Methodology for Development of e-Learning Materials within European Projects

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Abstract—The paper explains the reasons that lead us to elaborate an optimized methodology for development of e-learning materials and a methodology for authoring with respect to their prospective employment in European projects dealing with distance education. We are dealing also with the importance of quality standards that should be applied during the development process.

Keywords–e-learning; European projects; education; Leonardo da Vinci program.

I.   INTRODUCTION

Our institution has been coordinating several large European projects focused on development of modern e-learning materials. Their outputs are usually e-learning modules, 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 told 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 more details

The said rules have been applied to the next two projects. The first one is titled "E-Learning for Acquiring New Types of Skills – Continued" (ELefANTC). Its main objective is to develop a specialized course of industrial automation in eight languages that should be verified during a tutored pilot run for several hundreds of trainees. The software platform is LMS Moodle. The course is supplemented with a multimedia multilingual dictionary. The project started in 2008 and it should be concluded this year.

The second project that will take full advantage of the formulated rules and principles is called "Internationalisation of Electronic Communications Training (IntEleCT)". The principal outputs are also electronic course, but in this case they do not have common homogeneous logical structure, because they deal with different topics: NGN Protocols, Information Security, Internet Protocol version 6, Optical Networks, Digital Television and Traffic Engineering in Mobile Networks. Also this project contains a pilot run in its schedule. The project has started in October 2009 and it should be concluded in the autumn 2011.

II.   QUALITY MANAGEMENT

The most important criterion for evaluation of outputs is the quality of the individual parts. The quality management may seem as a routine task, but our experience says something different. We have to keep in mind that has the following features (from the viewpoint of demands on e-learning tools):

- International implementation team;

- Many authors of texts, images and other elements;

- Outputs available in eight language versions;

- Time stress during the development.

Therefore we have prepared a sophisticated quality management plan for evaluation of the outputs, which is based on a two-level system.

A.   First-level Quality Management

The development begins at the authors of texts. The source texts have to pass the first-level quality management, i.e. they are examined in the terms of professional content and language.

As these primary texts for different modules are developed in various languages, it is necessary to have quality managers skilled in the professional area as well as in language for each national area.

The first-level quality manager may then provide feedback to the authors or even return the material for refinement, along with proposals for changes, amendments or corrections, until the material meets the quality manager's demands.

Then follow the translation of the material into the reference language (which is English) and incorporation of multimedia elements.

B. Second-level Quality Management

The chief quality manager reviews all submitted materials and makes the final decision about their acceptance, providing feedback for the authors and/or first-level quality managers (i.e. suggestions for corrections, supplements, etc.). The corrected materials come back to the chief quality manager who is responsible for the requested changes and their verification before subsequent processing. The material passes the final review that checks also the formal details, such as correct styles, formats, etc.

After the final review the documents are translated into national language versions; the first-level quality managers are responsible also for these national versions (language check, professional level, national-specific information).

C. Technical Background of Quality Management

With respect to the number of steps contained in the whole procedure and to the large number of involved persons (authors, quality managers, partners, but also suppliers of multimedia elements) it is necessary to have a tool providing global overview, storing the assignments of partial tasks to specific people, indicating the progress and archiving the available results.

For this purpose we have been using specialized tailor-made software that supports efficient project coordination; we call it simply Task list. It's a web-based tool used by all parties involved in practical project implementation.

The functions and statuses supported by the Task list are illustrated in Fig. 1.
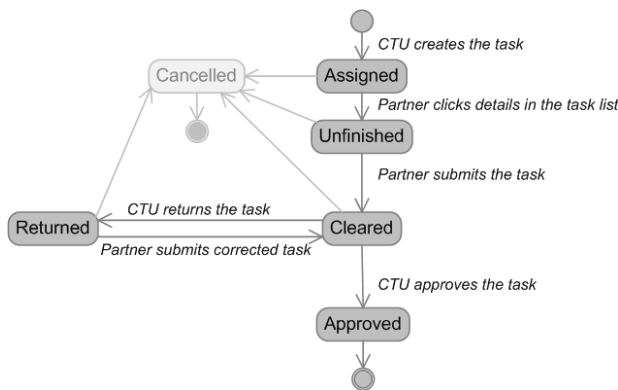

Figure 1. Flow diagram of the Task list

The entire process starts with defining of a task by a member of the coordinating team and by its assigning to a specific person from the project consortium. The assignee is informed about the new task by an automatically generated e-mail message. In the beginning of the process, the status of the task is set to "Assigned".

As soon as the assignee picks the task up, the status changes to "Unfinished". The assignee elaborates the task, uploads the prepared files to the system and confirms the submission. The status is "Cleared" now. The coordinator gets an e-mail informing about the delivery of the task.

Then the coordinator performs a thorough check of the submitted materials. According to their quality the task may be either "Approved" or "Returned" (with relevant comments and notes).

In every moment the task may be "Cancelled" by the coordinator.

Besides the informative e-mails, the coordinator and the assignee can have the complex overview of the assigned tasks thanks to the graphical interface that supports color keying of tasks with different statuses (especially the delayed ones).

III. CONTENT AND ITS AVAILABILITY

A. Learning Management System

How important is the selection of a suitable LMS? From the students' point of view, it does not play an important role. What really matters is the initial decision to use a single LMS for the entire institution (which may be a serious problem when considering large bodies, such as universities) – and such decision must be made in a proper time. Modern LMS systems offer standard tools that facilitate management and presentation of the learning materials, as well as communication and administration of classes. It is very important to make teachers and student to use these tools actively; in fact, teachers are often the party that plays more passive role, but this can be overcome by good management, breaking the barriers of traditional approaches and old-fashioned thoughts.

From the viewpoint of our two projects we had to take into consideration the following two fundamental conditions:

- The LMS must support multilingual operation;

- All partners and their users must have valid licenses for using of the LMS (this leads to selection of an open-source software product).

B. Learning Content

The quality of learning material 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? Interactivity, in the first place, because it represents the fundamental added value for our students. How can we implement it? There are several ways, and it is advisable to combine them together.

C. Interactivity

The educational content should include conventional interactive elements, such as tests with automatic evaluation. It is recommended to incorporate these 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 topic.

Besides that, elements providing quasi-interactivity of students with the material 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 this: "Did you know that some breweries use RFID chips to mark beer kegs? Well, now you do!"). 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 important!").

The interactive mechanisms employing animations, simulations and so on are obvious and it is not necessary to explain them in detail.

It is very important to keep in mind that the role of a teacher in e-learning 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 of the electronic course as well.

The educational content intended (primarily) for distance form of study must be supported especially by regular tutoring, which should be implicitly included in the study plan. Other forms of contact with teachers (tutors) are also desirable – on-line (chat, video chat) as well as off-line ones (e-mail, discussion forums). In order to meet some specific pedagogical objectives it is also necessary to initiate mutual communication among students.

IV. DEVELOPMENT OF THE LEARNING CONTENT

The following elements are available for the learning content development: factual content author (who is often a teacher) and, on the other hand, electronic tools with their specific functions. We should not forget about the support team (designers, programmers, reviewers). The goal is to harmonize all elements so that the resulting composition corresponds to the objectives described above.

The procedure that we have defined specifies unambiguous steps of the development process and their details. We have taken into account the following principal conditions:

- Modular concept – courses are composed of modules, modules consist of screens;

- A screen corresponds to approximately one half of a standard text page, a module contains approximately 50 screens (text, animations, simulations, images) + tests + interactive elements;

- The level of authors' experience in the areas of ICT and electronic pedagogical support is usually low, and therefore:

    o It is necessary to separate the authors from the final form of the course;

    o The authoring itself must be easy, well arranged, with distinct rules;

- Reviewing and ensuring of the unified concept in all development stages;

- Standardization of the individual development procedures;

- Enabling the development in other languages (especially in English).

V. AUTHORING OF TEXTS

The authoring of learning texts is the key to the success of the whole project. All the time we have to keep in mind that most authors – according to our practical experience – do not like to respect the given formal rules. However, only strict obedience to these rules (i.e. using appropriate text styles, respecting character limits and text structure, incorporation of interactive elements etc.) allows successive development of extensive courses prepared in cooperation of many authors in different time periods, so that this heterogeneous environment brings homogeneous results.

The authors work with a standard word-processing application, using a document template that offers wide variety of text styles (approximately 40). Each style represents a specific element in the final form of the learning material (e.g. beginning of a new screen, section headline, numbering, bullets, important text, definition, note, etc.). By the means of using the styles, authors can, for example, insert images (referencing external files), animations, simulations, tests etc. in a unified way to any place in the text, and they need not think about the final formatting. The first page of every module contains some basic metadata (authors' names, summary, objectives, key words etc.).

The authors are, to certain extent, also involved in preparation of multimedia elements (such as images, animations and so on), usually as providers of the fundamental ideas, in cooperation with the support staff (animators, drawers, programmers, etc.) whose task is to implement these ideas in electronic form, respecting the given graphical manual.

VI. COMPLEX DEVELOPMENT OF MODULES

The second section of this paper dealt with quality management as a basis for development of high-quality educational materials, forming the horizontal structure of the entire process. Now, the technical implementation (that partially overlaps with the former) can be understood as the vertical structure.

The development of electronic courses and their individual modules is – as we have mentioned above – a team work. Team members must occupy the following positions: team leader (assigns the global request for development, provides financial resources), e-learning manager (divides the future course to modules, determines their extent, finds authors of the respective parts, is responsible for formal correctness of the texts), author (writes texts and tests, provides basic data for designing of multimedia and interactive elements), in cooperation with reviewer, translator, technicians,

programmers designers of graphics, animations, simulations, etc. Of course, several roles may be played by one person, and one role may be distributed among several persons.

Fig. 2 provides an overview of the entire process and specific roles in it. It displays hierarchical structure and large number of feedbacks intended for correction of possible mistakes in different stages of the development process.
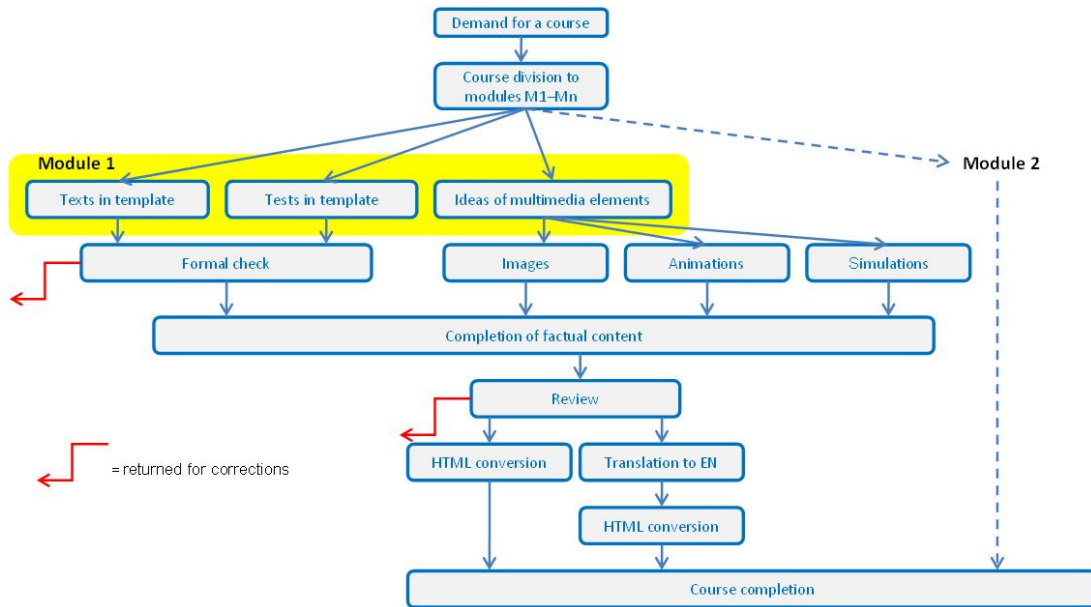
Figure 2. Methodology for development of e-learning courses

VII. CONCLUSION

Although it might seem to someone that the development of e-learning courses is an easy task, the reality is different.

We are building a complex system, and if it is expected to be a high-level and high-quality one, then its development and preparation is definitely not a routine. On the contrary – it's a challenging process that requires combining of specialized technical and pedagogical skills, so that the results fulfill the ideas and even dreams of the authors.

At present time we can conclude that our implementation team has mastered the demanding development processes and we are able to produce the individual modules as well as the entire courses successfully.

The courses are now just about to be launched; the first trainees should begin their study under the guidance of tutors in the middle of March 2010. The feedback from trainees (during and after their study) is always an important part of any training, and also our courses are prepared for this moment, having implemented evaluation questionnaires that may be used for making of

partial (but also substantial) changes to the developed materials. Since the first reactions should be available by the beginning of summer, the presentation of this paper will contain also the experience and students' opinions.

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