

INFORMATIZATION OF LEARNING AND TRAINING IN SLOVENIAN ARMED FORCES

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Abstract: The paper presents the results of a national project e-VIZUS: Informatization of learning and training in Slovenian Armed Forces. The project's main goal was to strengthen the role of e-learning in Slovenian Armed Forces and prepare the guidelines for its successful integration in the training process. The project had two main focuses. The first was on technical solutions for e-learning environment (e-classroom), and selection of tools and standards for preparation of electronic learning material. The second concentrated on development of electronic courses following the prepared guidelines and proposed technical solutions. Besides, several e-courses were developed and successfully used in the military schools as part of their regular training process.

Index Terms: blended learning, e-learning, LMS, SCORM, standards.

I. INTRODUCTION

The need of any modern individual is to constantly improve their knowledge and skills to be able to compete in today's rapidly changing world and find their place in it. The members of Armed Forces are no exception, and being familiar with the modern technology is today as important as any survival skill. Continuous education and training of the personnel is therefore very important, yet it has to rely on modern information and communication technologies (ICT) to assure the best outcome and facilitate the students in gaining the necessary ICT skills.

E-learning offers more accessible education, supports lifelong learning and distance learning (learning anywhere, anytime), and enable the mobility of students. It also supports adaptability and personalization of learning systems, while the high level of interactivity and connectivity stimulates active learning and cooperation between students.

The introduction of e-learning to Slovenian Armed Forces started in 2004, when the E-learning Center of Slovenian Armed Forces (ELC-SAF) [1] was founded under Doctrine, Development, Education and Training Command. Its main responsibility is coordination and organization of e-learning, as well as its technological support, development and research. The unlimited access to e-learning facilities for all members of Slovenian Armed Forces (SAF) and Slovenian Ministry of Defense (MoD) is also an important goal, as it enables training and education of SAF staff in NATO missions and on other missions abroad.

The e-VIZUS project [2] builds on previous experience in introducing e-learning in SAF and continues the path towards integrated e-learning system that is offered by ELC-SAF. The project also aims to assist ELC-SAF with learning material and

various online courses that can be used either for blended learning or for online training.

The project consists of two main parts that are closely related and intertwined. The first part includes an overview of existing e-learning practices in SAF and selection of a suitable solution for electronic content preparation and management (i.e. the technological platform and tools), while the second focuses on the technological aspect of e-learning content preparation, including preparation of different electronic contents for use in e-classrooms of military schools.

II. E-LEARNING MATERIAL

When preparing e-learning material, two equally important aspects have to be considered: the course content and its didactic preparation, and the choice of technologies and standards, including setting up the guidelines for preparation of e-learning content. The latter also influences the tools and systems used for preparing and managing the electronic material.

Due to economic and security reasons we rely on established standards and open source solutions for content development tools and learning management systems, which offer the possibility to upgrade and customize the solution so that it suits best to our specific needs.

A. SCORM Standards

Sharable Content Object Reference Model (SCORM) [3] is a set of technical standards and specifications prepared by Advanced Distributed Learning (ADL) Initiative [4]. They regulate the development, packaging and delivery of learning objects, as well as their interaction with the learning management system, and thus enable the Web-based learning systems to find, import, use, reuse or export the learning material in a standardized way.

Portability and reusability of learning material in SCORM packages is ensured by their proper organization into content packages and description of this organization in manifests. Newer versions of SCORM also enable separation of sequential tasks from the content and their treatment on the level of learning management system.

Using SCORM standard specifications we can achieve the compatibility of e-learning material with most managing systems for learning environments. Therefore, the compliance with SCORM standards is very important issue in preparation of e-learning material.

SCORM is one of the technologies in e-learning that is being rapidly developed and has already

become de facto standard in this field. Besides, it originates in military domain and is also used by NATO in its Partnership for Peace Courses [5].

B. Learning Management Systems

The SCORM technology anticipates a set of services that can deliver learning material, track student's progress, establish the sequence of learning objects to be displayed to the student, or report on student's success in knowledge acquisition in the subject domain. Such services are provided by a Learning Management System (LMS) [6].

LMS is thus a software package that enables the management of learning contents and resources, and allows the students to access these contents and resources. It also assures transparency in educational process flow and flexibility in choosing time, place or way of study. LMS is often accessible on the Web (as a Web application) and therefore enables easy access to learning material and its maintenance through any Web browser.

A learning management system allows efficient management of electronic learning contents, learning processes, as well as students. Beside the basic access to learning contents and logging into the system, it can also offer advanced forms of messaging and multidirectional communication, testing and assessing student's knowledge, student's self-assessment and the use of different forms and formats of learning contents. It enables construction and management of Web-based learning centers that combine Web classroom with various electronic learning tools, such as chat-rooms, quizzes, forums, surveys, calendar, dictionary, notes...

The choice of standards affects also the choice of LMS as it has to support the selected (standard) formats of the e-learning material.

C. Blended Learning

E-learning offers many advantages compared to traditional face-to-face learning, as it facilitates easy and trouble-free way to gain new knowledge, especially for people that are already employed and cannot take part in a whole day educational process. On the other hand, the complete loss of human contact in e-learning can negatively affect the process of learning. Thus the combination of both approaches, blended learning [7], merges the advantages of both electronic and traditional classroom education, enabling the student to freely select the learning time and pace, yet preserving the occasional human contact.

The use of blended learning in military schools has many advantages. There is less need for students and/or teachers mobility (suitable for training soldiers on missions abroad, when they have a lot of spare time, but no access to the educational center; it also reduces the problem of regional education centers,

which demand daily migrations of lecturers and/or learners), as part of the study is carried out by individual students independently in their spare time (students often take classes beside their regular work and are not able to attend classes at fixed hours due to overtime, long working hours, field work...), while the occasional face-to-face meetings preserve the social component (communication with people that we know personally is easier and more comfortable, while initial classes in person can also eliminate student's "fear" and uncertainty in using the e-classroom).

III. PROPOSED TECHNOLOGIES AND TOOLS

The first goal of the project was to find suitable technologies and tools to be used in the process of preparation of e-learning content and its use. Thus an overview of the current state of e-learning and of existing e-courses in Slovenian Armed Forces was prepared first, together with a summary of available NATO e-learning courses (ADL project). Then a comparative analysis of three open source learning management systems was carried out, as well as a comprehensive investigation of possibilities for SCORM export in Moodle and potential alternatives, including the review of SCORM editors. Based on the results, we recommended a convenient learning management system solution that suited well to the needs of Slovenian Armed Forces.

We also prepared a set of basic guidelines and templates for e-learning content creation. In addition, some templates were designed, intended for lecturers in military schools.

A. Comparison Of Open Source LMS

One of the tasks was to select such a LMS that would cover the specific needs of ELC-SAF and comply with their requirements. The system had to be open source and support the SCORM standards. Besides, modifications and customizations of the system had to be made possible if needed.

A comparative study of three different open source LMS was carried out in order to find the one most suited to our needs. As there are many open source LMS that support SCORM compliant electronic content, we decided to limit our study to the following three systems: Moodle, ATutor, and ILIAS. Our selection was based on some previous studies [8] and the popularity of selected systems. A comparative analysis was carried out and the systems were marked regarding their properties, capabilities and ease of use. Special stress was laid on user friendliness and adaptability to international standards for portability and reusability of e-learning content. Different standards for electronic content preparation were also taken into account. One important feature was the possibility of exporting SCORM packages (SCORM Export), which was not

supported in all studied systems.

Moodle [9] is a well known LMS in our educational environment as it is used in many primary and secondary schools as well as at the universities. The system has many users all over the world and is translated into different languages, including Slovenian. Moodle is very user-friendly and flexible; it has strong support for security and administration, and offers many different settings to aid the learning process and collaboration between users. The system is not complicated to use; it is easy to manage courses, and straightforward to prepare new learning material. Moodle supports the import of SCORM packages, but it can export the content only in its native format.

ATutor [10] is one of the few open source systems that support import and export of SCORM packages. Its main disadvantage is that it does not support Slovenian characters nor is it translated into Slovenian language. It is missing some useful tools, such as calendar and user authentication using Active Directory or Lightweight Directory Access Protocol (LDAP). The overall functionality is good, although the user interface may not seem too intuitive.

ILIAS [11] is the first open source system that has been certified by ADL Initiative to support SCORM standards. It has been used by Partnership for Peace - Consortium of Defense Academies and Security Studies Institutes since 2004, as well as by NATO Headquarters Supreme Allied Command Transformation. The system enables good administration of the content (what students/teachers may/may not use), group collaboration, use of metadata and bookmarks, and also includes an internal mail server. Its main disadvantage is in complex user interface for preparing new electronic content and the lack of Slovenian language support.

Based on the results, we found Moodle the most suitable LMS. Its main advantage is in its widespread use (also in Slovenia) and consequently relatively big Moodle Community that takes care of its development. At the same time this is also one of the disadvantages, as the community is self-sufficient and not sensitive to the needs for standardization and cooperation with related systems. Hence, Moodle does not support standardized export of the content (e.g. in a form of SCORM packages) and there are no plans to add this support in the near future. This means that the content developed in Moodle cannot be easily transferred to another LMS.

B. Comparison Of SCORM Editor Tools

As our goal was to prepare SCORM compatible electronic content, we decided not to use Moodle for content development (in any case, the main purpose of a LMS is delivering and managing the content, as well as managing the learning process and students). Instead, we relied on open source tool eXe (eLearning XHTML editor) [12] for content development. This solution was chosen after careful examination of

different tools that enable production of SCORM compatible content.

SCORM standards are based on metadata that are added to the content and bundled up together into a SCORM package. Due to its complex specifications and exactly defined standards that the learning content has to comply to be called SCORM package, different software tools have emerged that help us in preparation and packaging of such learning content. In our review of SCORM editors, we focused on their ease-of-use, support for Slovenian language, the possibility and efficiency of creating new content (especially exercises for electronic examination and marking), and compatibility of created SCORM packages with Moodle. Working environment, ease of installation and difficulties of first-time users were also of our concern.

We tested several SCORM editors (open source and proprietary solutions) and prepared a comparative study. We found out that the most suitable solution for our needs was the eXe editor. This is a free, open source tool, intended primarily for creation of e-learning content, although it also supports the exporting of created content as a SCORM package. The main advantage of the eXe editor is its easy-to-use user interface (the editor looks like Web browser, as it is based on Firefox and XUL (XML User Interface Language) technology), which is also translated into Slovenian. The developers collaborate tightly with Moodle development community; the result is trouble-free import of SCORM packages into Moodle and enabled traceability and connectivity between exercises in eXe and Moodle.

C. Electronic Content Templates

Based on the selection of LMS and SCORM editor, we prepared some guidelines for e-learning content preparation. Some of the guidelines were incorporated into templates that were later used for development of electronic content.

The templates define the structure as well as the style (look and feel) of electronic learning material. The material is based on HTML (HyperText Markup Language) format and includes various multimedia elements (e.g. audio, video, animation, pictures...). The style of these HTML pages is defined in CSS (Cascading Style Sheets) file, which can be edited or even replaced if needed.

The basic element of each SCORM package is Shareable Content Object (SCO) that typically contains one HTML page. There are no links between the pages (all pages are independent), as the organization of pages (their interconnection) is described in the manifest file.

The whole content of the course is placed in one SCORM package, which includes also the hierarchical structure of learning objects. The course has to contain the title with basic information on the course, and one or more course topics. Each topic

forms one complete module, comprised of title page with objectives, prerequisite knowledge and technical prerequisites, summary, introduction, explanation (in one or more chapters) with examples, questions, quizzes and exercises, homework, survey-quiz, references, and additional links.

Several templates for electronic content development in eXe editor were also prepared. They include different styles for text, activities, and quizzes. The templates are integrated into the editor and thus allow for uniform look and feel of the prepared courses, as well as easier and quicker course development for the teachers.

Fig. 1 shows two examples of quizzes prepared in eXe editor (the course is about Slovenian Military Doctrine).

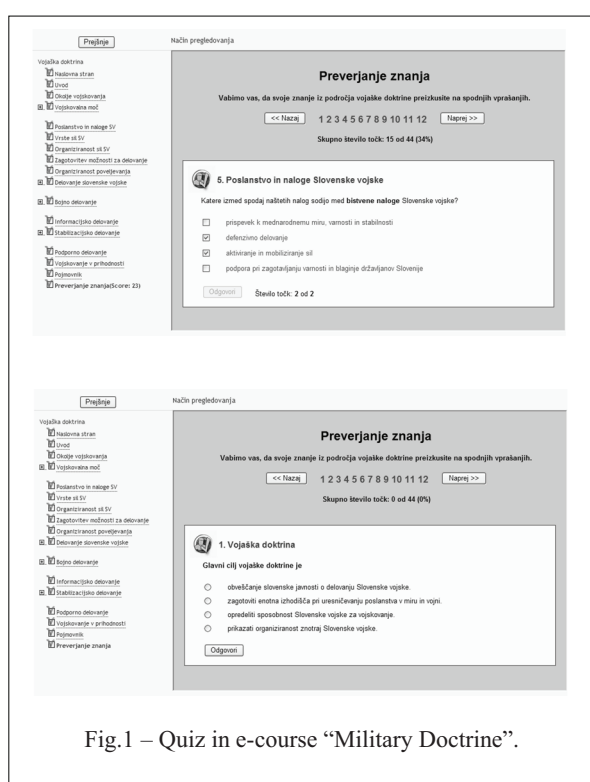


Fig.1 – Quiz in e-course “Military Doctrine”.

Both quizzes are multiple choice question type, with multiple answers allowed in the first one, while only one answer is correct in the second one. They provide immediate feedback to the student, marking correct/incorrect answers and adding points for the correct ones.

IV. PREPARATION OF E-COURSES

The second goal of the project was to develop some e-learning courses to be used in e-classrooms of military schools at ELC-SAF, either for standard e-learning or for blended learning. Thus the electronic content for five different courses for military schools and one computer science course were created, all in the form of SCORM packages.

A. Military School Courses

We selected five different subjects of military schools and in cooperation with the teachers specified the contents that were most appropriate to be prepared in electronic version. These contents covered from two to more than hundred hours of learning in e-classroom, depending on the specific subject and its content. The intention was to develop some e-learning material to be used in the courses for blended learning. Therefore, we did not use the content of the whole subjects, but tried to find only those parts that were most suitable for e-learning and thus brought some added value to the teaching process.

When analyzing the subjects of military school and preparing the corresponding e-learning content, we exposed the following facts:

- not all subject are suitable to be prepared in electronic form;
- in any subject there are parts of the content that can be prepared in electronic form;
- well prepared electronic material is fun for students and can make learning more interesting;
- some subjects are particularly suitable for presentation in electronic version, as the e-learning content enhances the learning experience, makes it deeper and more complete.

Although our work focused on the technological aspect of the electronic content and creation of SCORM packages, we also offered advice and support to the teachers in selecting the appropriate content as well as in preparing this content and using it in the e-classroom. All e-learning content was prepared in a form of SCORM packages and made available in the ELC-SAF e-classroom.

One example of the content that is well suited for electronic version is a part of the course in Communication Rules: Communicating in wireless traffic, where the student has to practice communication over the radio, listening comprehension, and communication transcription.

The course in Communication Rules focuses on wireless radio communication. The emphasis of electronic version of this course is on audio recordings and corresponding written text with Karaoke-style animation.

The students have to listen to the real life communication scenarios between two or more radio stations. The background noise from battlefield, motor vehicles or natural phenomena (e.g. wind, rain, thunderstorm...) is added to the recordings to make them more real-life experience and more difficult to understand. This background noise can be switched off (and back on again) for clearer sound. The course covers listening comprehension and communication protocols (words with special meanings,

abbreviations etc.), as well as writing skills of transcriptions in Q-code.

There are several exercises at the end of each lesson, where the students practice communication (how to say specific commands, use of protocols in specific situations etc.) and have to write down the transcript of the recorded communication. The exercises have two parts: the student has to verbalize the requested communication first, then listens to the recording of this communication, and writes down the Q-code transcription of it into the logbook. The correct answer is given at the end of each exercise, when the communication is written on the screen together with its transcription in Q-code.

A screenshot of the e-course in Communication Rules is shown in Fig. 2. The figure demonstrates the lecture on receiving and sending special signals. The communication between two callers (P1 and P2) is written on the screen, with control buttons for playing the animation situated just below the text. Some photos from real-life communication situations, equipment and environments are included to variegate the learning.

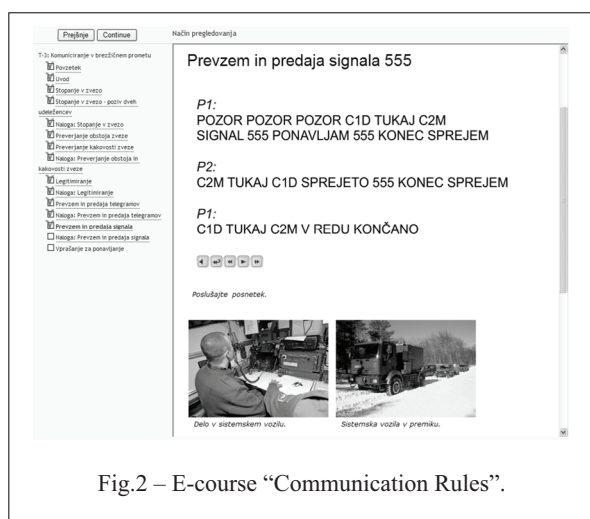


Fig.2 – E-course “Communication Rules”.

The content of the selected subject is extremely appropriate for electronic version, as it includes listening comprehension and writing skills that have to be executed as individual exercises by each student. In preparation of this e-course, we worked in close cooperation with the teacher to find the best approach to preparing and using e-course in this subject.

B. A General Course In Computing

To populate general knowledge about computers and their use, we decided to develop an extensive e-course, titled Introduction to Computing. The course is available in e-classroom to all students that wish to broaden their knowledge on the subject, as well as to the beginners to help them with their first steps in the ICT world.

This e-course was intended mostly for people, who

are not familiar with computers. It introduces basic concepts of computing and thus helps to improve computer literacy of e-classroom users. There are also some topics for advanced users that can be interesting introduction to more serious work on computers.

The course covers basic concepts in computing and informatics with special emphasis on user software (use of different software and services) and computer security. It gives students basic knowledge that enables them to prepare letters and other text documents, do calculations using spreadsheets, edit home-made holiday photos, browse the Web and search for information, yet also presents the safe use of Internet and electronic services like e-mail, e-banking, e-government or e-shopping. Advanced users can create their own home page and upload it on the Web server.

The course was delivered in a SCORM compatible package in two language versions, Slovenian and English.

A screenshot in Fig. 3 shows a part of the topic User Interfaces (English version) with video demonstration of one specific type of user interfaces.

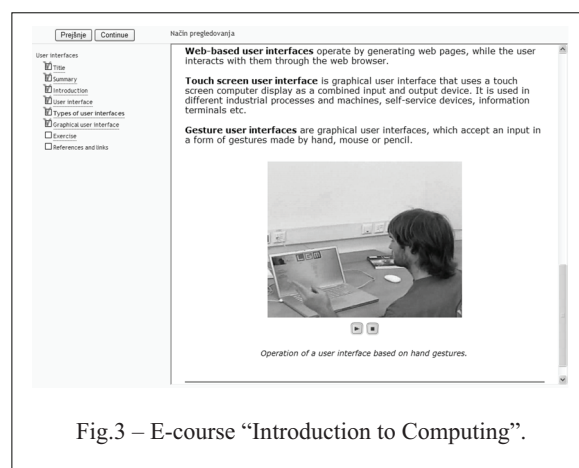


Fig.3 – E-course “Introduction to Computing”.

We gave strong emphasis to multimedia elements in the course, such as video and animation, in order to make the learning experience more interesting. We prepared many pictures, schemes, diagrams, and some animations. There are also some audio and video recordings included in the e-learning content. Each topic has several questions for self-evaluation and some exercises for consolidating gained knowledge.

V. CONCLUSION

We have described the results of the e-VIZUS project that aimed to assist the E-learning Center of Slovenian Armed Forces with technological support in providing consistent e-learning platform, as well as with preparation of electronic learning materials and various online courses.

The main goal of the project was to prepare a suitable e-learning model for Slovenian Armed

Forces, ranging from preparation of standardized e-learning contents to identification of a suitable learning management system.

Some of the prepared e-learning courses were used in classroom for blended learning already during the duration of the project. The students' responses were very positive and encouraged the trainers to continue with this kind of instructions in the future.

The next steps will be to get students' feedback via questionnaires, and to evaluate this new way of teaching/learning for different subjects. This way we could find the optimal combination of e-learning and traditional teaching for every subject, and these best practice examples could be transferred also to other courses of the military schools.

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