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PREFACE

Information technology is an everyday means that is found in all walks of life today. This is also true for almost all areas of agricultural management, which in Hungary has been extended and accelerated by the introduction of EU agro-informatic's systems. The Hungarian Association for Agricultural Informatics (HAAI) as a supporter of education in information science, the organiser of University Summer Courses in Informatics and a contact agent for fellow organisations both at home and abroad. It also keeps track of the activities of the European Association for Agricultural Informatics (EFITA) and takes part in its conferences. The world-wide organisation of agricultural informatics (INFITA – International Network for Information Technology in Agriculture) decided on launching a journal entitled „Journal of Information Technology in Agriculture" in 2002. The Journal of Agricultural Informatics has been established in 2009 by the HAAI.

Agricultural informatics serves not only the development of the management systems of the industry but also obtaining and publicising information on production, organisation and the market for the producer. The Commission in Brussels support rural development-related research and developments in informatics.

Technologies into network based business systems built on co-operation will ensure up-to-date production and supply in food-industry. The sector-level approach and the traceability of processed agricultural products both require the application of up-to-date information technology by actors of domestic and international markets alike.

This journal serves the publication as well as familiarization the results and findings of research, development and application in the field of agricultural informatics to a wide public. It also wishes to provide a forum to the results of the doctoral (Ph.D) theses prepared in the field of agricultural informatics. Opportunities for information technology are forever increasing, they are also becoming more and more complex and their up-to-date knowledge and utilisation mean a serious competitive advantage.

These are some of the most important reasons for bringing this journal to life. The journal "Agricultural Informatics" wishes to enhance knowledge in the field of informatics, to familiarise its readers with the advantages of using the Internet and also to set up a forum for the introduction of their application and improvement.

The editorial board of the journal consists of professionals engaged in dealing with informatics in higher education, economists and staff from agricultural research institutions, who can only hope that there will be a demand for submitting contributions to this journal and at the same time there will also be interest shown toward its publications.

Dr. Kálmán Rajkai

Chair of the Editorial Board

Special Issue ICT & E-learning: the case of Organic Agriculture

March the 28th, 2013

Editorial Note

The inspiration for the publication of this special issue has been based on the selection of a small number of papers presented at the workshop on " **ICT & E-learning: The case of Organic Agriculture**" taking place during the International HAAI-EFITA 2010 Conference on "IT-Enhanced Organic, Agro-Ecological & Environmental Education" that was held in September 2010, in Budapest, Hungary.

The papers of this volume comprise a mixture of extended versions of thought provoking work that was initially presented during the aforementioned workshop, along with some invited works from researchers and authors that over the years have developed internationally recognised expertise in subjects that embrace IT based education in agriculture, ecology and the environment.

The general success of the conference and the interest expressed by all the participants of the workshop has led to the firm decision that thematic conferences of this kind, including workshops of special interest, will continue to be organised by the national associations on ICT in Agriculture, Forestry and Food sciences throughout Europe. By focusing on advanced information technologies applicable to day-to-day practices in agriculture and related sciences, these conferences and workshops are contributing significantly to the development of both scientific and practical ideas and tools benefiting agricultural production, the farmers and the society as a whole.

The editors would like to thank all the participants of this highly successful HAAI-EFITA 2010 conference, the Hungarian Association of Agricultural Informatics and the sponsors for their generosity. They would also like to express their sincere congratulations to the Local Organising and Scientific Committees for the unforgettable experience they had shared through this international scientific event of very high standards**.**

Due to unexpected occasions during the review process, this publication has been significantly delayed. The editors are kindly asking for the authors' understanding.

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Content

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Special Issue - ICT & E-learning: The case of Organic Agriculture

Co-operation between Europe and some Southern and Eastern Mediterranean Countries on the use of ICT in Education: constrains and opportunities learnt from several European projects

Dumont B.[1]

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A B S T R A C T

Based on previous experience in Southern Europe and Middle-East, potentiality and constraints in collaborative projects are presented. More specifically, a number of EC funded ICT projects, undertaking by countries of these regions and implemented the last seven years, are presented in brief. By the introduction of quality issues and carefully examining a number of constraints and difficulties appeared during the development of these projects, we propose specific recommendations for successful co-operation, especially at a moment of deep and strong changes in these regions.

1. Introduction - Some projects as bases for concrete examples

Considerations presented in this paper are based on experience gained from several projects. They are described briefly to facilitate the background of the reflection developed in the following paragraphs.

1.1. META-ETE [2005 – 2009][2]

This project was funded by the EC, under the Agency European Training Foundation[3] (ETF) to support Mediterranean institutions in the design of relevant technical and vocational education and training policies that can contribute to promote employment through a regional approach. The project involved: Algeria, Tunisia, Morocco, Lebanon, Egypt, Jordan, Palestine, Israel, Syria, and Turkey.

The component focused on e-learning. It offered an online course in English and French, on Moodle, plus meetings, focusing on methodology to develop and deliver e-learning with practical activities on ICT and tourism.

1.2. Fostering Human Rights through Intercultural Education in South Caucasus and Ukraine [2006 – 2009]

This project was jointly funded by the European Commission and the Council of Europe (CoE)[4]. It has been implemented by the CoE in co-operation with the educational authorities of Armenia, Azerbaijan, Georgia and Ukraine. It aimed to promote awareness of intercultural education (Rey-von Allmen, 2010) and support drawing-up educational policy guidelines addressing cultural and religious diversity at all levels of education. It also aimed to help improve practice in this field by developing educational materials and by disseminating and translating existing materials from CoE into the languages of the participating countries.

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The activities included country assessments to identify main issues, needs, existing resources, opportunities and the key stakeholders to be involved. Meetings were organised at regional level, as well as awareness-raising conferences and workshops in each country, involving teachers, teacher trainers and education specialists. The development of co-operation and exchanges at regional level was also foreseen and, for this purpose, a virtual collaboration space has been made available on Moodle.

1.3. e-Quality [2003 – 2006][5]

Gathering 5 European Countries (Finland, France, Poland, Spain, and Switzerland), representing 6 institutions, the e-Quality project was carried out with the support of the European Community within the Action MINERVA of the Programme SOCRATES. The project focused on the "teaching and learning" quality dimension in order to be a pragmatic tool that helps improving the day by day work of the e-learning stakeholders in higher education institutions.

The main outcomes of the project were the production of methodologies, tools and training packages, the training of teams of actors involved in e-learning, one in each participating country, the evaluation of the applicability of these methods and tools in real life, and a databank of « good practices ».

1.4. Repositories: COSMOS [2007 – 2009][6], Organic.Edunet [2007 – 2010][7]

These 2 projects, funded under the eContentPlus Programme of the European Commission, are similar in terms of use of ICT for education. They aim at providing teachers and learners with multilingual pedagogical digital resources and scenarios for 2 topics: astronomy for COSMOS, organic agriculture and agroecology for Organic.Edunet.

The main purpose of the COSMOS project was to create an experimental laboratory for students and teachers in order to improve science instruction by expanding the resources for teaching and learning in schools and universities. The project involved 15 institutions from Austria, Bulgaria, Cyprus, France, Germany, Finland, Greece and Sweden. The COSMOS project deployed a Web Repository of educational content using multilingual vocabularies that facilitates end-users' search, retrieval, access and use of both scientific and educational resources.

Organic.Edunet is a multilingual federation of learning repositories with quality content for the awareness and education of European youth. It includes 16 partners from 10 countries (Austria, Estonia, Germany, Greece, Hungary, Norway, Romania, Spain, Sweden, and UK). It aims to facilitate access, usage and exploitation of digital educational content related to Organic Agriculture (OA) and Agroecology. It also deploys 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.

2. Potentiality of co-operative projects

Co-operative projects, like those mentioned above, offer good opportunities not only to produce together new knowledge or resources, but also to share experience, know-how, existing material etc.

2.1. To re-use existing (raw) material

2 projects based on repository are good examples of development of tools making easier the re-use of existing pedagogical resources and scenarios from several countries. Doing so, teachers and trainers can benefit from other colleagues' work, saving time and having some guarantee on this material. In the participating countries in the CoE project, documentations (articles, books…) and access to it is difficult for teachers and students, even at university level and in teacher training centers. So in this project an effort was done to give access to documents from CoE in a digital form.

[5] www.e-quality-eu.org
[6] www.cosmos-project.eu
[7] www.organic-edunet.eu

2.2. To take advantage of other people's experience

Another advantage of the co-operative projects is to give an opportunity to people coming from different educational contexts to meet regularly for a few years, to know each other, to visit places where colleagues live and work, to see teaching methods in situ, to compare and discuss situations in different countries. Travel is part of the learning experience for participants, and it is a quite important aspect of these projects, even from the EC point of view. Beside formal meetings, participants can see how people live, work and behave, in schools and outside. Cultural issues are very important in post-communist countries. Historic conditions shaped a strong national identity, going along with problems linked with ethnic relations, migration and diasporas; sociopolitical tensions are accompanying the transformation, cultural hybridization, globalization, and for some of these countries, the entrance in the European Union. Participation in transnational cooperation and programs, especially with Western European countries plays a strategic role to support such cultural and organizational changes (Bleszynska, 2010). Cultural issues, even if they are not as strong as in the post-communist countries, are to be taken on board also in Western European countries. For instance, it has been a very tricky aspect of the e-Quality project to define quality indicators as, for example, the responsiveness of tutors because the role and the obligations of teachers were quite different between French and Finnish universities. What seemed natural in Finland appeared as quite demanding in France.

Working together in projects, coming from countries with such different cultural and historic backgrounds, is stimulating and demanding if all participants strongly wish to understand each other and share experience, results and resources.

2.3. To get common experience and to produce material together

A project is not limited to share existing products but mainly it aims at co-producing new methods, tools, resources that can be used in the participating countries, and after the end of the project, in other countries. Usually, competences are not the same in the different teams but they are completing each other. Each participant brings something to the consortium and learns something. The 2 projects on repositories are examples of co-operation where teachers can upload their material, download material from other teachers, can give feedback after trying them in their classrooms, and improve existing resources.

2.4. To take advantage of Moodle or other open source tools (for instance for rare languages)

As we said above, the CoE project made possible for participants an access to digital versions of documents as articles, books and other official papers from the Council, plus other resources not protected by copyright. Mooddle was used to support this access to data and also to allow communication between participants. Moodle has 2 main advantages in this kind of project with limited funding and countries not able to spend a lot of money on their own. As an open source platform it does not need to be bought or to pay some fees to use it. On top of it, there is some localization for interface in rare languages as Georgian or Armenian, that doesn't exist in commercial products.

Moodle was used within the MEDA-ETE project as a Learning and Content Management System (LCMS) for the e-learning courses offered by the ETF agency. It has been also used by some of the participating national institutions that wanted to deliver their own courses, as in Jordan for instance, or simply to practice and test some learning material developed during the project. Interfaces were used in French, English and Arabic.

3. Constraints to take on board

Working in international projects, involving countries from Eastern and Southern Europe, or from the Mediterranean area, brings some constraints to take into account from the beginning.

3.1. Technical environment

As soon as ICT are part of the project, either as the core or as a support, the technical issues have to be addressed, especially:

- Configuration of computers: one can find old versions of OS and software, no USB entrance.
- Number of students per computer: this number is important to design pedagogical activities; the "official" number maybe different of the real one, depending of out of order computers in the institution.
- Internet access: problems can be internal to the institution (rules, authorization, forbidden websites) but also external, due to the quality of the Internet provider (speed, regularity of Internet connection).
- Availability of electricity: in some countries electricity can be off without warning or available only at some periods of the day or of the week.

3.2. Political, cultural and linguistic context

In these countries it is fundamental to forget the Western representation of administration, hierarchy, decision making process, to consider the real political, cultural and linguistic environment.

Some issues may be addressed – preferably during the writing of the proposal - to take into account the context in which your partners will work during the project. It is important to be aware of the political context, to know the role of the hierarchy in the decision making process about the project progress. Some forms of censorship can limit the persons involved in the project to express their own position or to take initiatives about content. In some cases, participants may have no way to manage the budget or even to decide who is going to travel to participate in a project meeting.

Linguistic situation is important issue to be aware of. One needs to go beyond too simple vision and to always take on board the link between language and culture. For instance, in post-communist countries, most of older staff in universities knows Russian better than English, but they are reluctant to express themselves in Russian in public, and they prefer to speak their national language. Nevertheless, when they meet with colleagues from other countries from the area, Russian stays the only language for communication. It is a mistake to believe that English can be used for collaborative activities, on forum for instance. Younger researchers and teachers are more at ease with English. So, the project could be designed differently, depending of the target group. In Lebanon, French, instead of Arabic, is mainly used at university and secondary school levels to teach sciences. So pedagogical resources in Arabic are not useful in this country at these educational levels. The mix between Arabic and French in Education is a very complicated situation also in North-Africa. On top of it, "pure" Arabic is not the inhabitants' spoken language; they speak a vernacular one, different from a country to another. A specific budget for translation is needed but enough money is needed to assure a good quality translation, to avoid difficulties of reading and understanding.

International co-operation presents different situations depending on whether the co-operation is with Western European countries, or with countries from the same region. This is obvious when there is a conflicting situation between countries (Armenia / Azerbaijan, Lebanon / Israel), but not only. Cultural differences and political constraints may explain some difficulties for such co-operation. For instance, in Israel, some governmental funding is available for projects with Palestine or Egypt, but it is difficult to succeed in building such projects. Cultural barriers seem to make uneasy cooperation in ICT between well advanced organizations in a small country like Jordan with developing ones in a very big country as Egypt. Nevertheless, the (r)evolutions going on in several countries of the region will certainly bring a lot of cultural and organizational changes, with a strong impact on international co-operation.

4. Quality issues

All proposals submitted for funding from EC are including a work package, or at least a part of the description of the management, on Quality Assurance. It is understandable as funding is public money. The issue of managing quality during the project is directly linked to the above considerations as it is fundamental to anticipate risks and dysfunctions (Dumont and Sangrá, 2006).

There are several aspects of Quality in a project using ICT.

The Quality of resources concerns resources offered to partners as well as resources developed during the project by the consortium. Quality of translation has been already mentioned, but for pedagogical resources, localization is often needed. The quality of such adaptation is a way to prevent the risk of a weak usability of the resources within the educational context of these countries.

The Quality of the technical environment includes the strengths and the weaknesses of the equipment of the local partners but also of the national context, especially service offered by Internet and electricity providers. The project can be designed on the existing situation with or without possible improvement, depending of the budget.

As it is difficult to assure a constant quality of the technical devices during all the time of the project, the Quality of human support is fundamental to keep high the motivation of the participants, especially the trainees, and to lower the risk of drop out. The design of the pedagogical activities should include human support as part of the whole system.

The method called "continuous improvement", issued from the norms ISO[8] about Quality Management, can be a useful tool for the project management. It is based on a process able to quickly detect dysfunctions, get feedbacks from users and other stakeholders, analyze and solve problems, and then propose some improvement to avoid these problems to occur again.

Another consideration, from norms ISO, concerns the top management: it MUST be committed to implement quality step in an organization. It is also the case in these countries where hierarchy and administration are very strong in the decision making process. To achieve the foreseen goals, in time and with the expected quality of the outcomes, top management must be strongly supporting the project, and all the staff who are going to work in it.

5. Recommendations for success stories

Here are some recommendations; of course they are not limited to Caucasus, North-Africa or Middle-East regions.

- One must be aware of cultural and technical differences between participating countries to minimize their impact on the project;
- One does not trust the « European idealistically simple » views about some countries or regions. Recent events prove, for instance, that people from Arabic countries can take courageous initiatives to change what we could imagine lasting forever.
- The design of the projects must take into account the specificity of (end) users, and leave them some « space » to adapt the product to local needs.
- Work team should be put ahead instead of individual contributions.
- The project should include training for participants (staff, trainers, etc.) in the global package.
- The budget should include enough money for localization of the pedagogical resources, not only translation.
- Avoid humor, as it is difficult to be sure that something funny in one country is not an insult in another.

6. Sure, it's worth it!

Even if there are a lot of difficulties and constraints to participate in such projects, it's worth it, and people from these developing countries deserve to be supported. Having presented some examples of such difficulties encountered in the projects, it is time to show also examples of success. From the project with South Caucasus and Ukraine, a handbook for teachers, with pedagogical activities proposed by teachers from the 4 countries, has been published by the Council of Europe (Wolff-Jontofsohn, 2010). From the MEDA-ETE project, even if regional co-operation has not been effective as expected, some results are highly positive, for instance: the improvement of the quality of e-learning material in partners from Jordan, Israel and Lebanon, the collaboration between public and

[8] www.iso.org

private organizations to develop e-learning in Egypt and in Morocco. Several experiences, as the work done between Israeli and Palestinian teachers who developed a common history textbook, proved that even in this part of the Mediterranean Sea co-operation is possible and productive (Steinberg and Bar-on, 2009).

What is going on in North-Africa and Middle-East, with deep changes in politics and daily life, is making even stronger the need to support the development of training in all sectors of education and by all means, including ICT and e-learning. It is clear that EC will soon decide to actively accompany these changes and to promote multilateral projects.

Projects promoting and supporting the use of ICT in developing countries, participate in reducing the digital gap within societies and inculcating media and computing literacy in schools. And doing so, co-operative projects support the development of a more robust critical multiculturalism among young generations (Carr and Porfilio, 2009).

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Driving Web 2.0 Tool Adoption in Agricultural Education

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A B S T R A C T

The new opportunities for collaboration, participatory content creation and communication offered through the advancements of Web 2.0, such as social networking, blogs, wikis, video sharing and other, are creating new learning models. In turn, tutors cannot ignore this trend and have to bear the responsibility of incorporating Web 2.0 tools in formal, informal, work-based and vocational education and approach their students in a very familiar and favourable way. In this context, this paper tries to highlight the need for enhancing tutors' skills and drive Web 2.0 tool adoption in educational practice. Thus, it draws upon the successful example of a European project regarding agricultural tutors' training on Web 2.0 tools. The challenge for all agricultural tutors is how to integrate Web 2.0 tools into current curricula and education.

1. Introduction

Although the term Web 2.0 has been used since 2005, the notion of Web 2.0 is not clarified yet (Constantinides and Fountain, 2008). A huge dispute has emerged upon this issue, reaching today with no consensus for a specific definition by the academic community and the business world. O'Reilly (2008), who is the inventor of the term, considers Web 2.0 the network as platform. Hoegg et al. (2006) perceive Web 2.0 as a philosophy-and not as a specific technology- that is structured by its users' common vision, reflects their knowledge and continuously adapts to changes in the environment. The overall aim of all Web 2.0 services is to mutually maximize the collective intelligence of the distributed knowledge among the participants.

The facts show that in the current times there has been noted a more mature diffusion of Web 2.0 applications, with blogging, photo and video-sharing, social networking and social gaming to have been adopted by 50% of Internet users worldwide (Pascu, 2008). Their simplicity (Braun et al., 2007), the ease of use and capability of active participation and collaboration in content creation and editing through social networking, blogs, wikis, video sharing and other Web 2.0 tools has made them most popular among students. This reality has influenced the way students access information, communicate with others and learn, thus inducing new models of learning and teaching in formal, informal, work-based and vocational education. In turn, tutors face a significant challenge that lies in their ability to integrate Web 2.0 in their instructions and approach students in a very familiar and favourable way. Despite the substantial impact on formal education and training, Web 2.0 applications comprise a new discovery for schools and higher education (Weyant and Gardner, 2010), and neither of which has seized this new opportunity for enhancing learning and addressing their learners' needs (Redecker et al., 2009).

In this context this paper studies the current use and opportunities of Web 2.0 tools in education. It focuses on the Metaschool initiative regarding agricultural tutors' training on Web 2.0 tools, so as to

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enhance their skills and drive Web 2.0 tool adoption in educational practice. Therefore, the structure of the paper is as follows: in the next section a review on most popular Web 2.0 applications and their categorization, as well as their use in education are given. Then an overview of the Metaschool project and its objectives, as well as the main results from a training workshop at the American Farm School (AFS) are presented. Lastly, some conclusions and suggestions for further work are apposed.

2. Web 2.0 Applications and Education

In Web 2.0, a variety of applications is used to enable users to connect and collaborate with others, as well as create, find, categorize, share and reuse content. These applications provide different ways of interaction (e.g. email messages, blogs, file sharing and chat rooms) aiming at attracting different audiences.

Also, Web 2.0 websites mostly focus on friendship and personal relationships. There are also others that are of a specific geographic location, youth oriented, business and marketplaces, professional networks and networking for social development. Many of them are adapted to the mobile device environment customizing their layout to be browsed on small screen devices (such as personal assistants or phone browsers) (FAO, 2009).

Till today, there have been many categorizations of Web 2.0 applications according to their functionalities and features. FAO (2009) focuses on the support of work groups and collaboration, categorizing them as follows: groupware and collaboration tools; e-mail; listservs, mailing list and e-newsletter; blogs and microblogs; video and photo sharing; podcasting; wikis; chats and instant messaging; voice chats and Voice Over IP (VoIP); video chats; and project management tools. Another categorization is used by Constantinides and Fountain (2008), who propose a basic classification based on application types, namely blogs, social networks, communities, forums/bulleting boards and content aggregators. Cain et al. (2009), consider as current popular Web 2.0 applications blogs, wikis, social networks, social videos, virtual worlds, podcasts, social bookmarking, document collaboration and repositories, aggregation applications (e.g. Really Simple Syndication-RSS feeds) and collaborative custom search engines.

Hoegg et al. (2006), distinguish Web 2.0 services according to the type they are provided into: (a) platforms or tools that help users to create, store, manage and share content, thus forming new communities. These platforms/tools offer services that according to the content type they support are characterized as directory services-enabling navigation activities-or technology centric services-enabling individual content creation; (b) online collaboration tools, focusing on the efficiency enhancement of users' interplay, for example through online timetables, agendas and text processing; and (c) Community services, facilitation the social creation of content by users that have a common interest. In the following, the definitions of the most popular Web 2.0 applications are given:

- **Wiki:** is actually two things; a program that makes it exceptionally easy for anybody to edit Web pages and a philosophy regarding how users should go about that editing (Louridas, 2006).

- **Podcast:** (or non-streamed webcast) is a series of digital media files (either audio or video) that are released episodically and often downloaded through web syndication (Wikipedia, 2011a).

- **Blogs:** are web sites consisting of dated entries typically listed in reverse chronological order on a single page. They can be personal journals, market or product commentaries, or just filters that discuss current affairs reported elsewhere, participating in an online dialogue (Kolari et al., 2006).

- **Media-sharing services:** store user-contributed media (e.g. movies, photos, artwork, presentations), and allow users to search for and display content (Franklin and Van Harmelen, 2007).

- **Social bookmarking:** is a method for Internet users to organize, store, manage and search for bookmarks of resources online. Unlike file sharing, the resources themselves aren't shared, merely bookmarks that reference them (Wikipedia, 2011b).

- **Social networking sites:** are web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system (Boyd and Ellison, 2008).

The context and functionalities of such applications is in agreement with modern educational theories -constructivism and connectionism- and make them very attractive for teachers and learners (Ulrich et al., 2008). Although there is a long way for institutions, individuals and groups of teachers and students to grasp the opportunities of Web 2.0 there are very good examples. A study on the use of such applications at institutional level (Franklin and Van Harmelen, 2007), namely by universities in the United Kingdom, has shown that universities follow differing rationales and approaches to implementing Web 2.0 and that there are many open issues to be addressed, such as what types of tools to implement, how to encourage uptake and use and whether to host systems themselves, or rely on externally (commercially) hosted systems.

By searching the scholarly literature across many sources using the well-known search engine Google Scholar for the terms ‘agricultural education’ and ‘Web 2.0’, interesting conclusions have been derived. In particular, a small number of sources (including thesis, books, abstracts and articles) that contain the above terms has been found, most of which appear from 2008 and after. A similar search in other fields has produced totally different results. For example in the field of medicinal education the search has given more than 1000 resources, presenting the increased interest and widespread use of Web 2.0 (McLean et al., 2007, Sandars and Schroter, 2007, Boulos et al. 2006). This fact shows that although agriculture is a substantial economic sector there is a need for more profound research and practice for matching Web 2.0 with agricultural education so as to be tuned with current progress. In the following, a European project aiming at improving the in-service training of tutors and school Information and Communication Technology (ICT) staff through the effective use of digital content is presented.

3. Metaschool Project Overview

Metaschool (www.ea.gr/ep/metaschool) focuses on organisation, sharing, use and re-use of digital learning resources that can be accessed through online learning repositories. Analytically the aims of the project are the following: (a) adaptation, development, testing, implementation and dissemination of a training framework regarding metadata, learning resources, and learning repositories. The framework will include a curriculum, training activities with good in-school practices and supporting material; (b) development and implementation of strategies/ best practices for organising favourite/useful learning resources into personal portfolios of digital resources and setting up learning repositories at school or regional level; (c) proposal and testing of teaching methodologies/ pedagogical strategies regarding the use of digital learning resources in the context of the educational process for the subjects of Science and Agriculture; (d) promotion of a European virtual space for interconnecting school repositories and exchanging/sharing teaching resources; (e) organization of pilot training and validation activities for teachers/ ICT staff to develop methods/ strategies for taking advantage from organising learning resources into personal portfolios/ learning repositories and exchanging resources with teachers around Europe; (f) involvement of European organisations activating in school education and working on the promotion and best use of digital learning resources in the classroom; and (g) development of a structured and reusable set of guidelines and recommendations for supporting the creation and assessment of relevant teacher training programs.

Metaschool consortium comprises of nine partners with expertise and experience in various areas from six European countries, namely Greece, Belgium, Austria, Germany and the Czech Republic. The project improves teacher practice and propels new knowledge on Agriculture and Science based on the experience gained from the projects of Organic.Edunet (http://www.organic-edunet.eu) and COSMOS (http://www.cosmos-project.eu) respectively. As far as agriculture is concerned, the

Metaschool project can support it in many ways. As mentioned above, environmental/agricultural education is one of its thematic areas. The particular area has been chosen because from one side numerous agricultural content and resources are available on the Internet allowing for a variety of instructional approaches, and from the other environmental/agricultural education has not been fully incorporated in the school curricula despite its significance to sustainable development.

A training framework comprised of 21 self-contained learning packages has been designed in the context of Metaschool. The learning packages are distinguished into three types: namely teaching and learning; ICTs in teaching and learning; and technical training. They are self-contained, offering flexibility and individual learning paths and taking into account different levels of ICT competence and experience with metadata and repositories. There are various ways of interconnecting the learning packages. There are learning packages providing introductory information that apply to teachers with little ICT experience, whereas others build on previous knowledge. Other learning packages refer to the most frequently mentioned application. One or two learning packages present good examples of practice to motivate teachers to use them directly in their classrooms. According the Metaschool training framework a series of training workshop have been organized in the participating countries. For the Greek case two workshops took place; first one focused on providing advanced training in using online repositories and metadata and is described in Costopoulou et al. (2010). In the following, the second workshop referring to Web 2.0 tools is presented.

4. Training Workshop for Agricultural Tutors

The Metaschool workshop took place at the premises of the AFS in Thessaloniki on May 25 2010. AFS is an independent, non-profit educational institution serving the rural population of Greece and the Balkans. It has been serving the sectors of food and agriculture since 1904, providing theoretical and practical education on farming and business practices that are economically viable, ecologically sound and socially responsible (AFS, 2010). It consists of the Secondary School, offering high school education with an additional practical focus on a full range of agricultural and technical subjects, the College of Agricultural Studies providing a BSc degree focusing on agribusiness, tourism, and environmental protection and the division of Lifelong Learning for transferring knowledge and skills on sustainable rural development through short courses, seminars, workshops and conferences.

The particular training has been realized through a one-day workshop. The participants consisted of 6 teachers, 3 college students and 2 ICT staff. All participants had access to a computer during the workshop, working alone, but also in groups of 2-3 persons for collaboration purposes when needed. It consisted of two phases. In the first phase the presentation and demonstration of the Web 2.0 tools, their functionalities, examples activity ideas, specific scenarios are described and their use in the classroom has been showcased to the teachers. By studying example scenarios given in the presentation, the teachers were asked to consider them as a basis to produce their own that will cover the topics they are teaching.

The workshop has been based on the use of two Metaschool learning packages. The first entitled “Web 2.0 Tools in Education”. This learning package gives examples of existing Web 2.0 tools and the use of Wikipedia in classroom. Since AFS is an educational institution, more focus has been given to Wikis and the Moodle example (Modular Object-Oriented Dynamic Learning Environment-moodle.org), a free open-source software package for producing Internet-based courses and web sites to support a modern social constructionist framework of education (Moodle, 2011). The ultimate goal is to provide teachers with the knowledge of these technologies and how to apply them in the classroom.

The second learning package entitled “Popular Social Tools and their Scenarios for Classroom Use” provides a description and examples on popular social tools and their usage. Such tools are Flickr (www.flickr.com), Youtube (www.youtube.com), Delicious (www.delicious.com), Slideshare (www.slideshare.net), Writeboard (writeboard.com) and other. Thus, teachers are enabled to use prominent Web 2.0 tools and take advantage of their capabilities in education. Specially designed scenarios provide teachers with actual evidence of the educational value of using such tools inside the

classroom. The overall pedagogical objective is to familiarise the teachers with the use of popular social tools.

Then in the second phase, a twofold evaluation based on questionnaires took place, namely evaluation of the workshop and the presented learning packages. Moreover, personal interviews have been taken from the participants. According to the evaluation, the workshop has been considered by all participants as very successful. The presentations and demonstration have been considered much focused and engaging. The majority of participants believe that the workshop has much value for them and that it is much useful for their future instructions. A 75% considers that the workshop can improve from much to very much their future instructions. Moreover, the majority is willing to attend another workshop. All participants believe that the workshop is much beneficial and is an important activity. More than half believe that the workshop was average to very good. The workshop leader's explanations were satisfactory to very good. More than 60% have enjoyed the workshop.

The majority believes that the knowledge presented was well known by them and they did not have much difficulty in using the tools/techniques shown. They found no difficulty in understanding content in the English language. The pace of the overall learning procedure was satisfactory. Also, the majority found no difficulty in following the content. The participants in general were familiar with the workshop content, except for a 25% that did not have any knowledge about it. They believe that they have learned very much knowledge that is helpful for improving their teaching/lessons. Thus, all of them are planning to use the tools presented during the workshop, as well as to introduce them to their colleagues. The smashing majority thinks that the workshop has met much their expectations.

According to the personal interviews, the workshop has given a variety of innovative ideas regarding the combination of Web 2.0 tools. One of the most useful things is uploading presentations and videos and giving the opportunity to the educational community to comment on them. The participants expressed their need for more time on: discussing educational scenarios and their realization in classroom through the presented tools, presenting detailed procedures examples for the advanced use of the tools, and hands-on sessions.

4. Conclusions

In spite of the use of Web 2.0 applications in students' everyday life, agricultural tutors have not yet much incorporated them in their lessons. Agricultural tutors need to recognize the potential of Web 2.0 in agricultural education. The challenge for all agricultural tutors is how to integrate Web 2.0 tools into current curricula and education. Common obstacles regard the lack of tutors' knowledge and skills on the applications and their use in educational scenarios. This paper has presented the successful example of the Metaschool project for enhancing agricultural tutors' skills on Web 2.0 tools. Metaschool training has provided a variety of innovative ideas on Web 2.0 tools for improving educational practice and has driven agricultural teachers' awareness and motivation towards them. As new concepts, such as mobile lifecasting, mobile socialcasting or mobile social streams and mobile micro-blogging are emerging (Pascu, 2008), relevant initiatives have to be supported so as the agricultural community to be aware of Web 2.0 technologies and their increasing role in providing agricultural information and education at any place and any time, following successfully the course of events. The potential of Web 2.0 for agricultural education activities will only be achieved if there is increased training in how to use this new approach. Careful thinking and research are still needed in order to find the best ways to leverage this approach to boost agricultural teaching/learning productivity.

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Design, Implementation and Assessment of Videoconferencing Sessions in Earth and Life Sciences: The Case of the Agricultural University of Athens

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A B S T R A C T

In this paper we present the methodology employed in the Agricultural University of Athens for the delivery of specific courses with the use of video conferencing technology. Earth and Life Science higher education courses (agricultural, environmental and biomedical courses) present specific requirements relevant to the exposure of the students to practical issues, and the exchange of expertise. The employment of video conferencing seems be a valuable solution for addressing a number of these requirements. We describe these requirements as they emerged from our study, and present the implementation of video conferencing sessions (design, application, and assessment). Through this paper we aim at describing examples of meaningful employment of video conferencing, particularly in higher education, share the positive and negative aspects of our approach, and provide insights for similar interventions in education and training.

1. Introduction

Research over the past decades indicates the potential and opportunities provided by videoconferencing (VC) as an educational tool (Amento and Brooks, 1998; Burge, 1994; Isaacs and Tang, 1994; Kaye, 1987; Locatis et al., 2006; Smyth, 2005; Bonk and Graham, 2006) and more specifically for demanding teaching environments such as the case of Earth and Life Sciences courses. In Earth and Life Science courses -agricultural, environmental and biomedical courses- teaching and learning conditions and requirements present certain peculiarities such as the necessity for connection with external, remote, rural locations, greenhouses, animal units, demonstrations of rare or unique events, simultaneous practical exercises of a large number of students in constrained laboratories and contact with research institutions and other relevant facilities. Videoconferencing in this context seems to provide solutions to setbacks and obstacles emerging from these peculiarities and also enhances and offers new potential to instruction, learning and hands-on experience of the students. It fosters cooperation and collaboration among remote participants and remote institutions; it may support students in remote areas where access of experts or access to specialized activities is difficult; it can be the only solution in cases where access to specific events or locations is impossible or hazardous or in cases where complex objects or procedures have to be demonstrated in detail to remote participants (Neale et al.., 1998) and it offers the opportunity to interact with experts from around the world cost and time effectively. It appears to be a solution in the cases where increased interaction among the participants is expected or required as, in relation to other forms of remote communication and Computer Mediated Communication (e.g. email, chat, fora) it provides the possibility for visual contact which creates a sense of social presence and consequently a more comfortable learning environment (Mason, 1994) as well as it permits a more direct and timely interaction among the participants.

The opportunity to integrate VC in the instruction process was presented for the Agricultural University of Athens (AUA) with the project “Implementation and Integration of New Technologies

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in Education" for the Greek Universities, funded by the Greek Ministry of Education and the European Union. During this project (September 2006-December 2007) the AUA project team designed and implemented a number of VC sessions for the support and enhancement of the education and research activities. The potential benefits of videoconferencing as a tool for teaching and learning in higher education were the initial motivation for the participation of AUA in this project, as well as the limited research in the area of distance education and VC, more specifically in the case of agriculture and life sciences education.

Research in the area of distance learning in agriculture education has mainly focused on the delivery of distance courses to off-campus students, as well as on the effectiveness of distance education in the learning process, in relation to conventional methods of instruction (Miller, 1997; Gray and Miller, 1999; Miller and Pilcher, 1999; Bowen and Thomson, 1995; Irani et al., 2000). Our viewpoint to the subject, though, was founded on a different perspective: the main goal of the project was to integrate distance learning tools and methodologies, and VC more specifically, in order to support and enhance on-campus instruction for on-site students considering the potential of the technology in relation to existing needs and requirements of courses taught at the Agricultural University, both concerning the instructors as well as the material, the educational objectives and the hands-on experience to be attained by the students. A blended-learning approach was adopted, with the instructors, the students, the material and/or activities and the available technology as the main defining factors for the implementation of VC.

During the project, twenty two (22) VC session scenarios were designed, with the participation of faculty members and 8 of them took place during the spring and the winter semester of 2007. In section 2 we present a brief description of the methodology for the design of the scenarios. In section 3 the implementation methodology is detailed and section 4 refers to the assessment and results of the implemented sessions by the participants. In section 5 the general conclusions that can be drawn for similar cases of Earth and Life Sciences courses are discussed.

2. Designing Scenarios

The design of the scenarios may be considered as one of the most critical steps for the successful implementation of VC sessions. Instruction with the use of VC requires a more detailed planning than the conventional methods of instruction, as well as the re-organisation and re-design of the content and educational approach, so as for the potential and dynamic of VC to be fully exploited (Kaye, 1987; Garrisson, 1989). A number of defining factors were addressed during the design phase. These factors were the synchronous and asynchronous interaction and communication among the participants, the number of points and of participants, the motivation of the students, turn-taking by students or speakers, the balanced cooperation and participation of all participating points, the quality of the educational content, and the technical support available.

After an initial phase of dissemination of the objectives of the project to the AUA academic community, a number of training seminars and day-events for updating the faculty members of the available VC resources and equipment as well as for motivating them to consider integrating VC into their teaching, a base of instructors interested in employing VC emerged. The Design Team of the project cooperated closely with these instructors for recording and mapping the particular conditions and requirements of instruction in AUA and for designing specific scenarios customised to their needs and requirements. A general template scenario was developed, for facilitating the design of new scenarios in AUA. The structure of this template is presented in Table 1.

Table 1. Template used for the development of the educational scenarios

Required Field	Description
Designated faculty member	The name of the tutor responsible for the VC session
Date	The time/date of the implementation of the session
Type of use	The model of videoconference (lecture/tutorial, seminar, presentation, collaboration between researchers, demonstration of experiment or process, debate)
VC type	Point to point or multi-point connection
Sites	The sites which will be connected during the VC session
Target group	The group the VC session is targeted to (students undergraduate or/and postgraduate-,university staff, researchers, public audience etc)
Duration	The duration of the session
Brief description	Brief description of the session (e.g. content, purpose, objectives)
Why VC	Justifies the need of VC and the added value compared to traditional teaching methods. Describes how VC will improve the quality of the course.
Integration in the curriculum	The course or the courses in which the session is integrated.
Instructional objectives	The educational/instructional objectives of the VC teaching session.
Participants	Number and the roles of the participants
Preparation	Outline of the preparation which should take place before the VC session
Educational /support material	Describe the type of the educational or other material used during the session. Description of additional technical equipment required during the session.
Detailed description	The whole session is described in detail (actions of the tutors, type and duration of the activities, presentations, interaction and discussion)
Further exploitation of results	Methods of further exploitation and reuse of the material and equipment (e.g. video recorded, educational material, scenarios) are proposed in this field
Technical context	The technology used and the additional equipment which might be needed
Evaluation comments	An evaluation of the whole VC session, the informal feedback and the experience acquired (field completed after the VC session).

2.1. Instructional Design Principles

The main objective of the design of the educational scenarios was the detailed planning and organisation of the educational content and of the relevant instructional methods so as to fully benefit from the session and exploit the potential of the technology considering the instructional objectives of the course. A crucial point was the legitimacy of the integration of videoconferencing in a class. VC sessions were only implemented in the cases where it would in fact be the best solution possible for coping with any problems or for enhancing and improving the quality of the course. The scenarios that were designed as well as the VC sessions that took place, demonstrate the necessity of VC sessions for specific courses in AUA; courses with needs that go beyond the level of communication and collaboration among remote participants, as would be the case in other higher education institutions. In these cases, VC seems to provide a solution to real practical and logistical problems, such as visits to remote or restricted areas, demonstrations of experiments which would otherwise be difficult or impossible, that have been constraining the quality of the courses and have been limiting the instructional objectives. It is obviously not suggested that videoconferencing should substitute the experience of the direct contact (Bonk and Graham, 2006). For more details on the planning and design of the scenarios and the sessions see also Sideridis et al. (2007).

2.2 Mapping the Instructional Settings in AUA in Relation to Videoconferencing Use

The AUA focuses on agricultural sciences, teaching and basic and applied research. It is situated in a 25-hectare green campus equipped, among others, with auditoriums, laboratories, agricultural facilities -such as an arboretum, a vineyard, laboratories, a flower garden, greenhouses, a cowshed, a sheep pen, a chicken coop, dairy installations, and aquaculture tanks. Furthermore, a number of farms located outside the campus and in remote areas around Greece are in the possession of the University, all targeted to serve the instructional and research needs of AUA. Instruction during the first nine semesters includes lectures, laboratory work and field trips. Four months of practical training are also required to ensure familiarization with actual farm conditions. Teaching conditions in AUA seem therefore to provide a significant opportunity for exploiting the potential of VC.

While investigating the conditions of instruction in AUA and mapping the needs emerging where VC could be the most efficient or even the only possible approach, a number of particular cases where recorded. Indicatively (for more details see also Sideridis et al., 2007): a) connection of classes with external locations such as fields, units for production, hydroponics laboratories, animal production units, greenhouses and research institutions, where detailed presentation of locations, and clarification of processes and features of livestock and vegetation are required, b) presentation of research activities and interaction with remote experts and specialists, c) demonstrations to the students from anatomy laboratories or microscopes, where the large number of students or the small-sized laboratories constraint attendance, d) connection of the class with beehives for Apiculture courses, where physical presence of students is not always possible (e.g. due to allergies or hostile behaviour of bees), e) cases or events that require the direct, timely and accurate scientific communication with other members of the academic community, the media and even the public, f) cooperation and interaction of AUA with other university departments and specialists from other universities, g) lectures to AUA classes by remote experts, or h) lectures from AUA to remote or isolated students, and i) presentation of research activities of students, to other universities or remote supervisors.

Based on the aforementioned framework, the instructional settings mapped and the emerging needs, the Design Team developed 22 customized educational scenarios, which correspond to almost all the categories of uses of VC in higher education, such as Lectures/ tutorials, seminars, presentations, collaboration between researchers, while cooperating closely with the Technical Team of the University so as to ensure the availability of the technical equipment in order to realize these scenarios. Additional equipment was purchased by AUA such as specialized cameras for the microscopes, and mobile units for the connection of the videoconferencing rooms with external locations.

2.3 Implementation Methodology

The Design Team was responsible for the implementation of the scenarios. The members of the team were familiar with the factors concerning the successful realisation of the sessions, and had relevant previous experience in Educational Technology and VC implementation. Each member of the team was responsible for a specific number of sessions (2-3 sessions). The person responsible for each session would coordinate all the participating members (i.e. lecturers, technicians, VC room attendants) for the most efficient preparation possible. Such preparation activities include the following: arrange the date and time, availability and booking of the VC rooms, technical trials, preparation of the educational material, timely notification of the participants, guidelines on the direction and familiarisation of the participants with the equipment. The Design Team was present in the VC room during the session so as to assist in the case of any problems, to ensure a sense of confidence from the part of the lecturers, as well as for recording and keeping notes on the process. Assessment of the VC sessions (i.e. preparation, distribution and collection of questionnaires) was also among the responsibilities of the Design Team.

Based on the aforementioned implementation methodology, 8 VC sessions were realized: 3 session scenarios were classified as “lecture/tutorial”, 2 aimed at the “collaboration between researchers” and 1 scenario –which was the basis for 3 sessions- was classified as a “seminar”. In relation to the number of participating sites (connection points), 7 VC sessions were “point to point” and one required a “multi point” connection: in two cases the AUA VC room was connected with a laboratory within the campus and with an external location respectively. For the remaining six sessions the AUA VC room was connected with the VC rooms of the other participating remote sites (Figures 1 and 2). In Table 2 the implemented sessions are summarized (see more details on the implementation of the VC sessions in Papadopoulos et al., 2008).

Table 2: Brief description of the implemented scenarios (cont.)

	Type of Use	VC type	Participants	Integration in the Curriculum	Target Group	Instructional objective	Brief description	Why VC?
Scenario 1: "Anatomy of productive animals - Autopsy"	lecture/tutorial	Point to point.	**AUA VC Room**: 1 lecturer, 28 students, 2 technicians **AUA anatomy laboratory**: 1 anatomist, 1 anatomist assistant, 1 technician	2nd and 3rd year undergraduates Course: Anatomy of Production Animals	undergraduate students of AUA	To observe in detail the process of autopsy of an animal	Students and lecturer in the AUA VC room watched autopsy on animal performed live at the anatomy laboratory (see Figure 1)	Constrained laboratory - limited capacity for students. Subsequent implications on time-scheduling of the course and the quality of the organs remaining on display for more than one days. Not all students can have a good view of the process. Students may refrain from attending due to smell. Students can interact with the experts and address questions simultaneously.
Scenario 2: "Live demonstration of hives"	lecture/tutorial	Point to point.	**AUA VC Room**: 1 lecturer, 30 Students, 2 technicians **Outdoor hives**: 1 assistant lecturer, 1 technician	2nd, 3rd and 4th year undergraduates Course: Apiculture	undergraduate students of AUA	To give the students the opportunity to observe in detail the bees' behaviour in real conditions of hives	The lecturer was at the VC room of the AUA presenting the theoretical background of the behavior of the bees and, in real time, the outdoor hives as transmitted by the AUA VC mobile unit. The students observed the process, listened to the lecture of the professor and asked questions.	In cases where, for example, students present allergies to the bees or when the bees behave aggressively due to bad weather conditions or due to the presence of the students, visits to the external locations of the beehives are difficult. Real time linking of the hives with the VC rooms and remote attendance of the presentation of the instructor by the students provide a solution for such barriers.

Table 2: Brief description of the implemented scenarios (cont.)

	Type of Use	VC type	Participants	Integration in the Curriculum	Target Group	Instructional objective	Brief description	Why VC?
Scenario 3: "Probabilities and Statistics" (3 sessions)	seminar	Point to point	**AUA VC room:** 2 lecturers, 24 undergraduate students, 2 technicians **VC room at Syros** (remote island of Greece): 26 teachers of mathematics in secondary schools, 1 technician	Training course for secondary school teachers and 2nd and 3rd year undergraduates	secondary school mathematics teachers undergraduate students of AUA	To overcome the problem of students' misconceptions on stochastic and deterministic mathematics in statistics, through the cooperation of university students and secondary education teachers. To facilitate the	Two lecturers presented theoretical subjects, examples and exercises concerning probability and statistics in the framework of a training course of 6 hours (divided in three sessions, each one lasting two hours).	Flexible ways of training like videoconference can provide a reliable solution for the training of teachers in remote and isolated areas of Greece (e.g. mountains, islands). Communication and collaboration gaps between the different levels of education (secondary, higher) constitute a crucial problem for the Greek educational system. The organization of similar events through VC could help overcome problems such as bureaucracy processes,
Scenario 4: "Biologic products and biomass Potentials for Biofuels"	collaboration between researchers and students	Point to point	**AUA VC room**: 1 lecturer, 3 speakers, 29 undergraduate students, 2 technicians **Eberswalder University VC room**: 1 lecturer, 5 researchers, 1 technician	5th year undergraduate Research	undergraduate students of AUA researchers in the field of biologic products and/or biofuels	To keep students up-to-date on contemporary subjects, not yet adequately covered by course material	Students from AUA made a presentation about biological products in Greece and researchers from the Universtiy of Eberswalder talked about Biomass Potentials for Biofuels and Environmental Constraints.	Timely and cost effective communication and collaboration of students, experts and specialists from remote universities and institutions. It has to be emphasized that this VC session was an initiative of the students.

Table 2: Brief description of the implemented scenarios

	Type of Use	VC type	Participants	Integration in the Curriculum	Target Group	Instructional objective	Brief description	Why VC?
Scenario 5: "Breeding of monogastric animals, in particular pigs. Is the reduction in piglets' fatality feasible?	lecture/tutorial	Multi-point (4 sites)	**AUA VC room**: 1 lecturer, 36 undergraduate students, 2 technicians **University of Thessaloniki VC room** (500 km from Athens): 1 lecturer, 7 undergraduate students, 1 technician **Technological Institute (TEI) of Arta VC room** (388 km from Athens): 1 lecturer, 30 undergraduate students **Technological Institute (TEI) of Larisa VC room** (356 km from Athens): 1 lecturer, 7 undergraduate students, 1 technician	5th year undergraduate students	undergraduate students of the AUA, the University of Thessaloniki, the Technological Institute of Arta and the Technological Institute of Larisa	Exchange of viewpoints, arguments and experiences relevant to a specific issue (fatality of piglets) among lecturers and students attending the same course (Breeding of Pigs) in different educational institutions. This issue constitutes a severe problem with critical financial implications and requires different perspectives and the combination of specialized knowledge and practical experience from animal units.	The lecturer from the AUA gave a 30 min. lecture. The lecturers from the other three institutions, with different specialties and background, added comments relevant to the subject according to their specific knowledge so as to cover all the different parameters. Questions and discussion followed (see Figure 2).	The students of the agricultural universities in Athens and Thessalloniki (capital cities) are offered high level theoretical knowledge but they lack experience in real conditions in animal farms and units because of their urban location. Lecturers and students of the Technological Institutes in western and northern Greece (countryside) have more practical experience on the subject. Through this common VC lecture they shared their specific knowledge and relevant experiences. Students of the Technological Institutes could be exposed to the theoretical background of the issue presented by the University professors, while the University students could benefit from the practical experience of the Technological Institutes' students and lecturers.
Scenario 6: "Presentation of methodology concerning fertilization maps of energy plants"	collaboration between researchers	Point to point	**AUA VC room:** 5 researchers, 2 technicians **University of Thessaly VC room** (central Greece): 3 researchers, 1 technician	postgraduate studies, research projects	postgraduate students of AUA researchers in a relevant project	Timely and accurate update on a contemporary subject (development of agriculture) In depth discussion on emerging issues Facilitation of cooperation among partners in the research project	Researchers from the University of Thessaly (central Greece, 320 km from Athens) presented the methodology concerning fertilization maps of energy plants in the valley of Thessaly. Further discussion among participants.	Researchers in AUA maintain links and constant collaboration with researchers to remote University departments around Greece. The technology of VC can facilitate this collaboration and interaction, cost and time effectively.

Figure 1. Real time connection of the AUA VC room with the AUA Anatomy Laboratory (scenario #1)

Figure 2. Real time connection of four sites for discussion of students and lectures (scenario #5)

3. Assessment and Results

3.1. Assessment Methodology

The objectives of the assessment were a) the investigation of the opinions, perceptions and attitudes of the participants for the particular sessions as well as for VC in education in general, after their experience with VC and b) to provide the possibility to the participants to express their proposals and suggestions. For the assessment a survey was employed. Two different questionnaires were constructed: for students and for lecturers.

The questionnaires were distributed to the participants, on site, after the completion of the session. They were anonymous and consisted of 8 closed ended questions (yes-no) and 2 open ended questions for further comments by the participants. In this study we will mainly focus on the feedback from the students. The students' questionnaire is presented in Table 3.

Table 3. Questionnaire for the students

No.	Question
Q1	Did you find the VC session you just attended interesting?
Q2	Would you be willing to attend more classes via VC?
Q3	Was the quality of the image and the audio satisfactory?
Q4	Would you rather the lecture had been conducted with conventional teaching methods?
Q5	During the VC session, did you have any questions you did not have the opportunity to ask?
Q6	Would you like to have access, via the web, to material relevant to the VC session BEFORE the session?
Q7	Would you like to have access, via the web, to material relevant to the VC session AFTER the session?
Q8	Would you like to be able to comment on the content of the VC session and discuss it with your peers and teachers, online (e.g. via a forum)?
Q9	What do you consider to be the positive points of the current VC session?
Q10	What do you consider to be the weak points of the current VC session?

227 students' questionnaires (191 AUA students, 26 secondary education teachers, 10 postgraduate students and researchers) and 10 lecturers' questionnaires were fully completed and returned. Although all the questionnaires were reviewed, in the current study, the 191 questionnaires from the AUA students were analysed.

Furthermore, the Design Team was attending the sessions and recording field notes relevant to any specific events, and the behaviour and actions of the participants.

3.2. Results

The following results refer to the responses of the 191 AUA students who participated in the VC sessions realised during our project. The statistical analysis included tests for comparison of proportions. For the statistical analysis the package STATGRAPHICS Plus v.4 (Statistical Graphics Corp.) was used.

In Figure 3 the observed proportion for each of the 5 scenarios, per question, is shown. The mean proportion (pooled) and the 95% decision limits is also shown. Since none of the samples falls outside the decision limits, there was no significant difference among them, for each question.

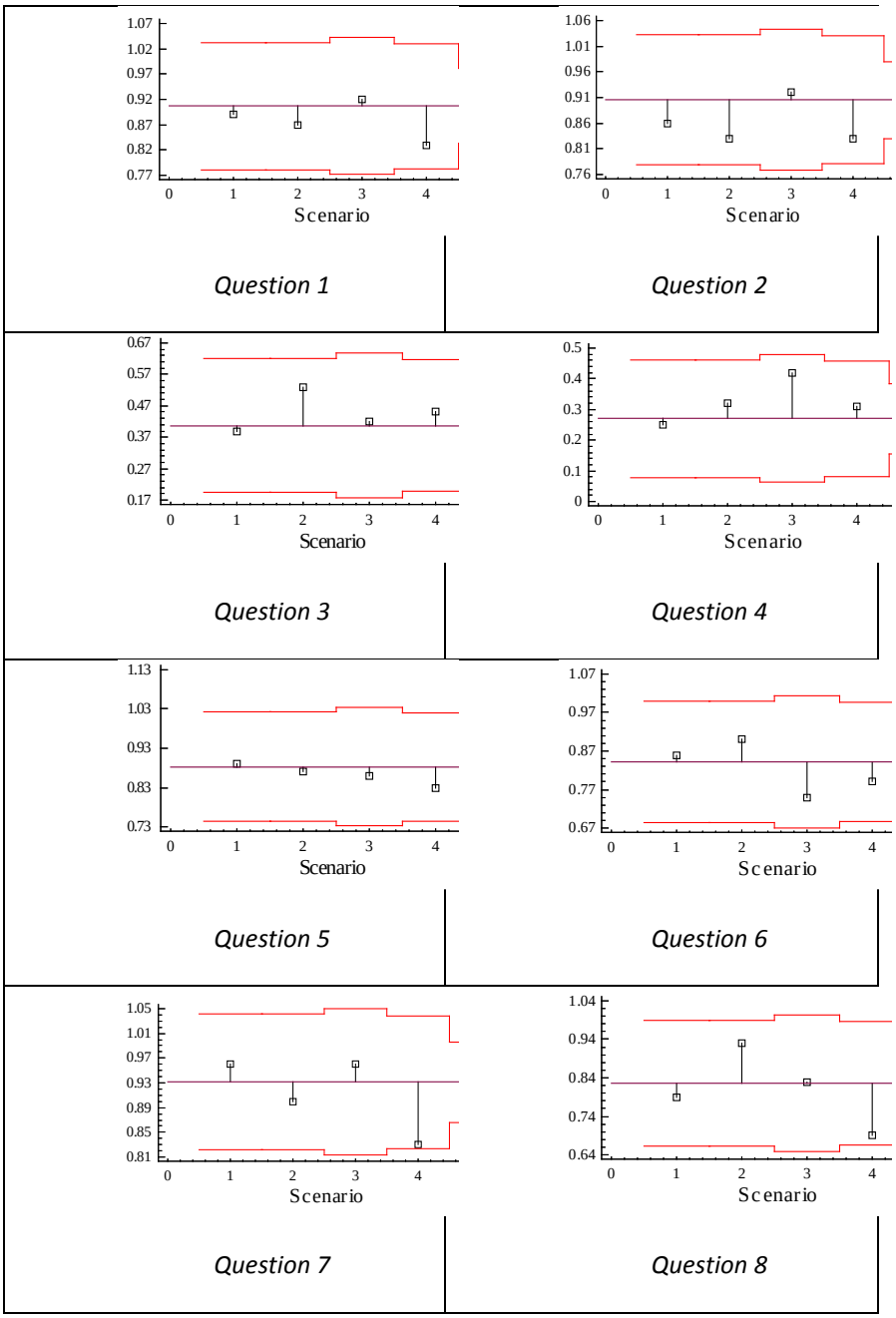

Figure 3. Analysis of Means Plot with 95% Decision Limits

More specifically, according to the students (N=191): a) the sessions were interesting, at high proportions (range from 0.83 to 0.95) with mean (pooled) proportion 0.91. There were no significant differences between the sessions (p=0.3555). b) They would be willing to attend similar sessions in the future, at high proportions (range from 0.83 to 0.97) with mean proportion 0.9. There were no significant differences between the sessions (p=0.0782). c) The quality of the image and sound was not assessed as satisfactory indicated by the low levels of satisfaction (range from 0.35 to 0.53) with mean proportion 0.41. There were no significant differences between the sessions (p=0.5404). d) The participants do not seem to prefer conventional teaching methods over VC at the particular lessons (range from 0.2 to 0.42) with mean proportion 0.27. There were no significant differences between the sessions (p=0.2509). e) The participants reported that they felt they had the opportunity to express any questions they had during the sessions, at high proportions (range from 0.83 to 0.91) with mean proportion 0.88. There were no significant differences between the sessions (p=0.8215). f) They expressed their requirement to have access to educational material before the realisation of the session,

at high proportions (range from 0.75 to 0.9) with mean proportion 0.84. There were no significant differences between the sessions (p=0.5455). g) The participants also expressed their requirement to have access to educational material after the session, at high proportions (range from 0.83 to 0.96) with mean proportion 0.93. There were no significant differences between the sessions (p=0.1487). h) The participants want to be able to comment and discuss on the particular session with lecturers and peers, at high proportions (range from 0.69 to 0.93) with mean proportion 0.83. There were no significant differences between the sessions (p=0.1705). i) There were no significant differences between on-site and off-site participating students (alpha=0.05 for all questions). Off-site students – non AUA students- were available only in Scenario #5.

The proportions of positive answers (yes) in Q6 and Q7 were high, even though, access to relevant material before and after the sessions was not considered essential, as it emerged from the comments included by the students. Similar was the case in Q8 concerning the attitudes of the students in relation to the access to online fora.

The main strength of VC, as concluded by the answers of the students to the open ended Q9 is the potential for a more effective approach to knowledge and learning. The quality of the image and the audio was the main weakness as commented by the students in Q10. The results were similar in the case of secondary education teachers (N=26). Secondary education teachers participated only in session #3.

For the researchers and lecturers, no statistical analysis was conducted, due to the small size of the sample (N=10). However their answers to the questionnaires show a high degree of satisfaction from the implemented VC sessions and a tendency to participate again in similar activities. They would also recommend VC sessions to other colleagues and they commented that they attained educational objectives that they would not attain with other methods.

3.3. Discussion

As indicated by the analysis and the observations and field notes of the Design Team, although a number of critical issues which can potentially affect the quality of a VC session emerged, there was a general positive attitude from the part of the participants.

The students were particularly critical towards the technical problems that appeared and the quality of the image and the audio. This may be attributed to the familiarisation of the students with high quality technology products and therefore having high expectations. Even though the proportions of satisfaction by the quality of the image and audio (Q3) were low, the corresponding proportions of satisfaction by the sessions (Q1) and the intention to attend similar sessions again in the future (Q2) were quite high. Furthermore, the proportions of preference to conventional methods and not VC for the specific scenarios realised (Q4) were low.

The case of a particular session (Scenario #5) is worth highlighting, where although extended technical problems were presented (the lowest proportion of positive answers in Q3), the students were not negatively affected and expressed their interest and their intention to attend similar VC sessions in the future (the highest proportions in positive answers for Q1 and Q2) and their preference of VC sessions over conventional teaching methods for the particular lesson (the lowest proportions of positive answers in Q4). This may be explained by the fact that the particular scenario capitalised, at a high degree, the comparative advantages of VC technology. In this session the students had the opportunity to attend the lectures and viewpoints of four different professors on a particular, multidimensional subject.

The proportions of students who preferred conventional instructional methods rather than the use of VC sessions were low. The highest proportion of this tendency was observed in scenario #3, where the students were attending the presentation of their lecturer at the VC room of their university (AUA), with no other lecturer at the remote site. A student commented, indicatively: “I didn’t attend a videoconference lecture but a lecture”. On the other hand, for the same session, the participants at the remote site (secondary education teachers) declared, in a very high proportion, that they preferred the VC session. One of the remote participants commented: “I had the impression that I was in a

University amphitheatre, attending a brilliant lecture". Therefore it is crucial, while designing the scenarios, that the connection of the remote sites is meaningful for all the participants.

The students indicated their interest in accessing online material before and after the session, as well as in participating in online conversations relevant to the courses, with peers and lectures, indicating the motivation for interaction triggered by such VC sessions.

Despite the positive attitudes and interest for the VC sessions, the students did not seem to interact as much as expected with the on-site lecturer and the off-site participants. It seems that the distance factor is difficult to bridge, despite the potential provided by the technology. The problem was accentuated by the presence of technical problems in image and sound quality (e.g. clarity of the image), directorial decisions (e.g. lack of close-ups of the speakers), and extended monologues from the part of the speakers. For example, in the case of Scenario #5, despite the technical problems, the interaction and participation of students and lecturers was higher, as the speaker would interrupt the lecture and invite questions and comments from the participants, on-site and remote. The case of scenario #3 was quite different: although the students expressed their enthusiasm for the lectures, their participation with questions and comments was limited. In this case, the lectures were relatively long in duration. Another important factor, which seemed to affect the participation and interaction of the students, was the factor of the "unknown audience". Specific techniques are, therefore, required, such as large screens, close-ups to the participants, introduction of the participants before the sessions (e.g. through exchange of photographs and CVs). Specific details have also to be considered for a more successful interaction, such as the language of communication. As an example, we cite the case of scenario #4, where the poor English language skills of the remote lecturer and of some of the students limited the quality of the interaction.

As indicated by the statistical analysis, there were no significant differences among sessions for all the questions, even though the types, objectives, participants and lecturers for each scenario were different. This may be attributed to the fact that all the scenarios and sessions were responding to actual educational needs.

For a successful VC session, certain details appear to be of critical importance, such as the technical trials that have to be realised in similar to the actual sessions' conditions. Indicatively, although during the trials of scenario #4 no problems were presented, during the actual session severe technical problems caused by the bandwidth overload, limited the quality of the session. This was attributed to the time of the day the actual session took place.

4. Conclusions

As indicated by our experience in this project, the teaching and learning processes in Earth and Life Science courses present a wide range of challenges and requirements which constitute valuable opportunities for the effective implementation of VC sessions. The detailed and in-depth design of the appropriate VC scenarios and the instructional design are crucial factors for the success of the sessions (Lim et al.., 2012). For the implementation of VC sessions, the educators will have to be involved in an instructionally and technologically complex environment, with a wide range of factors to be considered. It is, therefore, essential that the appropriate scenarios address specific educational objectives and actual teaching and learning needs.

Furthermore, a different teaching approach is required from the part of the lecturers: the sessions have to be more interactive for all the participating sites, both local and remote. The control of all the parameters affecting the active involvement and the interaction among the participants is essential. Interventions, which might seem trivial, such as directorial or technical decisions, if not appropriately considered, are likely to undermine the particular approach and lead to additional problems and unnecessary educational "noise".

The VC sessions can motivate interaction among participants, prior and after the session. This potential could be further harnessed by the development of supporting environments (e.g. a relevant website with fora for the online interaction of participants). The active participation and the interaction of the students with the material and with peers constitute an important factor for the effectiveness of

the teaching and learning processes (for similar findings regarding the preference of students for interaction with the content and with instructors and peers, see also Miller et al., 1999). Furthermore, such a supporting environment could address the issues of the "unknown audience", through the exchange of profiles and expertise. Participants who are already familiar with each other can more actively interact during the VC session.

Although the added value of meaningful VC sessions could mitigate the effect of possible technical failures, it is nevertheless necessary to eliminate through multiple technical trials and on-site support the technical features that may deteriorate the quality of the session and de-motivate the participants, both lecturers and students.

Although further research would be required for investigating weather the positive attitudes of the students were actually linked to the effectiveness of the employment of VC as an educational medium and not to the novelty of such a setting, the positive attitude of the lecturers and students cannot be disregarded. Positive attitudes of agriculture students towards video conferencing have also been identified in relevant studies (Meena et al., 2011). Furthermore, VC, in relation to other relevant technologies, emerged as a unique and valuable solution for addressing specific instructional needs and requirements. The experience of the VC sessions in AUA could possibly be relevant to the needs and requirements of other educational institutions with similar orientation.

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Adopting E-training and Living Labs for Collaborative Learning for Rural Public Agencies

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A B S T R A C T

Rural Small and Medium Enterprises devote significant resources exclusively for finding information so as to perform public services. The current period of information technology achievements but also financial crisis necessitates a different approach by local agencies and regional public authorities so as to provide information to rural businesses. In this paper , a European project entitled "Rural Inclusion" aiming at making the life of civil servants and rural entrepreneurs easier through innovative e-government services, training tools and methods is presented. In particular, this project offers collaborative learning for public authorities on providing information and adopting and deploying innovative e-government services, aiming at reducing the administrative burdens of rural businesses. In this light, this paper presents a framework for public authorities' training so as to model and provide information and e-government services.

1. Introduction

Rural Small and Medium Enterprises (SMEs) devote significant resources exclusively for finding information on public services. A great part of this information regards the informational phase, namely things that a rural SME should know before executing a particular public service. For instance, the informational phase concerns the SME's eligibility to perform a service; the Public Authorities (PAs) that are responsible for it; and what kind of documents the SME should adduce so as to apply for it. The process of searching for and retrieving this knowledge, either performed by the rural SME or by an expert (e.g. accountant, lawyer) on the rural SME's behalf, costs in terms of time and money. In many cases, this process can be repeated several times throughout a year, due to change of laws and regulations or in need of clarifications. Moreover, a public service could be very complex and include other public services, thus requiring information for each of them. For example in Latvia, the public service "Starting up a new business" requires performing five steps, namely decide on the foundation; paying the equity capital; register in the Register of Enterprises; open a bank account; and register in the State Revenue Service. The last two steps comprise on their own two individual public services (Ntaliani et al., 2011).

Administrative Burdens (ABs) are closely related with the informational phase of a public service. ABs are costs incurred by businesses for collecting information so as to meet legal obligations. In 2007, the European Commission (EC) launched the "Action Programme for Reducing Administrative Burdens in the European Union", setting the grounds for the cooperation with the member states to reduce ABs on businesses. The Action Programme focuses on the identification of information obligations that incur serious ABs so as to be reduced. It focuses on thirteen selected priority areas including company law, employment relations, taxation/VAT, statistics, agriculture, and transport. It has been estimated that administrative costs can be cut down by a quarter by 2012, which in turns will increase the EU GDD by 1.4 (EC, 2009).

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On the other hand, European countries have followed quite similar paths to reduce ABs as part of their efforts to modernize and reform their administration and improve the business environment and the quality of regulation. Rural SMEs consider ABs as the second most important individual business constraint, which justifies the raised interest by international organizations, PAs and the EU for measuring those (Costopoulou and Ntaliani, 2010).

The current period of information technology achievements but also financial crisis necessitates a different approach by PAs for providing information to rural SMEs and lowering their ABs. Such an approach is the Living Labs. Although Living Labs are a new phenomenon, there are various relevant definitions in literature. The Living Lab concept is based on a systematic user co-creation approach integrating research and innovation processes. According to Mitchell, a Living Lab represents a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts (Kusiak, 2007). Bergvall-Kareborn et al. (2009), consider a Living Lab as a user-centric innovation environment built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values. Also, they define as the five key components of a Living Lab the following: ICT and infrastructure, management, partners and users, research, and the approach. Particularly the approach is considered as the methodology or innovation approach for a Living Lab, which has five principles, namely openness, influence, realism, value and sustainability. Since PAs are usually responsible for overall innovation systems, they should not only be involved in Living Lab operation, but also utilize them from a content and application perspective in order to improve their transactions with businesses and internal workflow. (Niitamo et al., 2006).

In the RI context, the term "rural Living Lab" is used. It regards the involvement of rural users throughout all innovation processes; thereby, the innovation system becomes rural user-centric, in contrast to technology-centric. "Rural-Inclusion (RI): e-Government Lowering Administrative Burdens for Rural Businesses" (www.rural-inclusion.eu) is a project supported by the EC under the Competitiveness and Innovation Framework Programme. It aims at deploying an innovative infrastructure (e.g. software, models, and services) that will facilitate the offering of Semantic Web services by PAs in rural areas for the informational phase. In particular, RI aims at addressing PAs' longstanding challenges, such as easing the discovery of public services by users (rural SMEs), personalizing the service that the user needs to have access, providing all necessary information for the execution of the particular services and checking the eligibility of the user for receiving the service. Also, RI proposes a learning framework for helping PAs in implementing e-government services for supporting the informational phase. For succeeding these objectives, RI adopts, adapts, and deploys in a rural setting the Service Oriented Architecture (SOA) paradigm, implemented through state-of-the-art Semantic Web technology and supported by rigorous and reusable public administration domain analysis and modelling while being in line with all major European programmes and initiatives.

The envisaged potential users of the RI services are in five European rural regions, rural Spain, the Greek island of Chios, rural Latvia, rural France and overseas, in the region of Martinique. On a regional/national level, the directly involved user groups will be rural SMEs - including SMEs, PAs, and e-government service technology providers and innovators. In addition, project results are expected to reach and involve - but are not limited to - the following beneficiaries:

- Development agencies: different types of development agencies supporting rural communities;
- Chambers: all types of sectoral or regional chambers (e.g. commerce, technical);
- Public organizations: all public authorities/agencies;
- Civil servants: employees of public organizations, especially the ones that are specialized in the public service in question;
- Rural SMEs: all rural SME and business audiences (i.e. professional unions/associations, co operations);
- Potential entrepreneurs or SME staff: future business audiences;
- Academia: scholars and students engaged in higher education and research;

- Funding organizations: all types of financial organizations and funding agencies (e.g. banks, venture capitals, sponsors);
- Mediators: organizations playing a mediating role between public organizations and SMEs; and
- Non Governmental Organizations (NGOs): NGOs active in rural areas (focusing on particular groups of people, civil purpose/society).

The objective of the paper is to introduce a framework for PAs' training so as to model and provide information and e-government services for reducing the rural SMEs' ABs in the context of RI. Therefore, the structure of the paper is as follows: in section 2, the framework, as well as its application for two public services is described. The framework has two dimensions, namely e-training tools and collaborative learning. Section 3, explains in detail three training tools and the relevant training content for PAs. Section 4 presents two collaborative training initiatives, which are workshops and rural Living Labs. Finally, some conclusions are apposed.

2. RI initiative for facilitating public services

2.1. E-government services

RI project has already implemented the informational phase of nine public services (see Table 1). The public services have been documented and modelled according to the Public Service Modelling (PSM) methodology (D2.1, 2009). The implementation of the public service regards the development of a dialogue between the user of the public service (e.g. citizens/businesses) and the PA. Further below, two examples have been selected to present this approach, namely the "Issuing an operation license for manufacturing companies" service and the "Provision of grant to new farmers" service. The first one concerns different types of rural SMEs (e.g. food companies), whereas the latter is specialized for the agricultural sector. Both services concern the Greek island of Chios.

Table 1. Public services implemented by RI per region/country

Region/Country	Public Service
Chios island/ Greece	Registration in the Chios Chamber of Commerce
	Provision of grant to new farmers
	Issuing an operation license for manufacturing companies
Latvia	Registration in the Register of Enterprises
	Registration in the State Revenue Service
Spain	Identification of suitable business type for starting up a business
	Provision of grant from SRE public agency to unemployed persons for starting up a business
Martinique/ France	Declaration of work accident
France	Declaration employment of a new employee

2.1.1. Issuing an operation license for manufacturing companies

In Chios Island, a very significant cultivation is mastic. There is a great variety of products that are produced or contain mastic, such as cosmetics, pharmaceuticals and food. Thus, farmers cultivating

mastic start up small and medium manufacturing companies in order to use mastic as a raw material for the production of other products. Therefore, it is very important to support local entrepreneurship via the provision of an electronic service about the issuance of an operation license for manufacturing companies. In order to receive an operation licence an entrepreneur has to submit relevant papers (e.g. questionnaire filled in by the owner of the company, approval of environmental condition, verification of land use, and technical memo) to the Manufacturing Department of the Chios Prefecture, which will check them so as to issue the licence. In order to find this information the rural SME has to ask PAs (Chios Chamber of Commerce) or read complex laws and regulations. With the RI approach, all this information is given to the farmer through a single source in a dialogue form (D2.3, 2010). Below we appose some of the dialogue questions:

- Where will the company be established?
- Will the company process flammable or toxic material or gas?
- Is the company's mechanical equipment load less that 22 KW kinetic power or 50 KW thermal power?
- Which is the cost of the company's mechanical equipment and the machinery load?

2.1.2. Provision of grant to new farmers

In order to apply for receiving a grant as a new farmer, information on how to obtain and/or fill in a number of official documents, namely the liquidation note and family status certificate from the Tax Office and the Municipality respectively, as well as the farmers' candidacy file, is needed. Also, particular information on preconditions for being eligible for the service is vital for the farmer. These preconditions are defined by a ministerial decision and concern the new farmer (e.g. regarding place of residence, military obligations) and the agribusiness (e.g. economic size, property regime) (Ntaliani et al., 2010). Below we appose some of the RI dialogue questions that are posed to the farmer so as to acquire the particular information:

- Are you a physical or legal entity?
- What is your age?
- Is the agricultural holding at your place of residence?
- Has the entire agricultural holding being declared in the last two years?
- Which is your permanent place of residence?

In both aforementioned examples, the questions show the facilitation of the process of finding information. Through the RI dialogical way it is very easy for rural SMEs and/or farmers that are not used to read official documents to understand laws and provide the necessary information for making applications and using public services. According to the answers of the rural SME and/or farmer the information is personalized for the particular service. The implementation of the informational phase of the two public services can be accessed from the Chios Chamber of Commerce at http://www.chioschamber.gr/xios/shared/rural.jsp?context=101 (in Greek). The ultimate objective of the project is to train PA employees to deploy the informational phase of the public services provided by their agency using the RI methodology. This is succeeded through a particular training framework, presented in the next section.

2.2. RI framework

PAs are the responsible bodies for serving citizens' and businesses' needs regarding their transactions with government. In order to succeed this, PA employees have to be trained. RI offers an innovative training framework for training not only PA employees, but also rural SME personnel, who are the receivers of public services, so that the RI services can be effectively introduced in rural settings. This framework is comprehensive and integrates actions benefiting both PA staff and rural SMEs personnel, and integrates the proposed e-government solution in a wider vision: to provide to people in rural areas ICT-enabled tools so that they can adopt and be able to adapt the proposed change, inventing their own solutions for their specific circumstances, in a continuous sustainable route towards capacity building in the rural community through a lifelong learning culture.

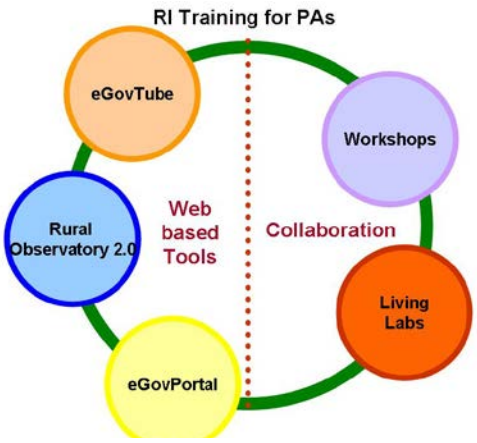

Figure 1. Training Framework for Public Agency Employees

As described in Fig. 1, RI provides a training framework through a multistage process including e-learning tools and collaborative training. E-training tools regard three main platforms, namely the eGovTube, the Rural Observatory 2.0 and the Semantic eGovPortal tools. Collaborative training refers to a series of Living Labs and workshops where PA employees will have a collaborative learning experience through the use of the Web-based tools of the project. The main target participants of the training sessions are representatives of the local authorities and public service providers, who can also act as facilitators/observers.

3. e-Training Public Agencies

3.1. Web-based tools

PA employees are trained in using three Web-based tools, described as follows:

- ***eGoveTube*** (www.calt.insead.edu/eis/egovtubeen) is a collaborative Web 2.0-oriented platform that aims at supporting PAs in sharing information and experiences, identifying innovative services and developing users' interest for them, and using innovative eGov-supportive technology introduced by RI through video communication, community and knowledge assets network(s) visualisation, rich profiling and other tools (Luccini and Angehrn, 2010). eGovTube is used as core driver for sustaining the overall process, not only by giving room to the delivery of training content, but also by giving voice to all participants to share their ideas and experiences, so that the innovation diffusion process will be constantly challenged and assessed. This platform is able to deliver formal training content as well as informal, actionable learning-based activities. It offers 4 coupled environments (video space, rich profiling space, knowledge and social networks visualization tool, synchronous and asynchronous communication space), as well as other peculiar Web 2.0 features, such as rating and recommending, devised to sustain the RI community over time in fostering the reduction of the ABs and the adoption of innovative e-government technologies.
- ***Rural Observatory 2.0*** (www.rural-observatory.eu/index.htm) is an innovative sophisticated Web-based environment that will facilitate information retrieval, access, usage and exploitation of e-government services and relevant digital educational content (Manouselis et al., 2007; Karamolegkos et al., 2010). It is an online point of reference, which PAs can continuously access for relevant information and digital training resources. The use of the Rural Observatory 2.0 tool can allow to store and deliver more traditional training content, which may be useful for addressing PA employees' needs regarding specific topics.
- ***eGovPortal*** is a platform that offers an ontology-based structured dialogue for driving users in eliciting specific information for performing a public service. It offers the main bundle of semantic e-government services and undertakes the responsibility of reducing the ABs of rural SMEs, in regard to their transactions with local authorities and regional public authorities (Ntaliani et al., 2012).

3.2. Training content

Training content is a very vital means so as to disseminate the RI knowledge to interested beneficiaries. The training content is used in the workshop sessions and Living Labs that will be attended by the PAs' employees in the context of the RI project. In order to create the training content that would achieve the aforementioned workshop objectives a four-step process was followed: (a) identification of the PA's needs to be covered by training content; (b) collaboration with RI partners for collecting content; (c) selection of the resources that will be used as training content; and (d) categorization of the resources according to the training objective they fulfil.

These steps have led to the determination of 21 learning activities that represent the corresponding leaning objects. A learning object/resource is any entity, digital or non-digital, that may be used for learning, education or training. Learning objects should include some learning objectives and outcomes, assessments, and other instructional components, as well as the object itself (Patrikakis et al. 2008; Costopoulou et al., 2010). The determination of the particular learning activities is the result of collecting, integrating and/or adapting existing digital content provided by methodological partners in each country so as to address the needs of the RI PA training sessions.

The objective of training PAs on documenting and modelling public services using the RI methodology and tools has been achieved through the creation of fifteen (15) learning objects/ activities. Training content on exploiting the possibilities of eGovTube aims at supporting the following PA workshop activities: introduction to Web 2.0 and its relevance for RI for sustaining innovation adoption; eGovTube presentation to PA representatives, guided familiarization to rich profiling and to network navigation and exploration of eGovTube features on supporting submission and sharing of content. Three (3) learning objects/ activities have been created so as to support eGovTube . Also, two (2) and one (1) learning objects/ activities have been created for exploiting the possibilities of RuralObservatory 2.0 and eGovPortal correspondingly.

The training content has been mainly designed on non-technical and technical aspects. Analytically, the non-technical content concerns issues, such as public service modelling, examples on how to complete the public service template for a particular public service, as well as creating the relevant dialogues. The technical dimension concerns issues such as user manuals and web-based tool functionalities. The learning objects are distinguished into four subjects: (a) public service modelling; (b) using the eGovTube; (c) using the RuralObservatory 2.0; and (d) using the eGovPortal.

The learning objects have been analyzed by a set of characteristics, classified in three main categories, namely content characteristics, media type and format and usability and availability, as described below (Ntaliani et al., 2012):

(i) Content characteristics

- Subject coverage: The most important identification in regard to the training content is the different topics it covers. There are four main subjects, namely Public Service Modelling, Using eGovTube, Using RuralObservatory 2.0, and Using eGovPortal.
- Type: A learning object can be of one or more of the following types Application, Assessment, Case study, Demonstration, Educational, Glossary, Guide and Lecture (course/seminar).
- Content use: In regard to the potential use of the content, two possible uses were identified, namely informational use and use for training purposes.
- Quality procedures: An approach for the evaluation of the content quality, including structured questionnaires and interviews.

(ii) Media type and format

- Format: Learning objects are in various formats (e.g. videos, PowerPoint presentations, and MS Word documents) so as to offer a variety of means and attract more participants.
- Size: The analysis of content in respect to the storage capabilities revealed that the total of content does not have excessive requirements for storage.

(iii) Usability and availability

- Ownership: For every learning resource the owner and creator/author have been identified.

It has to be noted that the creation of learning activities and corresponding learning objects is an on-going process throughout the whole RI project. This is due to the fact that gradually more e-government services will be added in the RI platform. Moreover, the insights provided by PA employee workshops on the RI approach will lead to the evaluation of current training activities and to the suggestion of new ones that will cover successfully PAs' needs. The following section presents two collaborative learning initiatives, namely workshops and rural Living Labs.

4. Collaborative training

4.1 Workshops

Training events aim at training the PAs' personnel in specializing in using the RI services and tools, modelling services according to the project methodology, and assisting their community in taking up the services. Up till now, one small scale event per rural partner, as well as one large scale event in Greece, Martinique and France has been organized. Further workshops will be organized in order to address specific training needs that may emerge from the feedback and the input of the RI community posted in the eGovTube. The objectives of the workshops are to train the PAs in:

- Documenting and modelling public services using the RI methodology and tools;
- Using and exploiting the opportunities of eGovTube;
- Using and exploiting the opportunities of RuralObservatory 2.0;
- Using and exploiting the opportunities of eGovPortal.

The organized workshops will allow to provide direct tutoring on the RI tools that will foster the reduction of ABs related to public services and to gather insights from direct interaction from targeted users by the means of discussions and hands-on sessions. It concerns testing products and services in real time and real life environments, thus helping users to encounter, understand and solve the problems users encounter, and to detect the usable features that have to be promoted.

4.2. Rural Living Labs

The key concept behind the organization of a Living Lab is that the user should be involved in the innovation process all the time. Involving the users will enable the stakeholders to obtain products closer to the market requirements without having to create such a market, because the market is already there. The user can contribute with ideas, experiences and knowledge from his/her daily life and interactions with the products, services and applications. The fundament of a Living Lab is that the innovation system becomes human-centric, in contrast to the classic technology- and/or market-centric approaches.

Observation of the behaviour of the users will provide information about the use of the tools, the obstacles to this use, and how to improve the usability of the tools and the ICT skills of the users. Recommendations, thus, will be based on real life experiences of the target group and therefore they will be context based and usable.

5. Conclusions

Nowadays, there are various platforms and initiatives for facilitating the communication of public agencies with citizens/ businesses using advanced ICT tools. For example, such a project is WeGov (wegov-project.eu). The particular project will develop a toolset that allows full advantage to be taken of a wide range of existing and well established social networking sites to engage citizens in two-way dialogs as part of governance and policymaking processes. In addition, Bose (2004), and Falivene and Silva (2008) identify training initiatives on e-government topics that mainly focus on the provision of necessary skills for the personnel of public and governmental agencies.

In this context, RI has the overall vision to make the life of civil servants and rural entrepreneurs easier through innovative e-government services, training tools and methods. Thus, it proposes a

training framework through a multistage process developed as e-learning tools and collaborative training, where PA employees are trained and guided in an experiential learning process through the use of innovative Web-based tools. PA employees' training will bring them closer to the rural SMEs' needs so as to respond to them. Also, it tries to develop a lifelong learning-oriented digital culture, so that PA employees in rural areas will be able adopt, adapt and invent solutions for their specific circumstances, in a continuous sustainable route towards capacity building.

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Readiness to use e-learning for agricultural higher education in Sub-Saharan Africa. Results from a survey of faculty members

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A B S T R A C T

E-learning is likely to be an increasingly important element in teaching agriculture and related subjects at universities in Sub-Saharan Africa. The purpose of this study was to explore the factors involved in determining the readiness and intention to adopt e-learning by faculty members at member institutions of the African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE). The study was based on the decomposed theory of planned behavior (DTPB) to predict intentions on the use of e-learning. DTPB draws on constructs influencing the attitude to use technology from two frequently investigated models in this area, that is, the theory of planned behavior (TPB) and the technology acceptance model (TAM). Valid responses were collected from 70 faculty members with a survey questionnaire. Validated scales from previous research were used to measure the variables of interest. The results revealed that the majority of the respondents have only limited access to ICT infrastructure and support services. However, they perceived e-learning to be very useful in general and to have the potential to enhance their teaching-related activities.

1. Introduction

The New Partnership for Africa's Development (NEPAD), a program of the African Union (AU, 2001), recognizes the critical role of information and communication technology (ICT) in accelerating economic growth and development. One of NEPAD's sectoral priorities is to bridge the digital divide by investing in ICTs by improving the poor ICT infrastructure, strengthening policy and regulatory frameworks, and developing human resources. In particular, NEPAD intends not only to boost the broadband infrastructure in Africa, but also to foster distance learning and the development of local-content software as capacity building is a crosscutting area for all the four pillars of the Comprehensive Africa Agriculture Development Programme (CAADP). Figure 1 illustrates the current status of the improvement of ICT infrastructure through various undersea cables connecting the African continent with the rest of the world.

The NEPAD Council has also organized two ICT Africa Summits in 2008 and 2010, which also addressed the need of institutions of higher learning for improved ICT infrastructure and access. While investments in ICTs and additional bandwidth are certainly needed to provide the physical facilities

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for advancing science, technology, and innovation, but special attention has also been given to developing the capacity to acquire, adapt, and adopt knowledge by using ICTs as a key enabler to a knowledge-based economy (Watkins & Ehst, 2008).

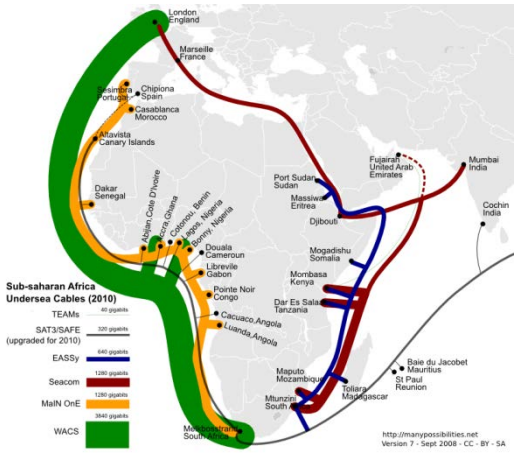

Figure 1. African undersea cables (Song, 2008)

According to the recent economic outlook of Africa (OECD & AfDB, 2009) the use of ICT in education has moved from small projects to national government and regional programs. Although this transitional process of adoption and diffusion of ICT in education in Africa constitutes a more systematic integration by policymakers, there still exist great differences between countries across Africa (Farrell & Isaacs, 2007; Farrell et al., 2007). The authors note a growing need for more contextualized digital learning materials that is relevant to local curricula as ICT becomes more integrated into the teaching and learning process across the curriculum. This issue, for instance, has been adressed in a recent project on improving the availability and relevance of agricultural learning resources in Africa, coordinated by the African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE) with joint funding from the Association of African Universities (AAU) as part of its Mobilisation for Regional Capacity Initiative (MRCI) through a grant of the Department for International Development (DfID) of the United Kingdom, and the World Agroforestry Centre (ICRAF)'s AGROLOR project funded by the Flemish Government.

Despite rapid improvements in ICT infrastructure (e.g., increased availability of mobile phone technology, number of wireless networks, undersea cable project, etc.), the ICT infrastructure at universities remains seriously constrained, primarily due to the lack of computer stations and limited access to affordable high-speed Internet connectivity. These findings confirm the results from the Survey of African University Connectivity (ATICS) from 2006 (Gakio, 2006) that was commissioned by the International Development Research Centre of Canada (IDRC) based on the initial 2004 ATICS study that was sponsored by the World Bank. The main results of the ATICS study show that the Internet connectivity in tertiary institutions in Africa is too limited in terms of type and availability of bandwidth, relatively high bandwidth costs, and a lack of proper bandwidth management and ICT skills training for educational purposes.

The findings these surveys correspond with the results of more recent studies on the use of e-learning in Africa (Unwin, 2008; Unwin et al., 2010). These studies confirm that there is a great potential in using ICT in education in Africa. For instance, ICTs could actually help to address the important demand for higher education in Africa by increasing the number of graduates that enroll in tertiary programs by utilizing ICT-based distance learning (Van Brakel & Chisenga, 2003). However, the use of computers and the Internet for learning is still very much in its early stages in Africa due in part to the lack of an appropriate infrastructure and investments in training instructors and support staff in ICT. These constraints have to be overcome before ICT can be more widely adopted for open and distance education across Africa.

An earlier study on accessing knowledge online in Africa (Ondari-Okemwa, 2004) also shows that countries in Sub-Saharan Africa lag behind in generating, accumulating and accessing knowledge due to an inappropriate ICT infrastructure, inadequate policy support to increased access to global knowledge. Even studies in an area such as library and information science education in Africa that would have the greatest interest in extending the use of ICT to advance its education, show that the situation in higher education remains a challenge (Ocholla, 2003; Minishi-Majanja & Ocholla, 2004; Ocholla & Bothma, 2007). These studies also confirm that there is great interest among faculty and students to use ICT in the teaching and learning process, but the underdeveloped infrastructure, inadequate resources, and lack of properly trained users remain an obstacle on exploiting ICT more effectively. The importance of training instructors as well as students in the use of ICT in education is also documented (Unwin, 2005; Mutula et al., 2006). These authors confirm that such interventions help to increase computer literacy, especially when offered using a blended approach, but issues such as infrastructure and online support remain resolved. Although university libraries play an important role in assisting e-learning and promoting scholarship, the challenge remains to overcome the digital divide with increasingly high costs of accessing online research databases and the procurement of digital information (Mutula, 2008).

A prominent example of using technology-mediated instruction in higher education is the African Virtual University (AVU), which was established in 1998 with funding from the World Bank, CIDA, DfID, and AusAID (Hicks, 2007; Ondari-Okemwa, 2002). E-learning has also been increasingly implemented in traditional universities throughout Africa, for instance, the University of the Francophone Digital Campus at the University Abdou Moumouni (UAM) of Niamey in Niger (Dramé Yayé, 2010). The importance of e-learning for higher agricultural education in Africa has also been highlighted (Beniest et al., 2008).

The purpose of the present study is to examine the relationship between teaching online and the readiness and willingness of faculty members in higher agricultural education in Sub-Saharan Africa. The paper is structured as follows: First, the methodology based on the decomposed version of the theory of planned behavior (DTPB) is briefly reviewed. Next, the research model and hypotheses are presented, followed by a presentation of the findings from the data analysis. Finally, a discussion of the meaning of the results and their implications concludes the paper.

2. Methodology used for the Study

With the increasing implementation of e-learning in educational settings, one important aspect to understand is the user acceptance of instructional technology, which is influenced by the attitude of end-users towards computers. Since computers have become an integral part of teaching and learning at all levels of education, it becomes important for both educators as well as policy makers to understand the different factors that influence the interaction of learners and instructors with computers by adapting the decomposed theory of planned behavior (DTPB) (e.g., Teo, 2009; Teo and Noyes, 2008). The present study was based on the DTPB to predict intentions to use e-learning. DTPB draws on constructs influencing the attitude to use technology from two frequently investigated models in this area, that is, the theory of planned behavior (TPB) and the technology acceptance model (TAM).

TAM was developed by Davis (1993) to specify the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using, and actual usage behavior. TAM focuses on explaining the attitude behind the intention to use a specific technology or service. In the context of e-learning, attitude towards this approach will be positively influenced by the perceived usefulness of the system and its ease of use. Perceived usefulness is defined as the extent to which an individual believes that using a particular technology will enhance her/his job performance.

The TPB was developed by Ajzen (1985; 1991) to predict and explain goal-directed behavior by taking into account perceived as well as actual control over the behavior. TPB states that behavioural intention is a function of attitude and subjective norm, combined with perceived behavioural control and in the context of this survey the intention of the respondents to teach online. While attitude is defined as an individual's positive or negative feeling about performing an intended behaviour,

subjective norm relates to the influence of an individual's perception that most people who are important to him/her think whether s/he should or should not perform the intended behaviour.

The DTPB incorporates the attitude dimensions from TAM, that is, perceived usefulness and perceived ease of use, and the behavioral dimensions from TPB, that is, subjective norm (i.e., social influence) and perceived behavioral control by decomposing them into more specific salient belief dimensions, for example, peer influence, supervisor's influence, self-efficacy, resource facilitating conditions, and technology facilitating conditions.

3. Research model

In general, readiness to undertake ICT-related activities comprises indicators such as access to and use of the basic ICT infrastructure, instructors and support personnel trained in ICT, the availability of radio and television instruction, educational software, e-mail, etc. (OECD, 2005; UNCTAD, 2009; UNESCO, 2009). The purpose of the survey conducted as part of the Flemish Government funded AGROLOR project was to examine the readiness and willingness of faculty members in agricultural higher education in Sub-Saharan Africa to teach on-line. A questionnaire with a five-point scale was used to collect the data for the survey. Items from related studies were modified for adaptation to the context of teaching on-line.

The survey addressed this dimension by asking questions about how useful teaching online is to the individual. Perceived ease of use is the degree to which using information technology is free of effort for the end-user. The survey covered this aspect by asking questions on how easy an individual thought teaching online was to him/her. In addition to these two aspects, the survey included questions about an additional dimension concerning how well teaching online fits with an individual's job.

The dimension for subjective norm in this study included questions concerning the support, approval, and relevance of supervisors, colleagues, and students concerning an individual's perception of and intention towards teaching online. The control belief of an individual refers to the efficacy of the individual's control in either inhibiting or facilitating the behaviour. Control beliefs reflect the perceived difficulty (or ease) with which the behaviour may be affected. In the current study on the readiness and willingness to teach on-line, the control belief refers to knowing how to use learning technology (self-efficacy), and facility refers to externally based resources constraints. Questions addressing the dimensions of perceived behavioural control in this study included:

- Usefulness;
- Ease of use;
- Fitness for job;
- Computer use;
- Computer training and support to teach online;
- Self-efficacy defined as an individual's self-confidence in his or her ability in using computers and the Internet;
- Computer anxiety defined as an individual's apprehension when s/he is faced with the possibility of using computers and/or the Internet.

Therefore, the following hypotheses were studied:

H1. The higher the perceived fitness of teaching online is to the job, the more likely the system is perceived to be useful.

H2. The higher the perceived fitness of teaching online is to the job, the more likely the system is perceived to be easy to use.

H3. The higher the perceived fitness of teaching online is to the job, the more likely the intention to teach online.

H4. The higher the system support towards online education, the more likely the intention to teach online.

H5. The higher the support from superiors and fellow faculty members, the more likely the intention to teach online.

4. Data analysis

A total of 70 usable, complete responses were obtained from respondents in 22 countries (see Figure 2). The gender breakdown was 57 (83%) male and 12 (17%) female, the majority either associate or assistant professor, and most of them in their forties or fifties.

Figure 2. Map of Africa with number of responses by respondents' country of residence

Almost all respondents had experience with both the computer and the Internet, and used them at least every other day. Most of the respondents (74%) had no experience teaching online nor had they offer any online education at the time of the survey; 15% had experience for one year or less, while only a minority of around 3% had experience teaching online for more than 2-3 years. Of those teaching online (about 24%), almost all use the Web for blended learning; only a fraction offered fully online courses (1%). Table 1 gives a detailed description of the main demographic statistics for the respondents

Table 1. Descriptive Statistics of Respondents' Characteristics

Measure	Value	Frequency	Percent	Valid percent
Gender	Male	57	81.4	82.6
	Female	12	17.1	17.4
	Total	69	98.6	98.6
	Missing	1	1.4	100.0
Total		70	100.0	
Age	< 30	1	1.4	1.4
	30-39	12	17.1	17.4
	40-49	28	40.0	40.6
	50-59	26	37.1	37.7
	> 60	2	2.9	2.9
	Total	69	98.6	100.0
	Missing	1	1.4	
Total		70	100.0	
Type of institution	University	57	81.4	82.6
	Technical college	9	12.9	13.0
	Training centre	2	2.9	2.9
	Other	1	1.4	1.4
	Total	69	98.6	100.0
	Missing	1	1.4	
Total		70	100.0	

Measure	Value	Frequency	Percent	Valid percent
Academic rank	Full professor	7	10.0	10.1
	Associate professor	25	35.7	36.2
	Assistant professor	18	25.7	26.1
	Instructor	14	20.0	20.3
	Doctoral student	2	2.9	2.9
	Other	3	4.3	4.3
	Total	69	98.6	100.0
	Missing	1	1.4	
Total		70	100.0	
Usage frequency of computer	Every day	65	92.9	97.0
	Every 2-3 days	2	2.9	3.0
	Total	67	95.7	100.0
	Missing	3	100.0	
Total		70		
Usage frequency of the Internet	Every day	57	81.4	81.4
	Every 2-3 days	11	15.7	15.7
	Once a week	1	1.4	1.4
	Less than once a month	1	1.4	1.4
Total		70	100.0	100.0

When asked to respond to the general infrastructure to support online education, less than 75% had the necessary assistance at their institutions to engage in online education. The lack of training, access, and other support mechanism confirms results from other studies. Table 2 provides a summary of the results.

Table 2. Summary Statistics of Responses About the E-learning Infrastructure at the Respondents' Institution

		Frequency	Percent
My institution maintains a specialized eLearning support unit	Yes	14	20.0
	No	56	80.0
	Total	70	100.0
My institution has implemented a strategic framework for eLearning	Yes	19	27.1
	No	51	72.9
	Total	70	100.0
My institution provides regular training on eLearning for faculty, students, and staff	Yes	16	22.9
	No	54	77.1
	Total	70	100.0
My institution maintains a network infrastructure	Yes	37	52.9
	No	33	47.1
	Total		100.0
All faculty members at my institution are equipped with computers	Yes	39	55.7
	No	31	44.3
	Total	70	100.0
All faculty members and students at my institution have their own e-mail account	Yes	39	55.7
	No	31	44.3
	Total	70	100.0
My institution ensures that intellectual property rights are	Yes	26	37.1

		Frequency	Percent
protected	No	44	62.9
	Total	70	100.0
My institution maintains a virtual learning environment	Yes	18	25.7
	No	52	74.3
	Total	70	100.0

The measures of actual use, behavioural intention to use, attitude toward using, subjective norm, and perceived behavioural control were adapted from various studies related to TAM and TPB. The alpha values of the constructs were calculated to assess the internal consistency reliabilities of the survey instrument. The results in Table 3 show that the alpha coefficients are relatively high, indicating that the items are in general reliable. Nevertheless, it is important to bear in mind the low values of the some of the items when applying the findings of the study, that is, those measuring student's influence and those measuring perceived behavioural control, e.g., efficacy in using computers and the Internet, computer anxiety.

Table 3. Reliability Analysis for Each Construct

Construct	Items	α-value
Behavioral intention		
	Intend to use when having access Predict to use when having access Intend to use next semester Given the choice to use Recommend to use	0.750
Actual usage		
	Computer usage frequency Internet usage frequency	N/A*
Attitude		
Usefulness	Online education technology is useful for teaching Online education increases effectiveness of teaching Teaching online makes the job easier Online education is effective for student learning Online education increases productiveness Online education is appropriate for teaching Students are well prepared for online education	0.832
Ease of use	Learning to teach online is easy Easy to become skilful in teaching online Online education helps to achieve the same as regular teaching Online education is flexible Online education does not require a lot mental effort to become skilful Teaching online is easy to accomplish	0.821
Fitness for job	Online education has positive effect on job performance Online education decreases time needed for our job responsibilities Online education fits well with teaching style Teaching online helps to accomplish more work Online education increases quality of teaching	0.863

Construct	Items	α-value
	Online education assist in teaching tasks	
Subjective norms		
Superiors	Superiors expect to teach online	
	Superiors approve to teach online	0.755
	Superiors' support to teach online is important	
Colleagues	Fellow faculty members expect to teach online	
	Fellow faculty members approve to teach online	0.755
	Fellow faculty members' attitude to teach online is important	
Students	Students expect to teach online	
	Students approve to teach online	0.578
	Students' approval to teach online is important	
Perceived behavioral control		
Efficacy - computers	Working with computers is easy	
	Diffucult to learn new applications	
	Applications make it easier to prepare for teaching tasks	0.586
	Computers rarely enjoyed	
	Computers are good teaching aids	
	Computers save time	
Efficacy - Internet	Know about latest IT developments	
	Confident navigating the Web	
	No problems finding things on the Internet	
	Confident retrieving teaching materials from the Web	
	Confident using discussion forums	0.674
	Confident downloading files and software from the Internet	
	Confident maintaing course website	
	Solve problems with Internet access	
	Not sure what a Web server does	
Computer anxiety	Hesitate using computers because of making mistakes that cannot be corrected	
	Avoid computers because of unfamiliarity and intimidation	
	Excited to learn about computes	0.186
	Confident to learn computer skills	
	Computers are necessary tools	
	Avoid using computers	
	One of the first using new / updates software applications	
Computer use	Access to computer at the office	
	Access to computer at home	
	Rely on computer support from others	0.531
	Use computer for basic tasks	
	Use computer for digital materials development	
Computer support	Institution has network infrastructure	
	Faculty members have computers	0.886
	Students have access to computers	

Construct	Items	α-value
	Institution has learning management system to teach online Institution has framework to teach online Institution offers incentives to teach online Specialized training to teacih online is available Institution has specialized support unit for online education Specific person / group is available for technical support in teaching online Guidance available for online teacing methodology	

* N/A = not applicable. Computer and Internet usage are single items measuring the frequency of use.

Lack of a support infrastructure and perceived behavioural control (that is, superiors and fellow faculty members) increase behavioural uncertainty and reduce the behavioural intention to teach online. However, individuals are more likely to teach online if their perceived behavioural control and system support are alleviated so that they have control over its usage. The results of the regression analysis used in examining the construct relationships are summarized in Table 4.

Table 4. Regression Results of Direct Relationships

Hypothesis	Statement	beta-coefficient	t-value	F-value	R^2
H1	The higher the perceived fitness of teaching online is to the job, the more likely the system is perceived to be useful.	.580	5.778	33.387	.326
H2	The higher the perceived fitness of teaching online is to the job, the more likely the system is perceived to be easy to use.	.652	7.029	49.412	.416
H3	The higher the perceived fitness of teaching online is to the job, the more likely the intention to teach online.	.433	3.934	15.480	.176
H4	The higher the system support towards online education, the more likely the intention to teach online.	.390	3.488	12.163	.139
H5	The higher the support from superiors and fellow faculty members, the more likely the intention to teach online.	.485	4.539	20.603	.224

The results in Table 4 show that the coefficient of determination (R2) for the regression is .326 and .416 for perceived usefulness and perceived ease of use respectively, indicating that 32.6% and 41.6% of the variation in perceived usefulness and ease of use are explained by fitness to the job. Further, the results show that perceived usefulness (t = 5.778) and perceived ease of use (t = 7.029) are key attitude shapers. When teaching online is perceived as useful and easy to use and fit to the job, the attitude is more favourable. It is also observable from the table that there is a significant association between the influence of superiors and fellow faculty members and the subjective norm, contributing significantly (F = 20.603), also predicting 22.4% of variations in subjective norm. The contribution of infrastructure support was not as high as expected (F = 12.163), yielding only 13.9% contribution to variation. The same observation applies to the association between fitness to job and intention to teach online.

5. Conclusion

Analysis of the data indicated that beliefs about the usefulness, ease of use of e-learning and user experience positively affect attitudes toward teaching on-line. Beliefs about self-efficacy regarding teaching on-line positively affect perceived behavioral control, which in turn affects on-line teaching behavior. In sum, respondents who believed in the usefulness of e-learning and in their own abilities to teach on-line were more likely to make use of e-learning in their teaching than were those without such beliefs.

The initial observations showed that there is a strong correlation between usefulness and ease of use to encourage faculty members to teach on-line. Establishing a system infrastructure that is useful and easy to use would help to increase teaching online. The significance of fitness to job suggested that teaching online should be clearly embedded into the work environment of an individual to increase his/her intention to teach online. This positively correlates with the influence of superiors and fellow faculty members on the intention to teach online. Although less obvious in this study, providing faculty members with the necessary supporting infrastructure will certainly increase the lecturers' intention to engage in online education. This does not only involve the technical infrastructure of network access, hardware and software, but also the technical assistance in instructional design as well as incentives. Overall, the results of this survey indicated that ANAFE higher education institutions showed a clear interest in the use of ICT to enhance their teaching and learning about agroforestry, agriculture and natural resources management.

One limitation of the study, though, was the relatively small sample size. Thus, the findings may not be representative for Sub-Saharan Africa or any developing country in particular. In addition, the analysis of the findings needs to be further enhanced through structured equation modeling in order to better verify the constructs and their relationship.

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Organic Edunet – Call for a Worldwide Platform in Organic Agriculture

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A B S T R A C T

Organic.Edunet (ECP-2006-EDU-410012 Organic.Edunet) aims to facilitate access, usage and exploitation of digital educational content related to Organic Agriculture (OA) and Agroecology. It deploys a multilingual online federation and digital environment of learning repositories, populated with quality content from various content producers. Organic.Edunet focuses on achieving interoperability between the digital collections of OA and Agroecology content of various EU countries. In this way, digital content that can be used to educate European Youth about the benefits of OA and Agroecology, becomes easily accessible, usable and exploitable. As the end of the project approaching the system has been set up and located to content providers preserving the network system. All partners related to education have uploaded all of their learning objects. In order to ensure the sustainability of the portal all partners contribute to affiliated partners' organization. The project offers a digital and user defined portfolio for them even in regular learning systems or lifelong learning.

1. Introduction

Consumers demand for food quality and safety, as well as, society's demand for more sustainable development, provide new opportunities for the agricultural sector (Williams, 2002). Consumers' fears, triggered by food scares and technological developments such as genetic modification and food irradiation, have been translated into serious concern about food safety, increasing demands for quality assurance and more information about production methods (Hammitt, 1990). In addition, public awareness of the irreversible damage done to the environment by practices that lead to soil and water pollution, depletion of natural resources, and destruction of delicate ecosystems, has led to calls for a more responsible attitude towards our natural heritage (Grunert and Juhl, 1995).

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Against this background, Organic Agriculture (OA) has come to the fore as an agricultural approach that can not only produce safer agricultural products but it is environmentally sound too (Stolze et al., 2000).

In this light, the European Action Plan for Organic Food and Farming (2004) has identified the need for actions supporting the training and education of all stakeholders related to OA, covering aspects related to production, processing and marketing of OA products and their benefits, plus targeting OA products as the preferred option for both producers and consumers (Schmid et al., 2008).

Efficiency of organic farming can either grow or decrease over time depending on the nature of the technology and the learning process (Sipiläinen and Lansink, 2005). The European Commission and social partner organisations at EU level encourage the lifelong development of qualifications and competence. This is reflected in many policy reports and reviews (Field, 2000).

The main objectives of the Organic.Edunet project are the following ones:

- To support stakeholders producing content about Organic Agriculture (OA) and Agroecology to publish it in an online federation of learning repositories, described according to multilingual, standard-complying metadata.
- To deploy 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.
- To study educational scenarios that are able to introduce the use of the Organic.Edunet Web portal and the content in the repositories, in order to support teaching of the relevant topics, in high-schools and agricultural universities.
- To evaluate project results in the context of both focused pilot trials and open validation events which permanently take place in various European schools and universities.
- To create organisational structures that reinforce the cooperation of stakeholders in this particular content area and support the sustainability of project results (Radics et al., 2008a, b).

The resources that are developed to support learning activities must be easily located, retrieved and be well selected to meet the needs of those persons to whom they are delivered (Tzikopoulos et al., 2005). That is why repositories (systems for the storage, location and retrieval of content) are so essential to the further integration of information technologies and learning (Holden, 2003). Digital repositories, in the broadest sense, are used to store any digital material. However digital repositories for learning resources are considerably more complex both in terms of what needs to be stored and how it may be delivered (Duncan, 2002). The definition of a digital learning repository (DLR) is the following: a digital repository is a DLR if it is created in order to provide access to digital educational materials and if the nature of its content or metadata reflects an interest in those materials being used in an educational context (Holden, 2003).

One type of DLRs is that store learning objects, which are called learning object repositories. A LO (Learning Object) is defined as: "an independent and self-standing unit of learning content that is predisposed to reuse in multiple instructional contexts" (Polsani, 2003).

2. Materials and methods

It is always a key point to determine the most applicable method to store the digital LOs (Learning Objects) for further use or search. The SCAM (Standardized Content Archive Management) is a web based content archive concept which gives you the possibility to use metadata and make the resources structured and well defined.

Confolio, which is a SCAM learning object repository, aims to provide a structured background depot for the uploaded LOs. This system is a user structured electronic portfolio to store and make accessible the content. Confolio is used in this project as a front-end web application and acts as a first link between the users and the back-end. The back-end of this project is a user related activity.

Main tool for it is the Organic.Edunet Portal, using the structured contents and make it searchable. User may just simple use the back-end to get information on his own or may organise complete

education courses upon it. To fulfil this requirement all the contents must be collected in an applicable format.

Organic.Edunet project consortium consisting of sixteen member organizations can be categorized into three typical parties, which have different functions and responsibilities:

- Technical partners dealing with the technical implementation, development and maintenance of the IT background, e.g. web interface, search engine, network connection of remote repositories, etc.
- Educational institutions as content providers. Universities and secondary schools upload their electronic educational materials to the system and support the integration of novel pedagogical methodology to the present curriculum. Corvinus University of Budapest, Hungary is a good example for this responsibility sharing its university level educational materials and learning objects optimized for distance and e-learning courses.
- Organizations related to organic agriculture and agroecology. These parties can contribute as content providers as well and support dissemination activities through their wide client database. Association for Hungarian Organic Farming (MÖGÉRT) supports the project by both functions mentioned.

3. Results

First phase of building Organic.Edunet was to set up the criteria for collecting the LOs. It was quite important to clearly declare the level of possible contents as well. The expected over 5000 contents all belong to organic agriculture and agroecology both scientific and information level.

The Organic.Edunet Repository is being uploaded continuously, however, greater amount of the materials are still uploaded, annotated with metadata and validated, and has reached the targeted number before the end of the project. This huge repository can not be used without clearly defined ontology in the background. One of the main results is the ontology, which is the biggest milestone of the first halt in of the project's life. The categories are set up to cover all the possible content fields in both organic agriculture and agroecology and continuously revised and extended according to professional and test feedback.

3.1. Confolio Home Page - http://oe.confolio.org

Confolio is the system which enables for educational bodies to upload and edit their own learning materials and share them with other interested parties. In the phase of project work only official project partners could use Confolio. However, the choice is up to every external content provider to become an affiliated partner and make use of Confolio. In order to starting use Confolio as an Organic.Edunet Repository first of all one has to create a user name and a password, which has to be written in the Login window (Figure 1).

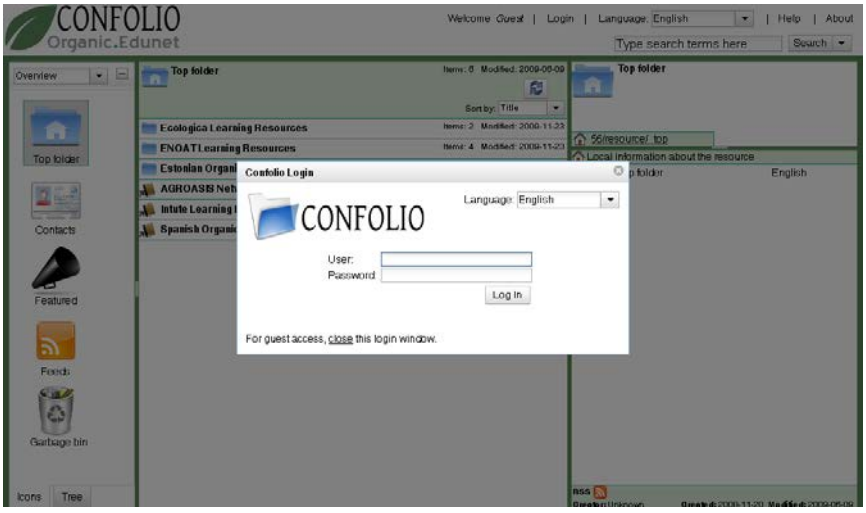

Figure 1. Confolio Login window

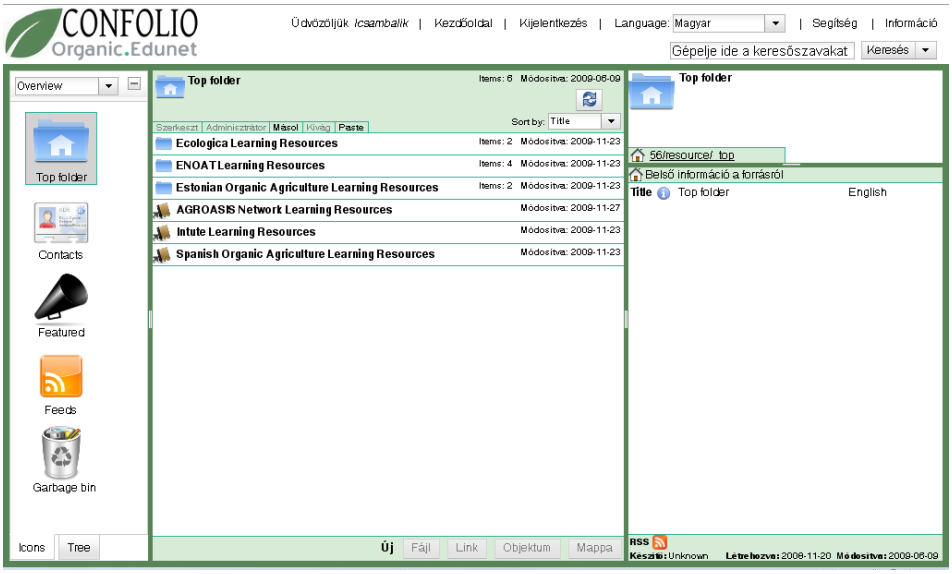

Figure 2. Confolio Top folder

After login, the user is directed to the Top folder (Figure 2). Guest users are allowed to use Confolio as web based file manager to check uploaded contents but not allowed to upload own content or edit any of other's.

- ***Uploading a resource***

After successful login, the registered user can upload a resource clicking on File button (Figure 3).

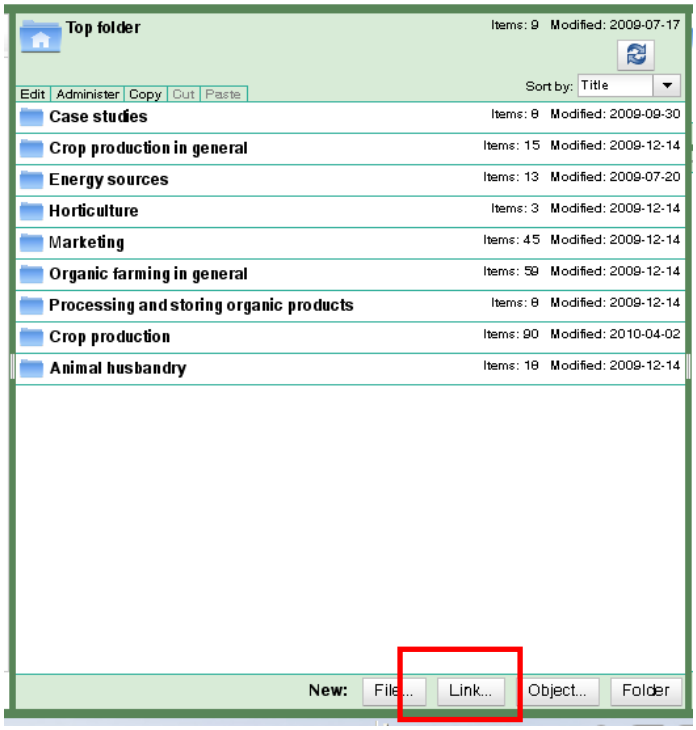

Figure 3. First step of uploading files to Confolio

The whole file system is built up on partner institutions' folders as seen on Figure 2. You may open your own folder and upload new content or edit previously uploaded ones.

Source of uploading can be chosen easily by 'Browse' button (Figure 4). Format and type of the desired file can be selected from a drop-down list. Title and description of the file should be given in separate boxes. Finally one should choose reading and writing access rights, what could be private,

user or public. After accepting that the resource has been pre-checked according to the rules of the Organic.Edunet the button “Next” can be pushed.

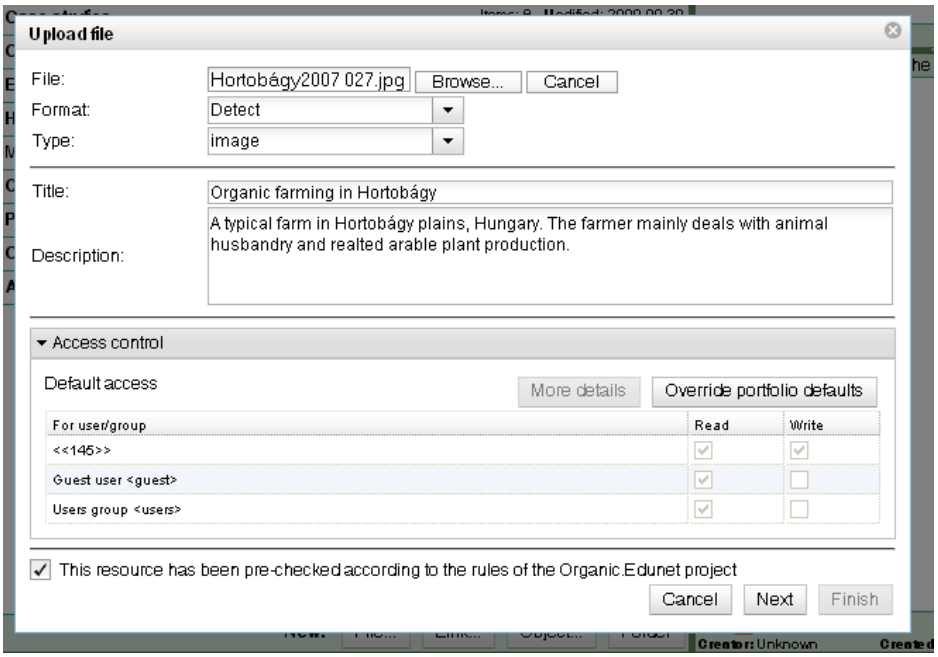

Figure 4. Second step of uploading files to Confolio

In order to make all uploaded Learning Objects (LO) valuable for all partners and interested users English has been determined as a common language, therefore all essential information related to a LO has to be provided in English and native language, even though the LO – e.g. a text file – is in native language. After completing the required data in both languages (Figure 5), the LO will be uploaded to Confolio. If any of the data is missing, a warning message appears and blocks uploading, until the required field is filled out.

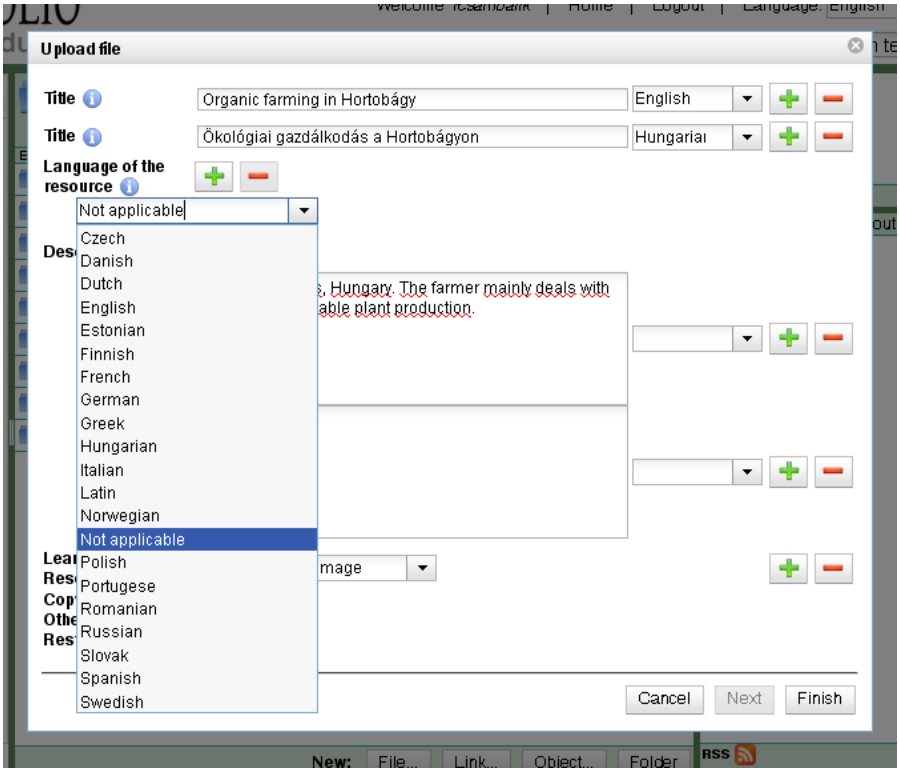

Figure 5. Providing essential metadata both in English and native language

The web application Confolio is just the container to store the data but it was necessary to make exact description in Confolio about the contents. The metadata system must be based on ontology and other parameters that enhance the utilization of a LO. Metadata are divided into three levels as mandatory, recommended and optional fields. Mandatory data are title, language, a short description and information of cost and copyright status of the content. Mandatory metadata are enough to describe the content clearly and make it available for search. Any recommended or optional fields are filled in will provide better search in the database (Figure 6).

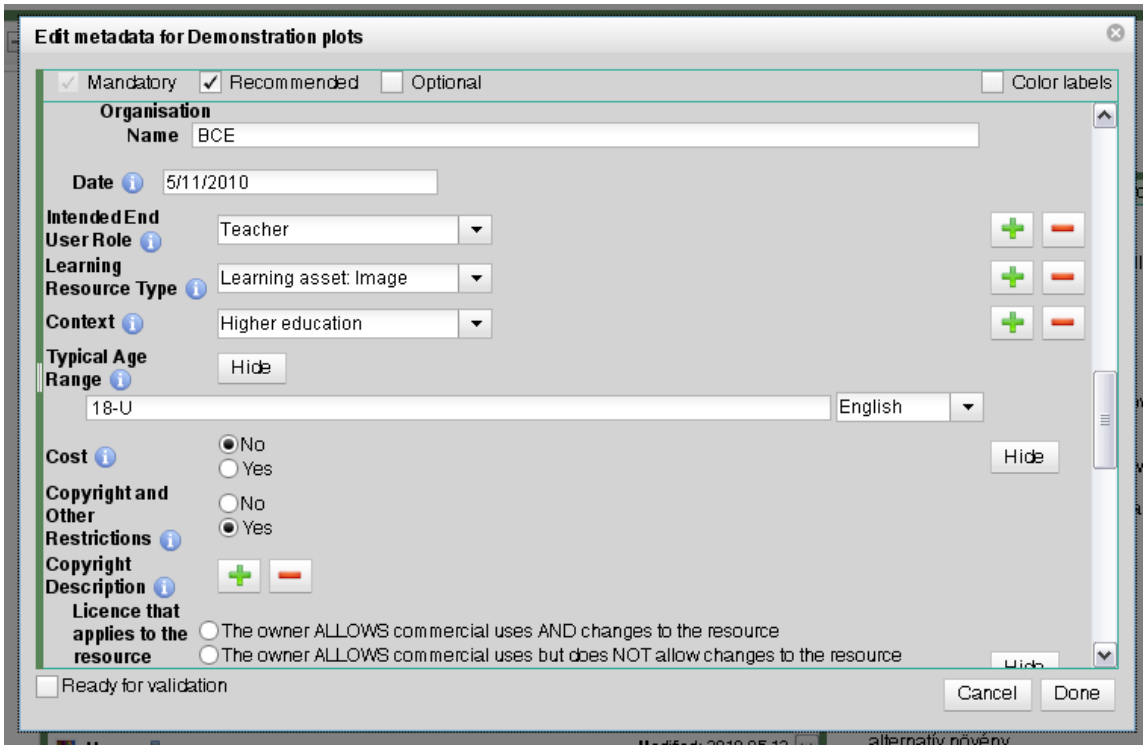

Figure 6. Metadata edition of a Learning Object

Each partner is asked to fill in as much recommended and optional metadata, because it will help the end users to find their contents and gives the possibility for advanced search.

The digital resources are usually typical learning objects and sometimes are references or links. Collected files are mainly documents (doc and pdf), image files (jpg, png), and video files (mpg, wmv, avi). Other resources are related to digital books, concepts, contacts, events and web-links. All the resources are described with detailed metadata.

It is important to provide multimedia content, like pictures, movies, sound files to fulfil the requirements of an e-learner or distant learner. Uploaded documents are mainly handbooks, tutorials, relevant publications and aim to give deep information a specific subject of organic agriculture or agroecology. It is important also to give presentations for the better understanding and provide mixed information of images and text explanations. It is also useful and necessary to give references or links to web sites, external resources to offer background or additional information or just make your content better supported.

Typical content sources are the contents of Organic.Edunet Consortium members, ECOLOGICA Project Resources, FAO Capacity Building Portal, AGROASIS Project Resources, ENOAT Learning Resources, Estonian and Spanish Organic Agriculture Learning Resources and INTUTE Learning Resources.

After uploading and editing metadata of the given source, user gets the screen of Figure 7.

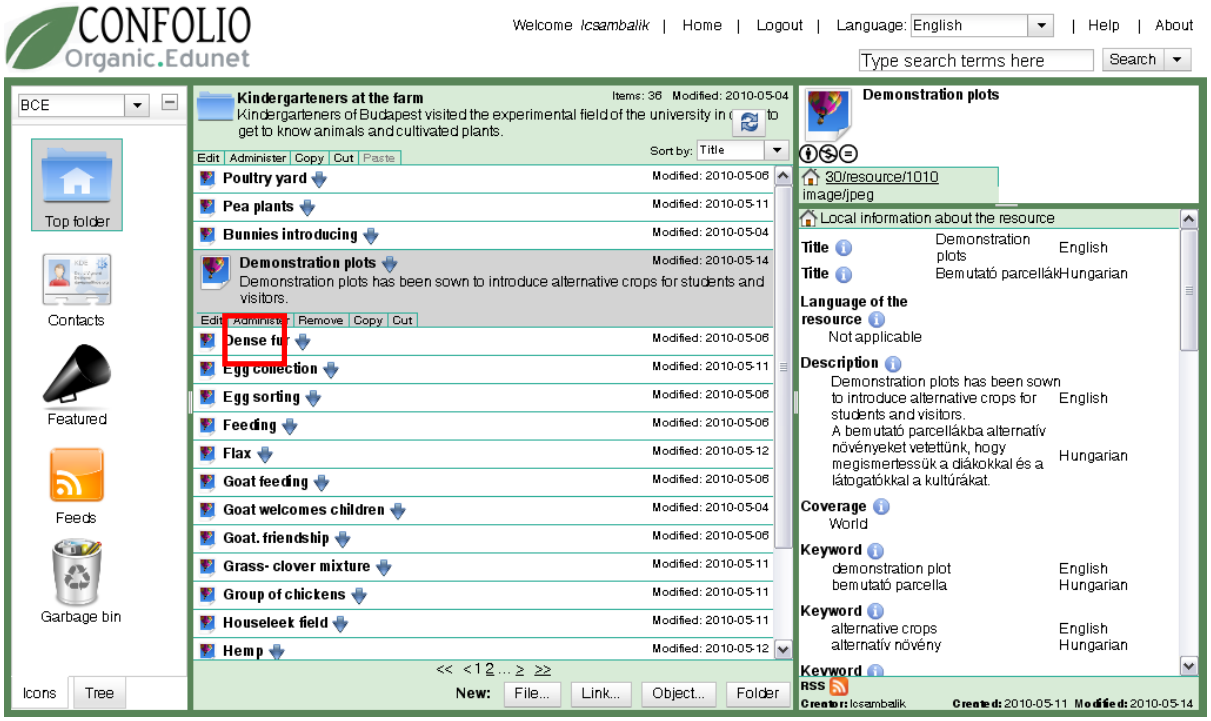

Figure 7. Users' Confolio

You can edit the metadata inserted for any resource if you are registered member in the user's Confolio by clicking on 'Edit' in the drop-down list beside the resource (marked with red) when the same surface appears like on Figure 6.

- ***Searching for a Learning Object***

Searching of LOs is important for end-users of the system, e.g. pupils, students, teachers and lecturers. The Front-end page of Confolio can be found at http://portal.organic-edunet.eu/index.php . As the portal is designed user-friendly, proper use of it can be explored individually.

Users have three options for searching: Text based search, Semantic search and Tag based search, as well as free browsing and tag cloud can be found at the main page of the Organic.Edunet portal.

Text-Based Search works in a typical text-based searching way. It looks for the keywords that the user is typing, into the title and description of all the educational resources in the federation. To facilitate limiting down the results, the Text-Based Search interface also allows users to filter the returned results according to their Learning Resource Type or their targeted Educational Level.

Semantic Navigation allows users to search for resources according to an ontology of Organic Agriculture concepts, providing results that are related to the particular concepts in the ontology. Users can directly ask for resources that are related to a particular concept in the ontology. For a more elaborated search, users may define a number of interest points upon the ontology, and ask for resources that are related to them.

Tag-Based Search allows users to search for resources according to the way other users have annotated (e.g. tagged or rated) them in the past. Users can either search for resources that have been tagged with a particular word (using a 2-D or 3-D interface), or can see which resources are most popular to other users (i.e. the ones that have been rated highly). For registered users only: when logged-in, registered users have access to more advanced search functionalities related to social navigation, such as receiving recommendations about interesting resources that match their profile.

- ***Educational Scenarios***

Organic.Edunet team described the main points of possible end user situations mainly in education. Two groups of partner institutions developed several education scenarios where Organic.Edunet may

be integrated or used as only resource for secondary schools and universities. Test courses have been organized to test the scenarios and feedback from pupils, students and teachers has been incorporated into the system.

The philosophy of using Organic.Edunet in direct education based on the concept of involving students into learning material gathering and processing. After a special collection work of a tutor, main resources are listed to students and they are free to download and use them in their own work. This system is fitted to regular secondary or university lecture structure but gives wider interactivity to both parties.

The concept of using Organic.Edunet in distant learning systems gives just access to the repository and students will search and use the content independently. It means less tutor activity and better fit to e-learning situation.

Here are two demonstrative cases to describe the basic situations:

- A teacher uploads digital resources on Confolio making them widely available
- Another teacher searches for digital resources to support teaching activities on Organic Agriculture

First Scenario

- You teach a particular topic for some time (e.g. Organic Agriculture)
- You want to share the material you have created
- You describe and upload them in Confolio providing all the necessary data
- The resources are accessible to anyone through Organic.Edunet Web Portal

Second Scenario

- A teacher gives a lecture on Organic Agriculture in high school
- Searches for online material to support it (i.e. lesson plans, document, videos)
- Visits the Organic.Edunet Web Portal
- Retrieves the resource uploaded in the Confolio tool

Added Value

- Easier retrieval of resources
- As they are described in standardized way
- Refine search with specialized terms
- Learning time, intended audience, difficulty, age range

Scenarios are organized around a learning target e.g. to introduce pupils the advantages of organic farming in household gardening. For this aim, theoretical and practical activities can be compiled, pupils can have a small area in the school garden, where they can produce vegetables from sowing until harvesting and cooking of the yield.

In university level a lecturer could possibly popularize the use of renewable energy sources in agriculture. Therefore the lecturer invite experts of the topic, who can answer the questions of the students, or an excursion can be organized, when such farms visited, where professional utilization of renewable energy sources can be observed. Practical experiences should always be supported be theoretical knowledge, which is accessible through Organic.Edunet portal. Projects done by students can be shared at the portal, which can be useful for lecturers who would like to compile such scenarios.

4. Conclusion

The project studies educational scenarios that introduce the use of the Organic.Edunet portal and content to support teaching of topics related to OA and Agroecology in two cases of formal educational systems, i.e., high-schools and agricultural universities (Figure. 8).

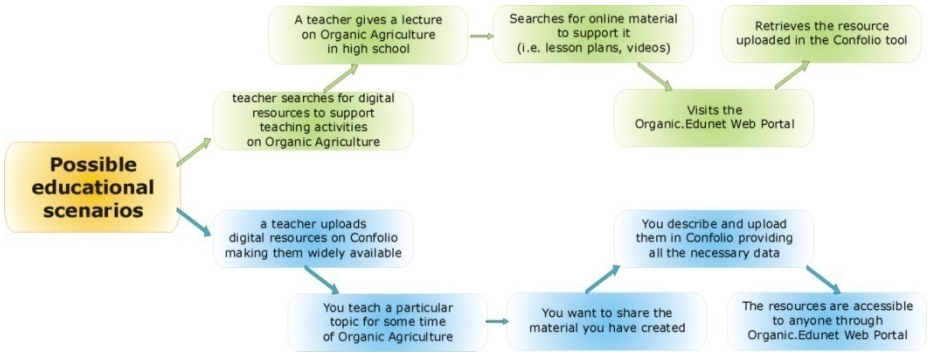

Figure 8. The two possible educational scenarios

Wide range of possibilities provides new ways to users in building up own scenarios based on Organic.Edunet portal. Moreover, multilingual online environment of Organic.Edunet portal makes it tractable and available world-wide. This gives a good possibility for all countries to join as affiliated partner or as user of free education materials.

One of the most human characteristic of OA is versatility. This could be well served with other partners who hold possession of knowledge about OA of certain continents. It would be very helpful not only for other European users but for students and professionals of other continents, too. E.g. more and more pests and weed species are spreading from south to north, and Organic.Edunet could be a platform where researchers or organic farmers can find answers or ideas how to fight against these pests. Besides, European education materials of organic farming could mean a good basis where educationalists and students can find starting point or help for their work. Organic.Edunet aims to become an international platform supporting knowledge flow in the topic of OA and Agroecology.

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