Electronic Courses on Electronic Communications

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Abstract—**The paper describes a system of e-learning courses covering the area of electronic communications. These courses are the main result of the Leonardo da Vinci project "Internationalisation of Electronic Communications Training (IntEleCT)".**

Keywords-electronic communications; e-learning; tutors; LMS

I. INTRODUCTION

Our department has been the coordinator of several European projects focused on support of education and development of modern e-learning materials. Their outputs are usually e-learning objects of various types, forming together extensive e-learning courses.

The first one of these projects was implemented between 2004 and 2007. Our experience from project coordination and authoring of some modules convinced us that efficient and professional development of high-quality e-learning materials should be based on clearly defined rules concerning the development itself as well as quality management and logistics of the entire process. Some of these rules are described below in detail.

The said rules have been applied to the subsequent projects. The present project taking full advantage of the formulated rules and principles is titled "Internationalisation of Electronic Communications Training (IntEleCT)". Its principal outputs are electronic courses dealing with different topics from the area of electronic communications. The software platform and environment used for implementation is LMS Moodle, as it has proven to be suitable for the given purposes (which means also full support for several language versions that have to be managed and maintained simultaneously). The project has started in October 2009 and it should be concluded in the autumn 2011.

II. KEY IDEA

The objective of the project is not just to develop electronic learning object and place them on the web – the entire process of education is handled in a complex way. This means considering of education objectives and using them as a basis for formulation of the optimal pedagogical approach.

For each of the courses there have been elaborated detailed instructions for all partners directly involved in their implementation, comprising mainly the following items:

- Expected duration of the study,

- Number and schedule of personal meetings,

- Number, form, extent, schedule and assessment of tasks included in the study plan,

- Structure, content, extent and form of the course,

- Interaction with a tutor, time windows, responsibilities of tutors,

- Procedures related to conclusion of the course, final testing (certification), classification,

- Documents to be issued to the students,

- Obtaining of feedback from the students.

III. TARGET GROUPS

The developed learning objects should serve mainly for continuous education of people employed in the industry (SME) who need upgrade of knowledge for their further professional growth.

Besides that we can envisage the involvement of people in engaged in vocational education and training (VET), e.g. at secondary vocational schools oriented on informatics and electrical engineering.

IV. PARAMETERS OF THE COURSES

The courses are being developed in an international consortium of eight partner institutions (universities, lifelong learning association, and one industrial company) in seven European countries. The composition of the implementation team should guarantee high quality of the final outputs.

As the individual partners represent different language areas, the courses are international in this sense. English plays the role of a reference language, in which the content for all six courses is authored. This decision is logical; it is based on the universal use of English as a standard language in the domain of electronic communications.

However, the courses are available also in national languages of the partner countries (i.e. Czech, Slovak, French, Italian, Slovene, Spanish and Polish), but not all language versions are available for all courses – specifically, there are two selected localized to each national language (see Table I for details; the numbering of the individual courses is explained

below). We assume that the offer of available language versions will be increasing in time.

TABLE I. LANGUAGE VERSIONS OF THE COURSES

Course No.	Available languages							
	EN	CS	SK	IT	FR	ES	PL	SL
1	√		√					
2	√		√		√	√		√
3	√	√						√
4	√			√				
5	√			√	√		√	
6	√	√				√	√	

Technically, the development process is relatively complicated (as it has to reflect the demands of authoring that involves several people from several countries, ensuring of independent reviews and corrections, multilingual nature of the system, etc.); nevertheless, the final result of the development process is the implementation of the courses in a common Moodle LMS that has been adapted accordingly to accommodate the specific needs of our courses.

V. TOPICS OF THE COURSES

Six complex courses are being developed within the project. The topics have been selected with respect to modern sub-areas of electronic communications so that they are suitable also for trainees with some previous experience in the respective fields whose intention is to obtain higher qualification or re-qualification. The following list briefly describes the planned content of all six courses.

A. Course 1: NGN Protocols
- NGN concepts
- NGN basic protocols
- NGN enhanced protocols
- Good practices in NGN protocols

B. Course 2: Information Security
- ICT concepts and relationships
- ICT security objectives, strategies and policies
- Security policies and design principles
- ICT security services and safeguards
- ICT security attacks and countermeasures
- Secret-key cryptography and algorithms
- Public-key cryptography
- Digital signatures and certificates
- Network security

C. Course 3: Internet Protocol version 6
- Addresses – notation and format
- Addressing scheme
- IPv6 protocol
- IPv6 mechanisms
- IPv6 routing
- IPv6 security
- IPv6 integration
- Programming of IPv6 applications

D. Course 4: Optical Networks
- Main drivers and applications
- Basic technological background
- WDM optical core-networks
- SDH networking
- Optical network resilience
- Optical metro and access networks

E. Course 5: Digital Television
- Audio and video compression
- Quality of audio and video evaluation – objective and subjective tests
- Advanced video coding (MPEG-4 part 10/H.264/AVC) and advanced audio coding (MPEG-4 AAC)
- DVB system
- DVB multimedia home platform (ETSI TS 102 812)

F. Course 6: Traffic Engineering in Mobile Networks
- Basics of traffic engineering
- Integrated services systems
- Resource allocation in 2G cellular networks
- Resource allocation in 3G cellular networks

VI. STRUCTURE OF THE COURSES

The quality of learning materials is crucial – and this does not apply only to the factual content, the quality of which should be a matter of course. Another important aspect is the pedagogical concept of the e-learning material. Again, we have to fight against the persistence of some teachers for whom it is very difficult to abandon the form of "electronic textbook", regardless of numerous recommendations, courses and enlightenment efforts of their colleagues.

So, what are we looking for in the e-learning materials? In the first place it is interactivity, because it represents the fundamental added value for our students. The educational

content should include conventional interactive elements, such as tests with automatic evaluation or self-evaluation. It is recommended to use such tests frequently, not only at the end of extensive blocks, so that students can realize the current level of their knowledge in relation to specific topics.

Besides that, elements providing quasi-interactivity of the learning material with students should be also included – for example, various "contact" screens that may draw their attention to practical use of the explained principles (e.g. a note like "Perhaps you didn't know that …" or "This technology is widely used in …"). It is also advisable to remind students of the importance of substantial facts after studying the respective screen ("Are you sure you have understood the text on the previous screen? If not, it might be better to have a break and return to it once more – it's really important!"). Another type of contact messages may contain various witty quotes, more or less related to the subject.

The involvement of interactive mechanisms including animations, simulations and so on [2] is obvious, and therefore it is not necessary to explain it in detail.

It is very important to keep in mind that the role of a teacher in e-learning study system is completely different from the traditional one. In fact, the teacher becomes tutor or moderator of specific learning activities that are supported by the appropriate functions of LMS (and by the specific features of the electronic course as well).

VII. Learning Process

As we mentioned above, we consider it to be most important that – besides well prepared courses – complete educational infrastructure is available to the students.

The key person of the learning process is a tutor who remotely organizes the online education and provides contact with the training institution for all students. Tutors supervise the study activities of their trainees, encouraging and motivating them if their study results are not satisfactory, and praising them if they are doing well.

The basic instruments supporting the tutors' work are related to their communication with their students, which can employ either on-line tools (such as chat, video calls,

telephony) or off-line ones (usually messaging, i.e. an equivalent of e-mail in the LMS environment).

The role of a tutor includes the position of a specialist in the respective technical discipline, and also of an assistant who helps the trainees to overcome any technical difficulties they may encounter in the course of their study. Therefore the selection of tutors is very careful, and the adepts have to ass specific training before taking their responsibilities.

VIII. Conclusion

Now the tutored pilot testing of the courses is about to be concluded. At present time, i.e. in the pilot stage, the courses are available free of charge (the related costs are funded by the EC grant and by the own contribution of the participating institutions). General information about the project, portal of the learning system and registration to the courses is available on the project web pages [1].

The next step after the finishing of the pilot run and evaluation of the feedback from trainees will be the update and modification of the learning materials and procedures related to the education and testing; then the routine use of the courses will begin since October 2011 – we assume that after this date the access to the courses will be commercialized and the incomes will be reinvested to the common maintenance and partly used for authorized changes and updates of the learning content.

References

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