts the awareness, information, or understanding about facts, rules, principles, guidelines, concepts, theories, or processes needed to successfully perform a task (Marrelli, 2001; Mirabile, 1997). The knowledge may be concrete, specific, and easily measurable or more complex, abstract, and difficult to assess (Lucia & Lepsinger, 1999). Knowledge is acquired through learning and experience. According to the EQF definition, knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study (EQF, 2008).

The skills are defined as "the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments)" (EQF, 2008). A skill is a capacity to perform mental or physical tasks with a specified outcome (Marrelli, 1998). Similar to knowledge, skills can range from highly concrete and easily identifiable tasks, such as filing documents alphabetically, to those that are less tangible and more abstract, such as managing a quality improvement project (Lucia & Lepsinger, 1999). According the EQF, skills are defined as the ability to apply knowledge and use know-how to compete tasks and solve problems (EQF, 2008).

"Learning outcome" is defined as a statement of what a learner knows, understands and is able to do on completion of a learning process. The EQF therefore emphasizes the results of learning rather than focusing on inputs such as length of study. Learning outcomes are specified in three categories – as knowledge, skills and competence. This categorization identifies that qualifications – in different combinations – capture a broad scope of learning outcomes, including theoretical knowledge, practical and technical skills, and social competences where the ability to work with others will be crucial.

Job Profile plays a critical role in managing human resources, including better understanding and definition of the duties and responsibilities in a work place, recruitment, job evaluation, performance appraisal, training and development.

Finally, certificate is the proved declaration of the successful fulfillment of the training.

2.2 Related Competence-based Web Portals

Several research, EU-funded projects have already worked on the direction of the development of competence models and identification of competences, supporting the professional training. The TEN-Competence project (www.tencompetence.org) aimed to integrate online tools and learning environments in a common infrastructure, based on the lifelong competence development (Fig.1). In addition, the iCOPER project (www.icoper.org) developed the best practice guides and online environment for the exchange of competence models and learning

outcomes, collaboration in terms of learning design and reuse of digital training objects (Fig. 1).

The WACOM project (www.wacom-project.eu) focused on the identification competence models and competences for professionals in the water sector, enhancing the improvement of professional training and workplace training (Stracke, 2011). Online representation of the WACOM Competence Model was designed in a way to describe the competences and workplaces tasks of the actors in fields like the waste water treatment management (Thanopoulos et al., 2011). The WACOM Competence Models Online Form for the description of competence is presented in the Figure 3.

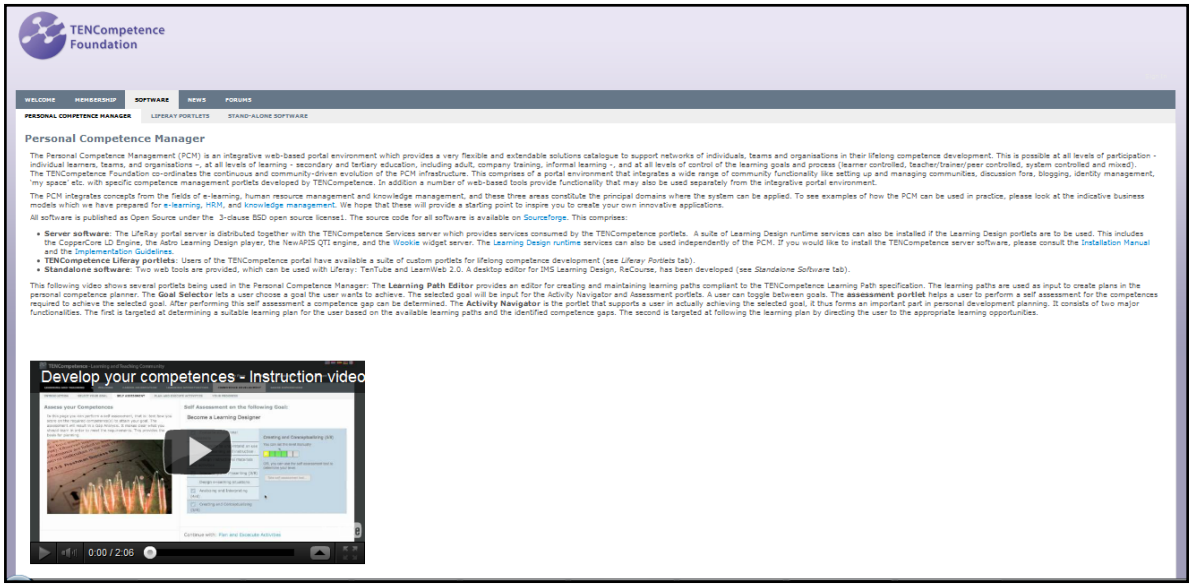

Figure 1: TEN Competence portal with the tutorial video on how to build your own personal competences

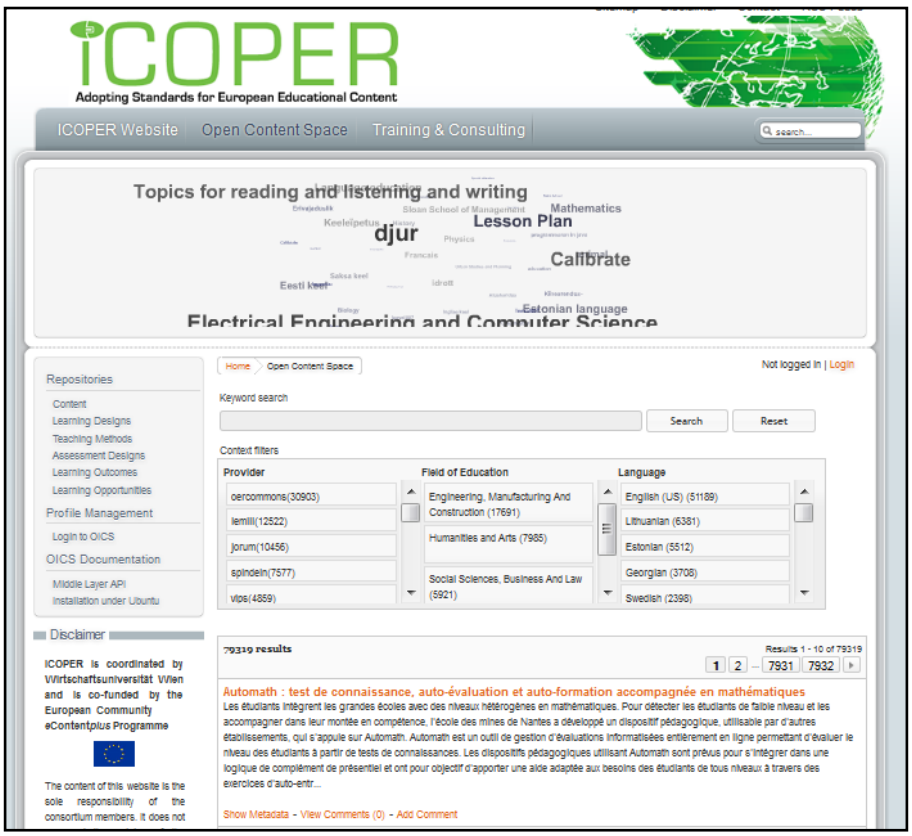

Figure 2: iCOPER repository with training content based on competences and learning outcomes.

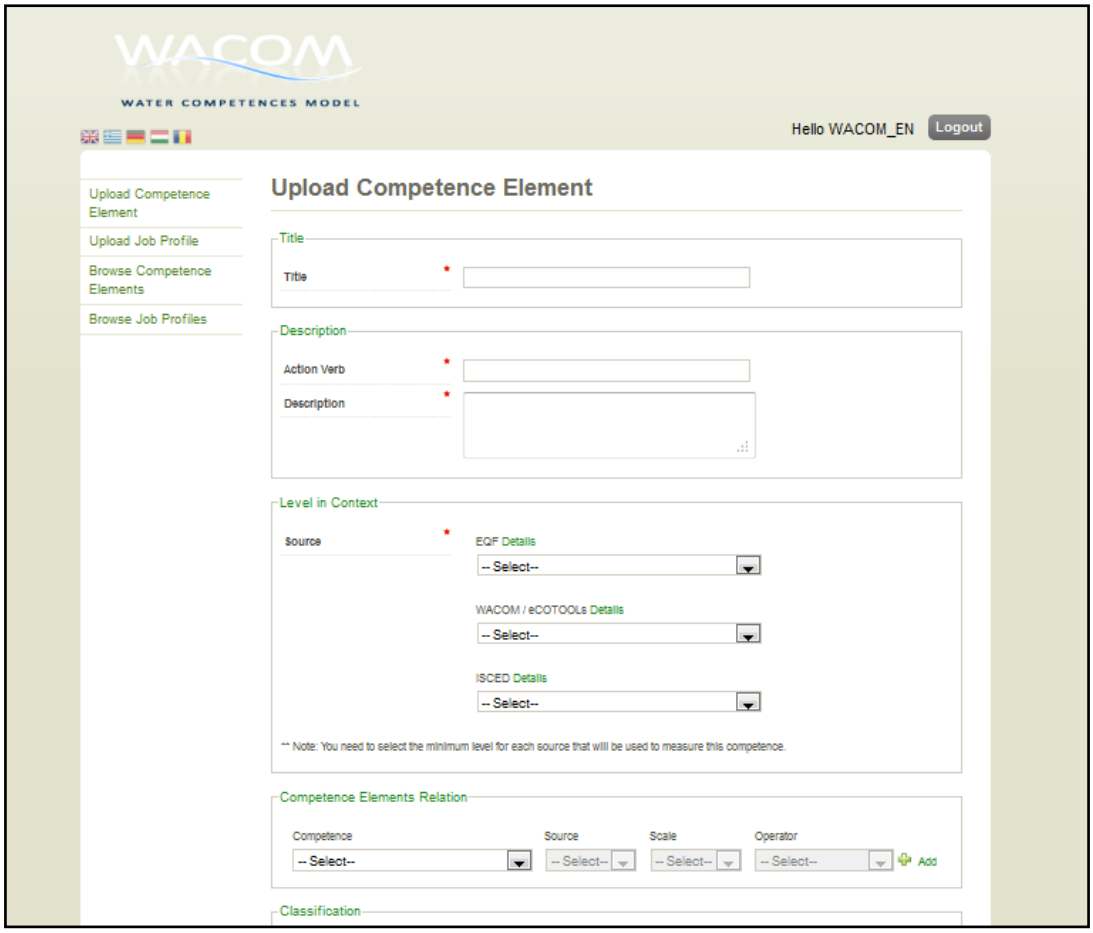

Figure 3: WACOM Competence Model Online Form for the description of competences.

3. The CerOrganic Web Portal

The CerOrganic Web Portal (http://portal.cerorganic.eu) was developed in order to meet the vocational education and training needs raised in the context of OA. It is a portal that supports the development of innovative ICT-based content, services, pedagogies and practices for lifelong learning, focusing on the vocational education and training sector of agriculture (Thanopoulos et al., 2011). It lists, collects, describes and categorizes vocational training content that help stakeholders of the vocational education/training of agricultural advisors/trainers, based on the European Quality Assurance Reference Framework (EQARF). A typical user of the CerOrganic Web Portal is able to browse through its content and find information about available jobs and vocational training opportunities, particularly in the rural and agricultural areas, as well as certificate supplements that can be obtained from the corresponding vocational training opportunities. Through the CerOrganic, the user has access to the following services:

- Upload / Create Digital training Objects (DTOs). A user can fill in the online form for the description of a new DTO or review an existing DTO. For instance, the online form foe a new training opportunity object includes the metadata elements: a) training opportunity provider details, b) training opportunity instance, c) classification (based on the European standards of NACE codes, Organic. Edunet ontology and coverage), d) (related) certificates, e) entry / access requirements and f) objectives (competence and / or learning outcomes).
- Browse DTOs. A user can browse through the available DTOs and select the preferable result. The first step is to hit the appropriate link from the left side menu (e.g. “Browse Training Opportunities”). All available Training Opportunities are categorized by type, by provider, by country, by language and by classification. The user can select the category of the Training Opportunity by clicking on the appropriate link.
- Search DTOs. A user can search for DTOs, using the simple search or advanced search

tool. The first step is to hit the appropriate link from the left side menu (e.g. "Search Training Opportunities"). The available Training Opportunities elements are available for the user to select.

- View My Contribution (DTOs uploaded by the user): This is a private place where each user can view his own DTOs (e.g. training opportunities) than he has previous uploaded.
- Registration to the portal. A user can registered to the CerOrganic portal in order to have full access to the portal services. E.g. the description of a new DTO (e.g. a new training opportunity) is accessible only to registered users.

Figure 4 shows the available filters of the search mechanism for competencies.

A number of DTOs have been described and stored in the CerOrganic Portal so far, including competences elements, learning outcomes, training opportunities and their certificates, as well as job profile objects. The organization of the DTOs objects into these specific categories helps the users when searching for particular material to develop the CerOrganic use cases of the learning resources (Maroudas et al., 2011).

3.1 Methodology

The steps that were followed in order to design and develop CerOrganic Web portal are:

a) Identification of the main information resources that will be stored, annotated, shared and accessed through the portal.

b) Outline of the general architecture and user roles involved.

c) System analysis and specification using the Unified Modeling Language (UML, www.uml.org).

d) Development of the required metadata application profile (AP) for the description of the resources available through the portal.

e) Interface design and prototype development.

f) Public operation and testing with a sample set of real users.

3.2 Content

DTOs include a variety of resources, containing different types of information. For example, they represent rural and agricultural professions that are described and stored in the database, in order to support the scenarios of the project. These are

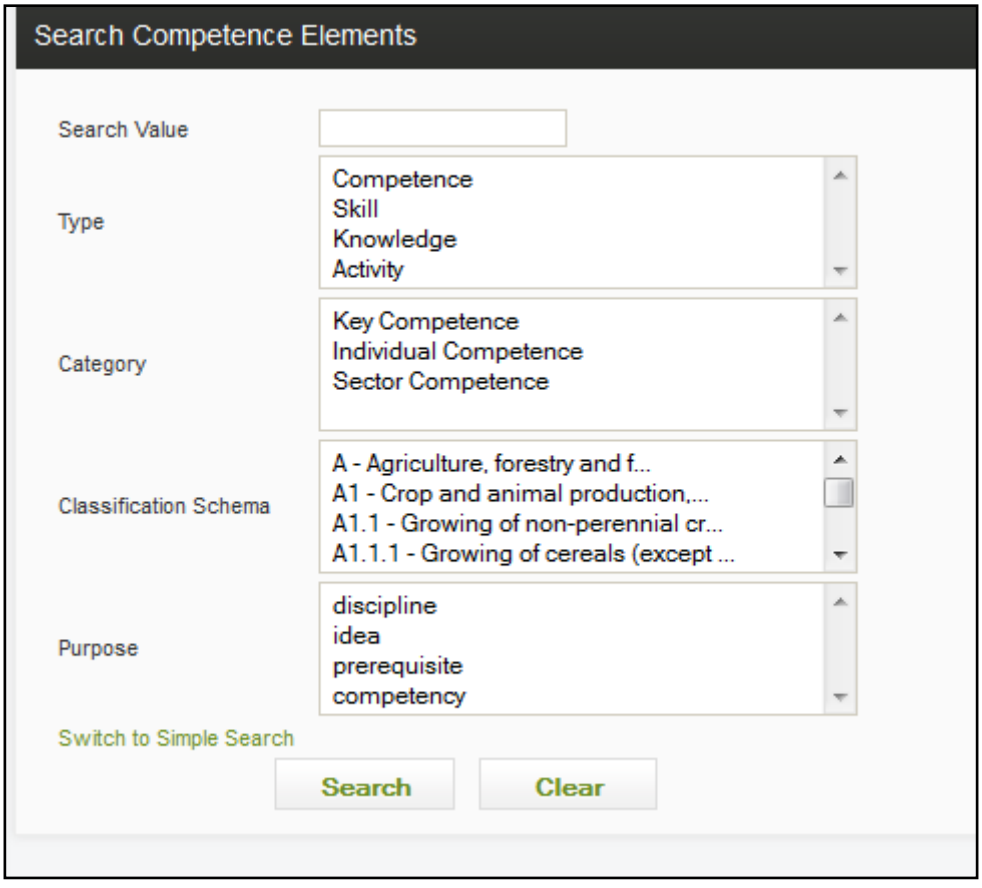

Figure 4: Searching for competence elements in the CerOrganic Web portal.

registered according to the category / classification to which they belong and decomposed in their appropriate competences and other lower level components. Another type of DTOs are Learning Opportunity Objects (or Training Opportunities Objects), pertinent to rural and agricultural professions which are related to the appropriate competences that they offer. Further Learning Opportunity Objects have been collected in the future from distributed databases existing in other systems.

DTOs also include Certificate Supplement Objects, pertinent to rural and agricultural vocational training that are correlated to the appropriate competences that they certify and to the appropriate learning opportunities from which they can be obtained. Further Certificate Supplement Objects (e.g. Europass Certificate Supplements or descriptions of other types of Certificates) have been collected from distributed databases existing in other systems. Besides, Vocational Objects (or Job Profiles objects) have been been included in the design of the CerOrganic Web Portal, even if it was not in the overall objectives of the CerOrganic project.. The Vocational objects offers a n efficient solution for the better understanding and identification of the working places and the jobs tasks for the OA.

Finally, another type of DTOs are Competence Elements Objects (competences, knowledge, skills and activities) and learning outcomes, pertinent to rural and agricultural vocational training. Competences are a building and supporting block for all other types of DTOs stored and categorized in the the CerOrganic Web Portal. All the aforementioned DTOs are described and stored in the database of the CerOrganic Web portal.

3.3 Architecture of the CerOrganic Web Portal

The main architecture of the CerOrganic Web Portal, as well as the types of users of the CerOrganic Web Portal and their interaction with the portal are illustrated in Figure 5, where the users accessing the portal, the corresponding services as well as the repositories involved are depicted.

The figure 5 depicts the conceptual overall architecture of the CerOrganic Portal.

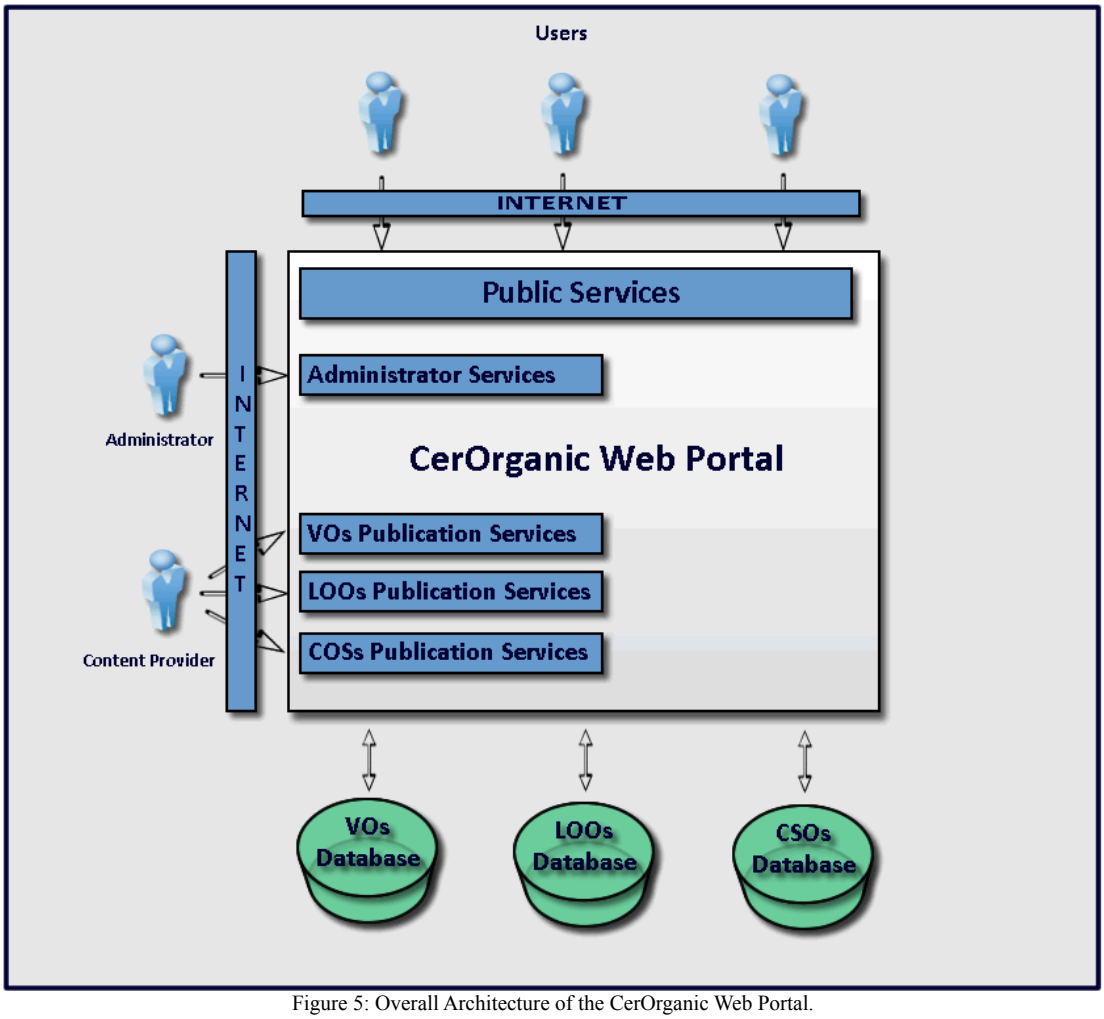

Figure 5: Overall Architecture of the CerOrganic Web Portal.

- At the lower level the database can be seen. The database is where the actual information of the objects is held. Since three core different DTOs (VOs: Vocational Objects, LOOs: Learning Opportunities objects and CSOs: Certificate Supplements objects) and supporting DTOs (Competences Elements and Learning Outcomes) have been chosen to be hosted in the Web Portal, three different databases exist, one for each DTO type. Of course this is the conceptual view, since technically a single database will be employed, divided in three different areas.
- The "Publication Services" represent the available services that will be provided by the CerOrganic Web Portal, i.e. upload / edit a VO / LOO / CSO and review it,
- Outside the CerOrganic Web Portal, the different user types that interact with it can be seen, each accessing the specific functionality available to his type.
- As regards the envisaged users of the portal, there are three main types of users, each one accessing the CerOrganic Web portal in a different way:
- Visitors, who can use the services of the portal such as browsing or searching for VOs / LOOs / CSOs and Competence Elements (e.g. competences) and Learning Outcomes. Visitors can be either registered or unregistered, with the registered ones having access to a wider set of the portal's functionalities.
- Content Providers (CPs), who can insert VOs / LOOs / CSOs and Competence Elements (e.g. competences) and Learning Outcomes and describe them by creating the corresponding metadata records. Content Providers have the ability to upload DTOs and the corresponding Metadata.
- Administrators, who perform all the administrative functions related to Visitors, Content Providers and DTOs. Those include Viewing/Deleting/Deactivating DTOs and the corresponding metadata, Accepting or Declining Requests for Registration from CPs, Viewing / Activating / Deactivating Registered Visitors or CPs, etc.

3.4 Use Cases

During the design and development of the CerOrganic Web portal, the Unified Modeling Language (UML) was used, in order to analyze the system and its expected operations. UML is the software industry standard modeling language for visualizing, specifying, constructing and documenting the elements of systems in general, and software systems in particular. UML helps towards the top-down refinement of software systems from the early stages of collection of requirements until the development of the required software components, by providing a user-friendly approach of graphical artifacts (Boggs and Boggs, 2002).

Based on the UML approach, the use case diagrams for the three types of users have been developed and are shown in the figures 6, 7 and 8.

3.5 CerOrganic Web Portal Design and Specifications

DTOs available through the portal are described with metadata according to the CerOrganic Metadata Application Profile (Manouselis and Maroudas, 2011), which is based on the Learning Object Metadata published by the Institute of Electrical and Electronics Engineers Standards Association (IEEE LOM) application profile (IEEE 2002), widely used for describing educational resources with metadata. Interoperability and reusability were two factors taken into consideration during the development and implementation of the CerOrganic AP, as the interconnection of the CerOrganic Web Portal and other closely related online portals such as the Organic.Edunet Web Portal (www.organic-edunet.eu) and the ARIADNE foundation (www.ariadne-eu.org) was a critical factor for the availability of the portal's content through these additional means of publication.

Thus, the CerOrganic Web portal supports the harvesting of the metadata records of its content to other learning repositories through the OAI-PMH protocol (Open Archives Initiative Protocol for Metadata Harvesting - www.openarchives.org/pmh). This specific classification supports the users in their search for particular material to develop the CerOrganic use cases of the learning resources (Maroudas et al., 2011). The metadata elements of the CerOrganic AP used for the description of the Training Opportunities and Competencies are depicted in Figures 9 and 10 respectively.

To facilitate searching and locating all Objects hosted by the CerOrganic Web Portal (i.e. VOs, LOOs and CSOs), they should be adequately described, detailing important characteristics. In this way, users can simply go through the various descriptions, and select the most appropriate resources for their needs. Apart from reflecting the most important characteristics, descriptions also have to be available in the language of the users (that is, multilingual descriptions will be necessary).

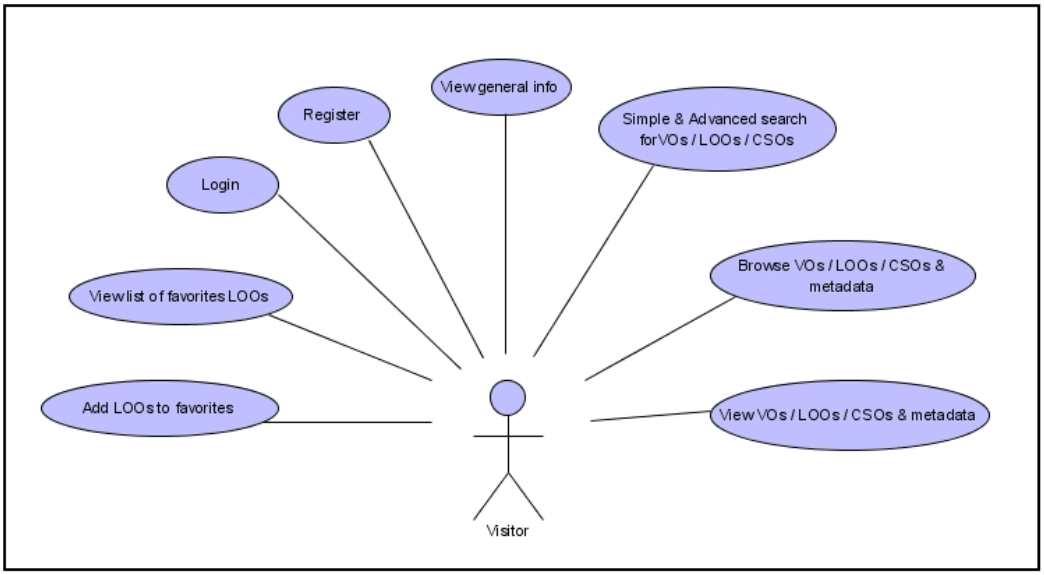

Figure 6: Use case for the Visitors of the CerOrganic Web portal.

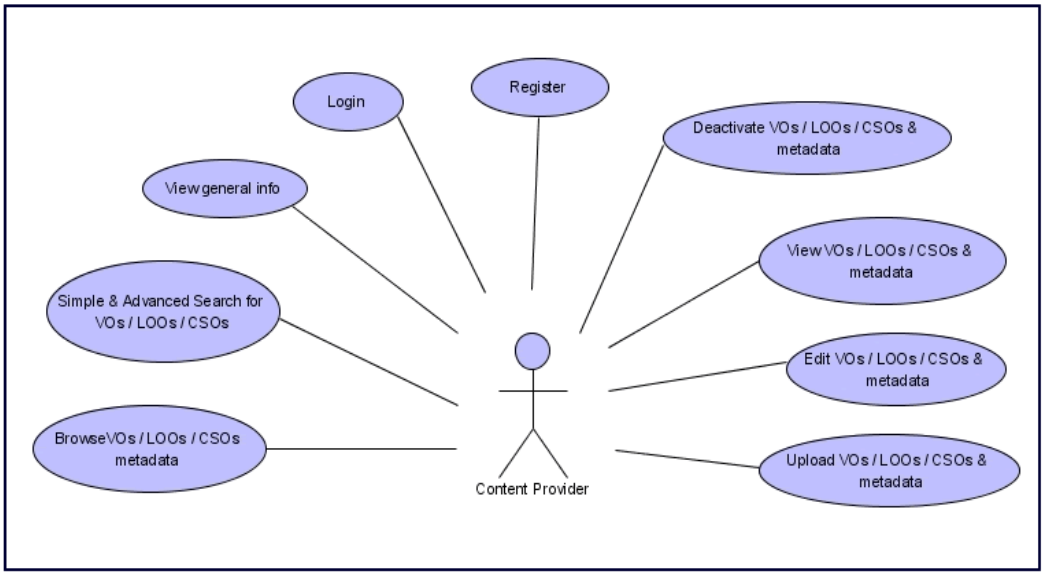

Figure 7: Use case for the Content Providers of the CerOrganic Web portal.

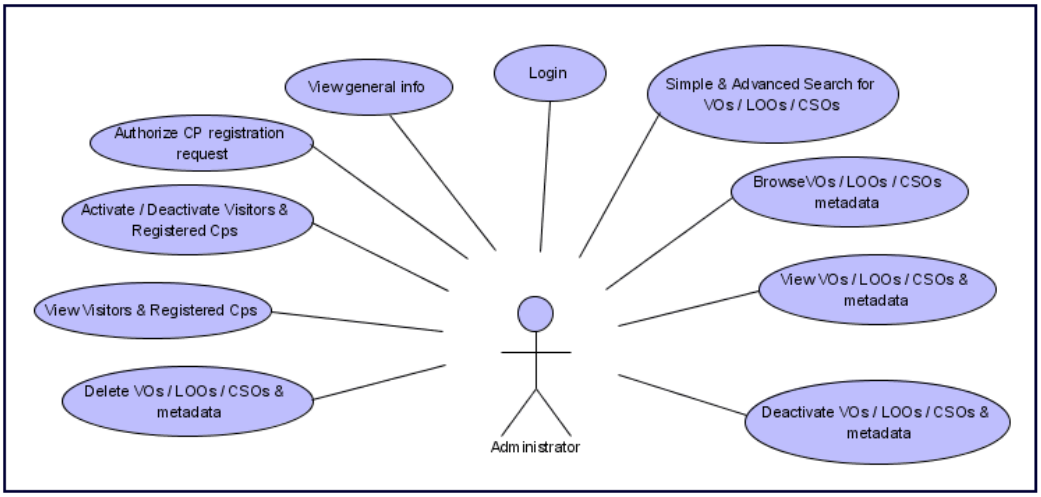

Figure 8: Use case for the Administrators of the CerOrganic Web portal.

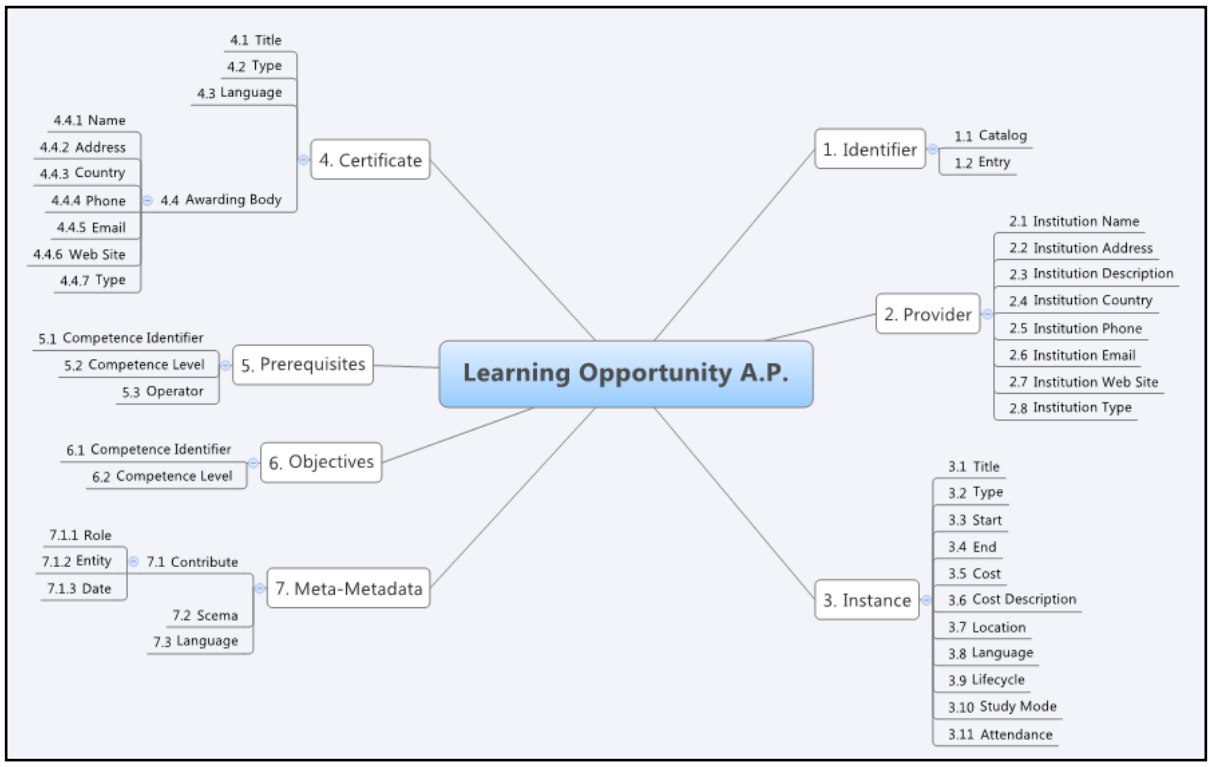

Figure 9: Metadata elements of the CerOrganic AP, used for the description of the training opportunities.

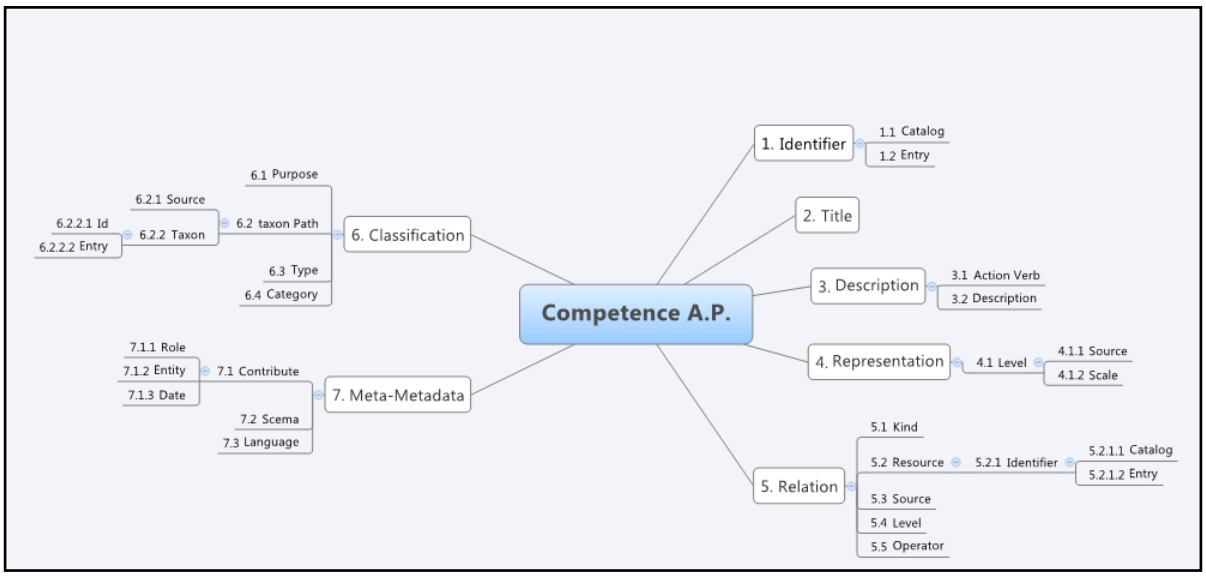

Figure 10: Metadata elements of the CerOrganic AP, used for the description of the competencies.

The Competence Element Objects, pertinent to rural and agricultural vocational training have been described and stored in the database, in order to support the descriptions of training, Certificates and Job Profiles that are related to. The analysis of the Competence Elements objects follows:

3.5.1 Competence Elements (Competence, Knowledge and Skills) Objects

The competences were carefully selected in order to provide the future extension workers with a variety of skills and knowledge that today's professionals in OA pointed out as crucial in order to fulfill the new challenges an OA extension worker is facing.

For the purpose of the CerOrganic Web Portal the online representation of the Competence Element objects is consisted of the fields:

a) Title,

b) Description (Action Verb, Description),

c) Level in Context (Source, Level),

d) Relation (Competence Element, Source, Level, Operator),

e) Classification (Purpose, Type, Category, Classification Schema).

3.5.2 Learning Outcomes Objects

In the case of CerOrganic the key competences of an excellent OA extension work are knowledge transfer between the different stakeholders, identification of site specific problems in organic farming and finally decision making.

For the purpose of the CerOrganic Web Portal the online representation of the learning Outcome Element objects is consisted of its description.

3.5.3 Training Opportunities Objects

Descriptions of the Training Opportunity Objects have been designed in away to include all the available types of vocational education and training for the OA (e.g. seminars, lectures, professional schools).

For the purpose of the CerOrganic Web Portal the online representation of the Training Opportunities Objects is consisted of the fields:

a) Training Opportunity provider (name, address, description, country, phone, email, web Site, type),

b) Training Opportunity instance (title, type, start - end date, months, days, hours, cost, cost description, location, language, lifecycle, attendance, url),

c) Classification (classification schema, Organic. Edunet, coverage),

d) Certificates,

e) Entry / Access requirements (competence, source, scale, operator) and

f) Objectives (profile of skills and Competence and Learning Outcome).

3.5.4 Certificates (of the trainings) Objects

For the purpose of the CerOrganic Web Portal the online representation of the Certificates Objects is consisted of the following fields:

a) Certificate details (title of certificate, type of certificate, language of Certificate, url, logo),

b) Entry / Access requirements (competence, source, scale, operator),

c) Objectives (profile of skills and Competence and Learning outcome),

d) Awarding body (name, address, country, telephone, email, web site, status),

e) Regional national authority (name, address, country, telephone, email, web site, status),

f) Classification (classification schema, Organic. Edunet, coverage),

g) Range of Occupations accessible to the holder (Job Profiles) and

h) Level in context (Source).

3.5.5 Job Profile Objects

For the purpose of the CerOrganic Web Portal the online representation of the Job Profile objects is consisted of the fields:

a) Job organization (existing organizations, organization name, telephone, address, country, email, URL, organization type, organization size, organization coverage, organization region),

b) Job description (title, description, target group, group of employees),

c) Competence element (competence, source, scale, operator) and

d) Classification (classification schema).

3.6 Interface design

The first step towards the development of the CerOrganic Web portal interface was based on blocks that contained the information provided by the portal. Based on that, an initial version was developed and circulated to CerOrganic project partners that provided feedback, which led to the corresponding revisions of the interface. Additional revisions were made at a later stage, in order to enhance the usability of the portal and the access to its most frequently used functions. The current and final version of the CerOrganic Web portal interface can be seen in the figure 12.

3.7 Current Status

The CerOrganic Web portal is currently available at http://portal.cerorganic.eu. In order to facilitate the usage of the portal by non-English speakers, the portal provides a multilingual user interface, currently available in eight languages: English, Greek, German, Czech, Hungarian, Romanian and very adapted Italian. It currently contains more than 150 DTOs of the five different types mentioned earlier, provided by 9 content providers.

Since its official deployment in September 2011, the portal has received about 500 visits and more than 3,500 page views from 143 unique visitors coming from 20 different countries.

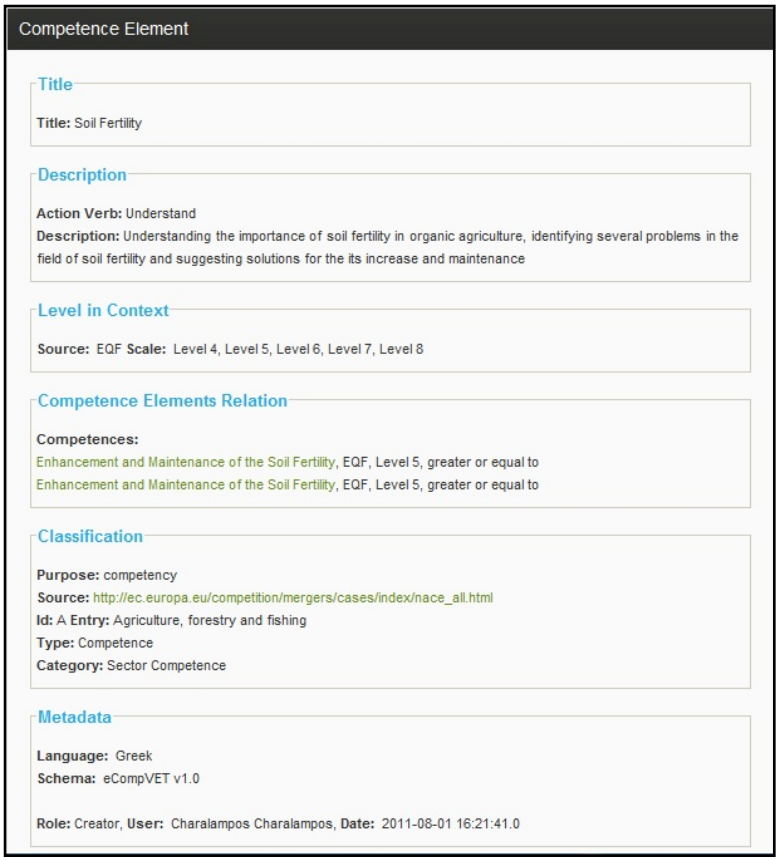

Figure 11a: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

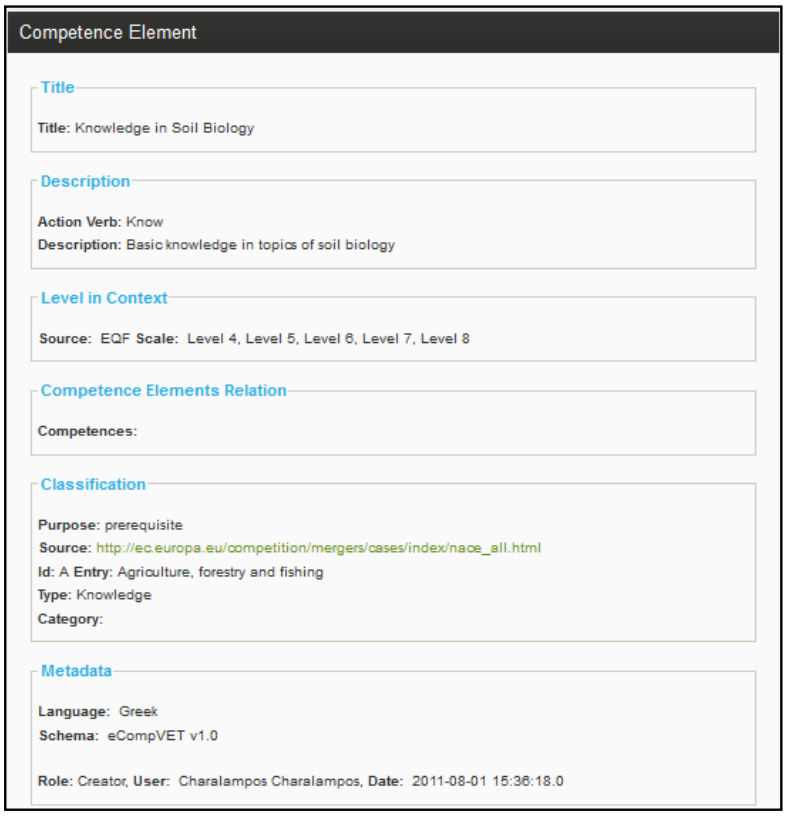

Figure 11b: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

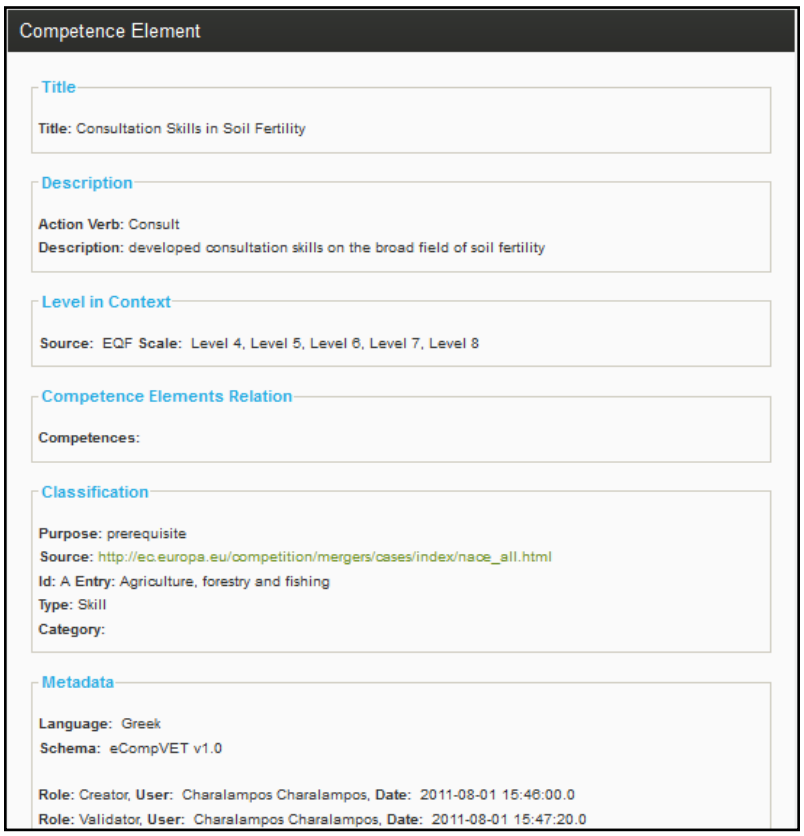

Figure 11c: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

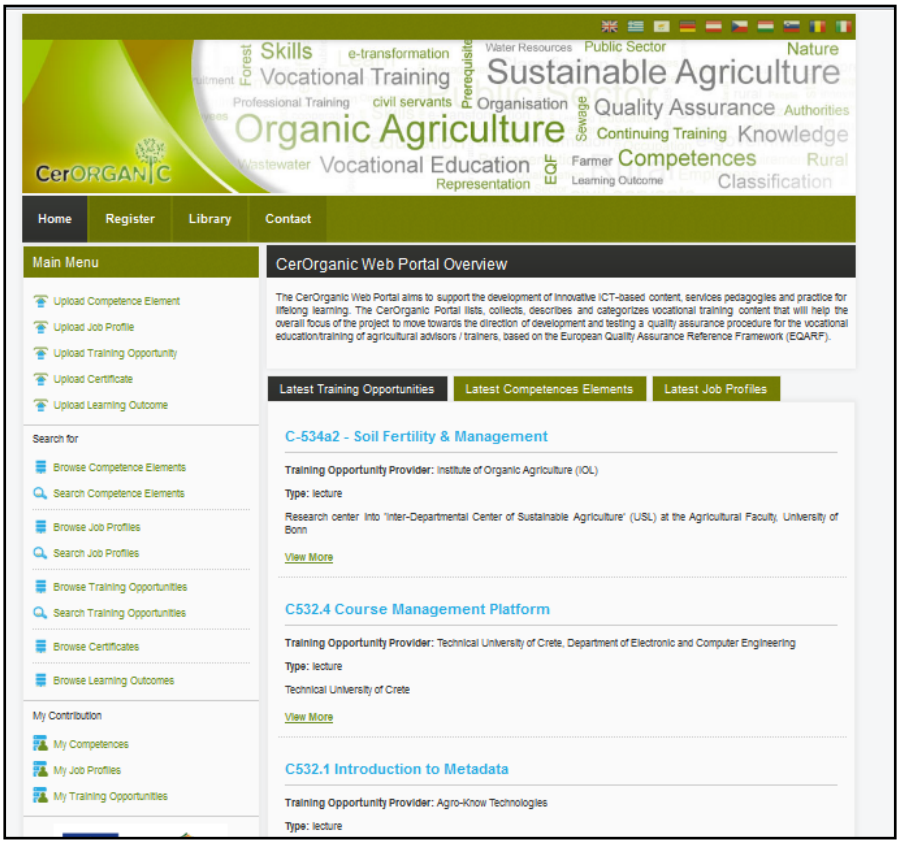

Figure 12: The homepage of the CerOrganic Web portal.

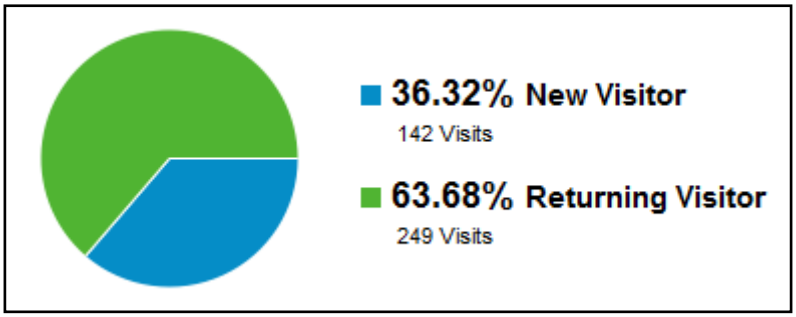

Figure 13: New vs returning visitors of the CerOrganic Web portal.

Due to the relatively short lifetime of the portal, the numbers are expected to increase within the next months. The traffic to the portal is also expected to be increased after the interconnection with related portals (e.g. the Organic.Edunet Web portal – www.organic.edunet.eu) and repository networks (such as the ARIADNE network – www.ariadne-network.eu) is implemented.

4. Conclusions

Through the CerOrganic Web Portal, vocational training opportunities are mapped with the required competences and skills of targeted stakeholders, supporting the connection of training actions (course, modules and units) with the learning outcomes, which satisfy the needs of individuals and the requirements of specific working places for accurate and up-to-date training. The main idea of the design and development of the CerOrganic Web Portal is the reusability and interoperability of learning resources through the interconnection of the portal with other federation of resources such as the Organic.Edunet Web Portal (www.organic-edunet.eu) and the ARIADNE Foundation (www.ariadne-eu.org). The description of the digital training objects is based into educational metadata standards, the IEEE LOM, which adapts the recommendations from the Learning Resources Exchange (LRE) Metadata Application profile (AP) developed by the European Schoolnet (EUN) Consortium (EUN Consortium, 2007) and specifications from other application profiles for agricultural learning repositories, like the Organic.Edunet Application Profile and FAO's Ag-LR AP (Manouselis et al., 2009, Kastrantas et al., 2009).

Through the CerOrganic Web Portal, vocational training opportunities will be mapped with the required competences and skills of targeted stakeholders, supporting the connection of training actions (courses, modules and units) with the learning outcomes, which satisfy the needs of individuals and the requirements of specific working places for accurate and up -to-date training.

Additionally, the CerOrganic Web Portal will be is further extended in more use cases from other European countries (e.g. Italy) and it will be enriched with more DTOs from other fields of agriculture. New DTOs (Training Opportunities, Job Profiles, Competences) will be described in the field of hydroponics and in general the water management in agriculture (e.g. irrigation), covering the growing needs of professionals, training providers and individuals for a better understanding of the workplace descriptions and the competence-based analysis of available training opportunities in Europe through the EU-funded project AGRICOM (www.agriculture-competence.eu).

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