

## Creating a Virtual Learning Environment

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### ABSTRACT

Creating a virtual learning environment may be useful to acquire knowledge in some circumstances. A Learning Management System is essential to manage a virtual learning environment. There are numerous steps of creating an e-learning curriculum. In the described three-year international project the goal was to develop an e-learning system with the following logical development scale: (1) Specification of the needs of the target group; (2) Development of the on-line toolkit; (3) Development of the training material; (4) Training of the e-tutors; (5) Development of the methodology to test the training material; (6) Pilot testing on the target group; (7) Accreditation of the modules; (8) Dissemination and promotion activities. This paper contains a brief description of the above mentioned development process which resulted in an e-learning material that can be used to prepare agrarian specialists to prepare for today's modern world and to be a successful member of the information society.

## 1. Introduction

This paper gives a short summary about three years of e-learning development in an international cooperation. The main goal of the project was to create an e-learning material and its learning management system for e-workers and e-managers which enables them to successfully integrate into the information society.

Learning materials assisting the acquisition of knowledge are created nowadays in several scientific disciplines which are either stand-alone or available through a Learning Management System. Agricultural sciences are no different.

E-learning materials with their learning management systems – mainly based on open-source software – are implemented (Nauris, 2010), examined (Alecu et al., 2011) and used in several agricultural higher education institutes (Herdon, Lengyel, 2008). Since training is essential for the future employee (the worker) and employer (the manager) to become competitive in a rapidly changing environment, the development efforts are backed by EU programmes and funding, like the Leonardo NewCAP project (New European Standards in the Context of Reformed EU Common Agricultural Policy) and the AVARES project (Enhance Attractiveness of Renewable Energy Training by Virtual Reality) (Palkova et al., 2013).

In recent years papers were published about the benefits of the involvement of computers and the internet in education. (Sideridis et al., 2010). Some of the main benefits are as follows: it is student-centred, self-directed and self-paced, interactive and hands-on, flexible, provides consistent and effective training (DNA Analyst Training, 2013). To be able to transfer the necessary information and to achieve success, the range of different technology should be carefully selected by weighing several factors (Gaceu et al., 2010).

It should also be clear that this modern technology is not a panacea, as – for example – the summarizing paper of Workshop on Virtual Learning Environment (Dillenbourg, 2000) states: It has

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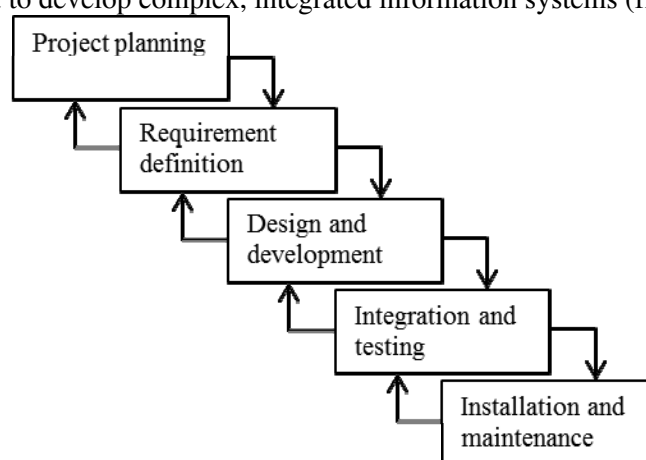
some potential effects, although it is difficult to turn it to actual ones, or at least to measure the positive effects. So, there is hardly any scientific proof of the superiority of the modern technologies.

Nevertheless, creating a virtual learning environment may be useful for students to acquire knowledge in some circumstances. What can be considered a virtual learning environment? According to Dillenbourg (Dillenbourg, 2000) it is a designed information space which is not restricted to distance education; it is a social space which integrates multiple tools where the space is explicitly represented, it also overlaps physical environment where the students are not only active, but also actors.

A Learning Management System is essential to manage a virtual learning environment. The task of this system is to identify, to record and to follow the students participating in the educational process and to connect the users to their respective courses according to their roles and competencies (Gaceu et al., 2009).

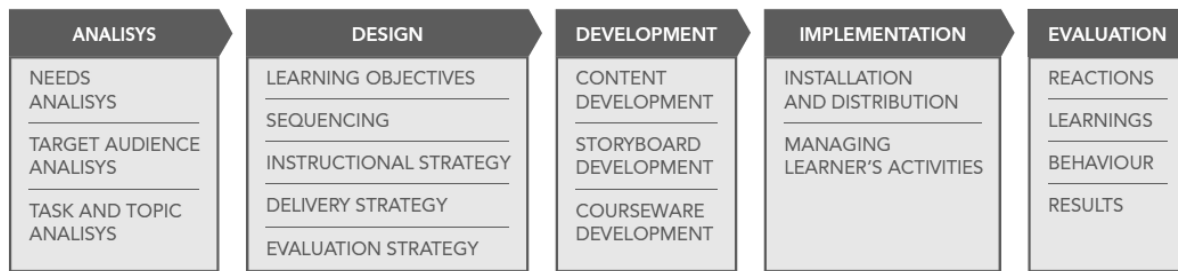
When creating the learning materials and their learning environment, the learning management system, it is suggested to follow some rules or standards which may more likely lead to success. Depending on the goals to be achieved, the type of the e-learning material, the aspiration level of the tutors (or the development team) and the available technical and financial possibilities there are basically two methods:

- Agile development: In this case the elements of the information systems are created separately and combined, integrated later into a larger system (Munkhtsetseg, Uyanga, 2013).
- Waterfall development: A more preferred method is based on the information system lifecycle processes introduced in IEEE/EIA 12207 “Standard for Information Technology – Software Life Cycle Processes” (Lee et al., 2002). The software development life-cycle can be described in five steps by the waterfall model: (1) Project planning; (2) Requirement definition; (3) Design and development; (4) Integration and testing; (5) Installation and maintenance. The standard defines processes covering the entire life-cycle of a software system from the concept to retirement. The steps are well-tried to develop complex, integrated information systems (figure 1).



**Figure 1.** Waterfall model of the software development life-cycle (source: Paulins, 2010)

The ADDIE model (Analysis, Design, Development, Implementation and Evaluation) is a framework training e-learning developers may also use. The model which is a recognized and proven instructional design methodology (Delf, 2013) describes guidelines useful to build effective training and performance support tools (Morrison et al, 2010). The guide to e-learning methodologies published by the Food and Agriculture Organization of the United Nations (Ghirardini, 2011) also recommends the ADDIE model as a suitable methodology to develop e-learning materials (figure 2). Ghirardini draws attention to the importance of the professional roles, the required technology and media related skills of the participants taking part in the development.



**Figure 2.** The ADDIE model for e-learning (source: Ghirardini, 2011)

Since we are talking about software, ISO 9126 standard assuring software quality (functionality, reliability, usability, efficiency, maintainability and portability) can be taken into consideration (Al-Qutaish, 2009). Other useful tools and criteria are also available to maintain the quality of e-learning programmes, including the Heuristic Evaluation Instrument and Protocol for E-learning Programs (Benson et al., 2001) or the LMS Evaluation Tool User Guide (3waynet, 2004).

## 2. The e-material development project

The main goal of the international development project financed by the Leonardo da Vinci programme was to provide practical and useful support for the preparation of small and medium-sized enterprises for working in a virtual environment and to be able to be useful members of virtual teams.

The participants of the international consortium were

- Inno-Motive Nonprofit Ltd., an accredited education institute from Szeged (Hungary) with wide experience in co-ordinating international projects and promoting alternative employment, competency based training and education;
- Bit media e-Learning solution GmbH & Co KG from Graz (Austria) with experience in developing e-learning material and learning management systems and also in providing e-learning content through the web;
- West Lithuania Business College from Klaipeda (Lithuania) with experience in creating, converting and using e-learning materials in higher education;
- Inovaformação – Prestação de Serviços de Formação Profissional Lda from Matosinhos (Portugal), an international company experienced in promoting innovation, training and supplying advisory services for SMEs and higher education institutions.

The e-learning development concept was based on a logical scale defined by the consortium members built on the waterfall model of software development, but also including the experiences of the Austrian partner in this field (Inno-Motive et al., 2010):

- (1) The specification of the needs of the target group;
- (2) The development of the on-line toolkit;
- (3) The development of the training material;
- (4) The training of the e-tutors who help the students to acquire the knowledge;
- (5) The development of the methodology for testing the training material;
- (6) A pilot testing on the target group;
- (7) The accreditation of the modules;
- (8) Dissemination and promotion activities to promote the finished e-learning material;

Mainly due to the inclusion of EU funding sources, the project followed a timetable which included several personal meetings and web conferences of the project staff involved to disseminate information, documenting and reporting of progress to stakeholders and, of course, a strict budget. The total budget of the project was 406 753 Euros and the EU funding was 75 percent. The detailed description of these falls outside the scope of this paper.

## 2.1. The specification of the needs of the target group

After specifying the main objectives, defining the partners involved in the project, budgeting, obtaining the financial support of the EU and the distribution of the different tasks between the project staff, the first thing to do was to conduct a survey.

The aim of the survey was to identify the necessary competencies of the target groups in the participating countries and to explore and summarise the coherence with national training needs of the target groups. The survey involved 200 small and medium-sized enterprises from Austria, Hungary, Lithuania and Portugal. Each partner conducted the survey in its own country. The results were synthesized in a sectorial survey report (figure 3) by the Portuguese Inovaformação. Their findings provided input to determine the specific content of the e-training materials.

Based on the survey results, important competencies could be identified which showed what skills have to be assessed by the on-line toolkit and then developed by the e-learning material. The development of the curriculum was highly based on the survey results.

Competencies of e-workers				
How do you assess the importance of the following competencies of e-workers to work in an e-working environment?				
	Irrelevant	Relevant	Important	Very important
ICT knowledge	0	2	21	27
Quality Awareness	0	2	28	20
Continuous Improvement	0	6	21	23
Customer/Project Orientation	1	9	19	21
Cooperation	0	6	18	26
Reliability	0	0	14	36
Initiative	2	16	21	11
Planning	1	20	19	10
Managing Change	5	14	21	10
Internet Communication	0	2	18	30
Lifelong Learning	2	9	18	21
Independency	0	3	11	36

Competencies of e-workers				
How do you assess the importance of the following competencies of e-workers to work in an e-working environment?				
	Irrelevant	Relevant	Important	Very important
ICT knowledge	1	5	23	21
Quality Awareness	0	6	12	32
Continuous Improvement	1	8	24	17
Customer/Project Orientation	4	4	17	25
Cooperation	0	7	23	20
Reliability	0	2	6	42
Initiative	2	17	26	5
Planning	2	16	30	2
Managing Change	0	11	16	23
Internet Communication	0	2	12	36
Lifelong Learning	0	13	16	21
Independency	0	6	17	27

**Figure 3.** Sample of survey results of Hungary (top) and Austria (bottom) from the Sectorial Survey Report. Numbers show number of answers. (Source: Inovaformação Lda., 2010)

## 2.2. The development of the on-line toolkit

The e-learning material has to be tailored to the students' needs and skills, so it is necessary to identify whether he or she possesses the right competencies. To achieve this, a "Competency Tool-Kit" was developed in the co-operation of the Hungarian and the Austrian partner. The tool allowed the identification of the missing competencies: by using the toolkit at the beginning of the e-learning

course, a self-assessment can be conducted and the personal development plan can be created, specifying the training needs of the participant (figure 4). Originally the plan was to create an entertaining, game-like tool with graphics, animated cartoon characters and sound, but unfortunately that did not fit into the budget, so eventually the team had to be satisfied with a text-only version.

**SeeS self assessment toolkit**

Prev. Next

00:00:03 / 01:23:20

Finished 0 All 45

Close

**Your working spirit is fading away and you feel tired. In this case you:**

- Think about the consequences of the work you do under these circumstances. You know yourself and take a half day off to let yourself loose.
- Do not worry about motivating yourself, because it has happened before and the problem solved itself at other times as well.
- Using the methods and steps of problem solving, you explain yourself why and how you ended up at this stage. Based on the reason(s) found, and using your self-awareness, you chose an answer to the problem.
- Think your tasks over and find those problematic tasks that you would think no one could really solve, but you. Due to this, your work morale returns and you can continue your work at a high level of quality.

Category	Progress (%)	Feedback
LLL (M)	50	You think that life long learning ñ according to your answers is everybody own business. You do not think that creating needs for it would be your responsibility. If you do not direct and control self-development continuously with others (with the ones that really need it), you should not be surprised if their performance will not be at the maximum. For this, you are responsible by all means.
Change management (M)	50	Although you know that during your work changes need to be made, you do not think these can be pre-planned. You tend to react to changes in an ad hoc way. This often results in using good old methods instead of having flexible changes that are more appropriate for the situation.
Quality (M)	40	You know that quality management is a must in every organization. You have your reservations about its effectiveness and existence. Your answers indicated though that you are formally taking part in working out such policies. Based on the above, you do not consider some of the aspects necessary for you. Most likely, one of the very important reasons for this is your authoritarian leadership style.
Communication (M)	55	It is not your strong point to collect mistakes in communications. You trust your co-workers to realize these mistakes themselves. This will likely happen, but it takes time. You think similarly about giving and receiving feedbacks on these mistakes. It is of outmost importance that you change this!

print result Go back

**Figure 4.** Sample question and results of the on-line toolkit  
(first test version during software development)

### 2.3. The development of the training material

Twelve e-learning modules were proposed based also on the survey results which would help workers to thrive at work and in life. Three modules, including leadership, change management and performance appraisal were planned explicitly for managers, another three modules were planned for workers which were time management, decision making and problem solving and the other six modules including e-communication, team building, quality awareness, motivation, conflict handling and life-long learning were proposed as shared learning materials for both groups. This task was carried out by the Hungarian coordinator and approved by the project partners.

The curricula were created in accordance with the steps devised by Bitmedia:

Step 1: Shaping up the rough concept: The target of the rough concept was to determine the course structure (table 1), the main principles, aims and the methodological, didactical approach (table 2).

**Table 1.** The element and the description of the learning modules

Elements	Description
Navigation elements	Bottom left
Layout design	According to style guides
Extras (book marks)	To be defined
Notes-drawer	Yes
Glossary-drawer	Yes
Topics-drawer	Yes
Video-drawer	Yes
Speaker	English
Audio on/off button	Yes
Types of interactive elements	To be defined after finalization of first rough concept
Graphics	Will be delivered by responsible person, processed and animated by Bitmedia
Animations	Approximately 1 animation per module
Self test	At the end of each module
Help	To be activated by a button

Source: Bit media e-learning solutions, 2009

**Table 2.** Principles, aims and didactical approach of the learning development project

Principle	Aim	Methodical / didactical approach
<b>Practice oriented</b>	The learners are brought up to speed and sensitized to the subject using examples from their everyday work situations.	The learners will be made aware of the relevance and application of the learning material to their everyday work through the implementation of the material in everyday situations etc.
<b>Action orientation</b>	The learners are motivated by interactivity in the learning process which develops their active competence in the application of the material.	Exercises are not only used for checking learners' knowledge, but also for transferring it by simulating situations where decisions and choices have to be made on the basis of actual case studies.
<b>Multimedia stimulation</b>	The learners are stimulated optically and through multiple channels in order to appeal to the different types of learners and to assure their learning success.	Application of graphically attractive and didactically effective visualizations (static graphics and animations and audio).

Source: Bit media e-learning solutions, 2009

A comprehensive time schedule was also set up which contained all essential phases to complete the learning material.

Step 2: Elaboration of the detailed concept: As it represents an intermediate state between the rough concept and the script, this was a time consuming process. The position of the planned screen page within the learning programme, the unit title, the learning steps (screen pages), the design of multimedia elements, the content description (i. e. the learning goal) and the reference on external sources were designed. Developing the rough concept and the detailed concept was performed in collaboration by all members of the consortium on face-to-face meetings and virtual seminars, video conferences. Due to budget constraints and possible cultural differences of the participating countries the partners have eventually decided not to include video recordings of role plays, but have not fully abandoned the idea. Later, in case the learning material proves to be successful, the videos can be created and integrated into the next version.

Step 3: Creating storyboards (script) and visualisation: The script described the structure as well as the set-up of all screen pages of the learning programme. It also contained all the texts on-screen and the description of all the multimedia tools that had to be produced (figure 5). This task was distributed among all consortium members.





situations, scenarios were created from real-life cases by the project partners. The generated problems were to be solved by collaboration and by making decisions in a virtual environment with the use of online communication tools.

**Evaluating e-content – Questionnaire for the developers and the project management (Page 2 of 4)**

**Apply a rating from 1 to 5 for each statement below, with 1 indicating total disagreement, and 5 indicating total agreement.**

Statement	Rating
1. The content covers all of the objectives of the course, and is it all related to the objectives.	1 2 3 4 5
2. The content reflects the real world.	1 2 3 4 5
3. The presented information is relevant concerning the target group.	1 2 3 4 5
4. The content is accurate and self-contained.	1 2 3 4 5
5. The content is practice oriented.	1 2 3 4 5
6. The content is action oriented.	1 2 3 4 5
7. The tasks are problem-based.	1 2 3 4 5
8. The different types of information carriers (text, sound and graphics) are appropriately used.	1 2 3 4 5
9. The content is appropriate considering gender, age, race, religion and learning ability.	1 2 3 4 5
10. The page layout is consistent and well designed.	1 2 3 4 5
11. The text is large enough to be easily read at most common screen resolutions.	1 2 3 4 5
12. The used colours are appropriate.	1 2 3 4 5
13. The audio and video is understandable.	1 2 3 4 5

**Figure 6.** Sample of the evaluation forms (Source: Hampel, 2010)

## 2.6. A pilot testing on the target group

A pilot testing was conducted on the prototype of the learning material. The participants were volunteers, representatives from small and medium sized enterprises and educational institutions from the countries of the consortium members. The twenty volunteers (five from each country) formed four groups. First of all they had to identify their own competencies and skills to be developed with the on-line toolkit, which gave them feedback regarding their preparedness. With this input, the participants have learned the material using the e-learning modules before the simulation. The actual simulation started only after completing all the above mentioned tasks.

All the participants of the pilot testing had to make obligation for seven working days and allocate 2 hours of their time every day for online work and some time for homework. During these hours they had to do specified tasks connected to a marketing case of an international company.

After each online meeting every team members had to fill in an online evaluation form. The e-tutor evaluated their performance and made comments regarding the techniques learned in the e-learning material.



After completing the pilot testing, an evaluation was done by the volunteers. Their feedback, the remarks and the experiences of the pilot testing were built into the final e-learning product.

### **2.7. The accreditation of the modules**

Once the local language versions were available, the developed e-learning modules were embedded in the local training plans of the partnering institutions. From that point, all adult educational institutions can officially make the content available in their portfolios. This allows the future expatriation and also provides an opportunity for building new programmes and projects based on the completed curriculum.

### **2.8. Dissemination and promotion activities to promote the finished e-learning material**

Big effort was made to spread the e-learning material after the product was finalized. The necessary information was available in the languages of the project partners. Traditional promotion materials like announcements, newsletters and flyers were designed and were continuously distributed to all sector stakeholders, involving small and medium sized enterprises, educational institutions, human resource managers, vocational education representatives and research and development institutions. Local dissemination seminars were organised by the partners in their countries across all administrative levels and through the associated partners. The project partners also participated in local fairs, conferences and in events organised locally or by the EU Lifelong Learning Programme.

### **3. Conclusion**

It is a known fact that our world is rapidly changing. The economic crisis has a great effect on the business world today. The new, emerging learning methods backed by ICT are essential to effectively acquire knowledge. Using them can prepare learners to accept the fact that modern ICT is essential to acquire information and succeed in business, too.

Creating an e-learning curriculum and presenting it through a learning management system as a virtual learning environment is a time consuming and resource hungry task. It requires a lot of experience from different fields and coordinated work of many people from the very beginning until the dissemination of the finished product. The product is of course, in reality, never finished and has to be improved from time to time.

Professionals working in the agriculture of the future have to be aware of the new requirements and must comply with the challenges of today's modern world. The online toolkit, the e-learning material and its learning management system, which has been developed for three years in an international partnership, may be useful to prepare agricultural specialists for our knowledge-based information society.

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