

TOWARDS A FRAMEWORK FOR DEVELOPING STANDARDIZED E-LEARNING MODULES

A Report on Methods and Tools in a Distributed Content Production Project

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Abstract: The article summarizes the surrounding conditions and solutions for challenges in the so called SECo-project, which was initiated by several German universities in order to strengthen the competitive situation of small- and medium-sized enterprises by providing knowledge on e-learning. It focuses on methods and tools for the development and production of standardized e-learning modules in distributed teams of authors. It is a report on work in progress, outlining solutions for typical problems in content production projects, which are generated through interdisciplinary expertise and based on the need for standardization.

1 INTRODUCTION

The production of e-learning content is considered to be cost-intensive and highly uncertain in terms of revenue. Therefore the utilisation of e-learning in on-the-job trainings in small- and medium-sized enterprises [SME] hasn't yet become common practice. In order to strengthen the competitive position of SMEs, which are in the focus of federal employment politics in Germany, nine universities in the German State of Saxony started a common project named Saxon E-Competence Certificate, also called SECo (SECo, 2009).

The aim of the project, which is managed by the University of Leipzig and sponsored by the European Social Fund (European Commission, 2009), is the provision of standardized e-learning modules for continuing education of SMEs training-staff by teaching them how to use e-learning for a more cost-efficient staff training. By promoting the

knowledge transfer from science to industrial practice, SECo actively involves Saxon SMEs, both during content development and certification.

For that purpose the participating universities are geographically dispersed over Saxony so that communication with local SMEs is facilitated and requirements are not limited to regional specifics. The resulting diversity of authors and expertise poses a couple of problems, which have to be coped with to produce standardized learning modules.

Since learners may choose freely from the entire range of modules that are not necessarily built by the same author, standardization is seen as a basic requirement for SECo learning modules. For consistent appearance several measures have been taken. This paper will give an overview of methods and tools developed or chosen for SECo. They will be presented in four dimensions of standardization. These dimensions cover aspects of content, didactics, technology and organisation. The modules

will be provided under the CC License [CC-BY-SA] (Creative Commons, 2009).

2 CONTENT

The declared aim of the project is the development and production of e-learning modules to increase competencies in media and e-learning for Saxon companies. This first section will give an overview of content-related aspects of standardization.

2.1 Topics

The cumulative study time for all modules was estimated to be around 400 hours split into 50 different learning topics. These topics are derived from the domains of didactics, technology and management.

Furthermore, these topics are grouped by roles, which are typically involved in e-learning scenarios, namely author, trainer, manager and expert of technology. The topics were redefined during the initial phase of the project.

2.2 Module Types

For each topic, a basic module with a study time of two hours and a comprehensive module of four hours are to be produced, each addressing different learning profiles. A few topics were supplemented with special courses that have a study time of seven hours and contain applied knowledge of highly practical relevance.

2.3 Certification

All the modules are designed to be applied in blended learning settings. Like the different module types, certification is also planned to be provided in three stages: the basic, the standard and the special certification.

The definite configuration of the certification stages is still pending and the final solution will be worked out based on practical experience and requirements of Saxon SMEs later on, even though there is an initial concept contained in the project description.

2.4 Content Classification

The content to be produced is classified according to the ratio of production effort to study time. There are three classes of content defined: lower, medium and

high qualitative content. The respective ratios are defined with 20, 70 and 100, saying that a 10 minute learning content of lower quality by definition allows a production effort of 200 minutes.

The proportions of lower, medium and high qualitative content are fixed at 20%, 35% and 30%. The missing 15% are designated for tests. These values are compulsory for the overall content.

3 DIDACTICS

The development of multimedia learning content is usually very complicated. Therefore, it is useful and appropriate to have a well-planned didactic approach rather than a mere intuitive concept.

In order to build didactically sound modules, the heterogeneous expertise among the authors in SECo requires a high degree of standardization in this field.

3.1 Didactic Approach

In media didactics, the quality of a learning medium can be rated by its contribution to solving an educational issue. Therefore, an adequate assignment of learning opportunities to a learning situation is required.

Several steps of analysis and specification are necessary, namely the definition of learning objectives (Bloom, Engelhart, Furst, Hill and Krathwohl, 1956), the choice of teaching methods and media for the learning scenario, not to forget the didactic design of the learning modules.

Therefore, a common didactic approach for the modules is essential and includes several basic educational issues such as the classification of learning theory, the focus on educational models, the preparation of the content, the use of teaching and learning methods and aspects of learning control.

A didactic concept was needed, that can be used as a template for the entire module development. The basic concept is the Instructional Systems Design (Issing and Klimsa, 2002). It relates to media didactics and both learning and cognitive psychology.

The first step is to determine what the e-learning program has to provide to satisfy the educational needs. Therefore a description of the targets of the educational program is needed. This relates to the educational goals such as skills and learning objectives as well as to general objectives such as certification and training duration.

The second step involves the development of the didactic approach. The approach chosen is based on the Constructivist Learning Theory that corresponds to the distinct individual learning character of the SECo modules.

3.2 Didactic Template

The didactic approach will further be integrated into a methodological framework for the e-learning modules. This includes aspects of presentation, performance, exercises, assessment, content and reflection on learning time. In result a didactical template is defined, which must be used for the development of the modules in the SECo project.

The template is structured into basic components such as knowledge units and content pages of different types according to the elements of the Learning Content Management System [LCMS] which is used for module implementation and will be introduced in the following section.

This methodological framework, containing the module template, is the starting point for detailed concept elaboration on individual module level.

The detailed concepts include the selection and preparation of the learning content. Therefore, the collection of potential learning content and its modularization is based on the learning objectives (Kerres, 2001).

The efforts are driven by the intention to produce modules that are reusable in multiple e-learning trainings. Therefore, as a first step, a Knowledge Map based macrostructure of the module is set up. In a second step this static structure is converted into a sequence made up of a temporal order of actions and events. Next, the content is divided into lectures, units and learning steps. Furthermore, the type of screen page is defined and, in addition, the types of media and interaction is selected and planned.

All of the above information is compiled to a detailed module concept. It includes a description of the complete screen content, the structure of the module as well as the learning objectives. After evaluation, this document is binding for media production and content creation.

4 TECHNOLOGY

Furthermore, authoring software and a platform for course creation and content management had to be chosen. This section provides information about the solutions considered appropriate for the surrounding conditions in SECo.

4.1 Media Production

Learning modules contain different types of media. The range goes from simple text elements up to complex interactive animations. Each media type is assigned to a content class according to its ratio of production effort to study time. Content Classification was introduced in section 2.4.

The market offers a wide range of authoring tools for media production. Not just commercial solutions, but also open source and free software programs were tested at the beginning of the project.

Finally the Adobe E-Learning Suite (Adobe, 2009) was chosen for reasons of usability, the wide functional range and availability of documentation. Another important criterion was the support of standard web formats. On the long term, maintenance of the media content is facilitated by a limited variety of media formats.

4.2 Course Creation

There are a plenty of software solutions for course creation and management. Concerning the software architecture, they can be distinguished between desktop-based and web-based systems. In summary, the following selection criteria were taken into account:

- Web-based system;
- Multitenancy;
- Flexible role model;
- Cooperative course creation;
- Separation of content and design;
- Template-based course creation;
- Multiple output formats (html, PDF etc.);
- Flexible template modification;
- Flexible combination of knowledge objects;
- Media- and metadata management capabilities;
- SCORM compliant learning modules;
- SCORM compliant tests.

The system of choice was the state-of-the-art Learning Content Management System [LCMS] named KnowledgeWorker developed and distributed by the Saxon e-learning specialist chemmedia AG.

It is a web-based solution, which provides multitenancy, online editors for text entry and flexible definition of didactical elements such as citations or notes. These elements appear in a specially set up style and can freely be generated by defining an appropriate XML-structure (chemmedia, 2009).

Furthermore, the system strictly separates

content and design. This way authors don't have to take care of the look and feel during content creation, they just have to pay attention to a correct semantic markup. For this purpose the system provides a so-called What You See Is What You Mean [WYSIWYM] editor. Alternatively, content can be created in XML-mode, showing that the systems' interface is flexible enough to address both experienced and first-time users.

In addition the LCMS provides distinctive features for content management. All the media files transferred to the system are organized in a media database. To use a media file in a course element, the respective file in the database is referenced. Each media file can be referenced several times. The advantage of this solution is the easy replacement of frequently used media files. At the same time, planning of media use gets more demanding. It needs to be considered that future changes to the media elements still fit the context of the knowledge objects.

The media files can be tagged and described via various metadata elements. It is possible to deposit the raw pictures, videos or animation elements in addition to the published media file, making it easier to enhance the media elements during maintenance after the project is finished.

5 ORGANISATION

The organisational measures focus on the usage of collaborative technologies such as web 2.0 tools or learning management systems for project organisation and cooperation.

Furthermore, the production process is described via an event-driven process chain model that is provided to all SECo authors via a simple web-interface.

The determination of a valid media mix with regard to production effort and study time is the third organisational tool for working out the module concept. It will be introduced in this section.

5.1 Cooperative Platforms

Two different open source learning platforms are used for project communication: Moodle and OLAT (Online Learning And Training / Zurich, 2009).

Moodle is the standard Learning Management System [LMS] used by the University of Leipzig. It is predominantly used for project organisation. In a special course room all necessary documents, which were created during the project, are provided to the

project members. It is the central platform for document management and communication (Moodle, 2009).

OLAT is the standard LMS of the Saxon universities. It is used for mainly non-organisational, content-related discussions.

Furthermore, the open source project management tool dotProject is used for overall project supervision and cooperation with external stakeholders and promoters (dotProject, 2009).

The platforms contain various tools for online communication. The most popular tool is the web forum. After a posting is sent, it is additionally pushed to all the project members via email.

Instant messaging clients and traditional email can be used for individual communication in addition to the tools within the learning platforms.

5.2 Process Model

For the purpose of creating a common understanding of the production process an event-driven process chain was modelled, using ARIS Toolset (Scheer, 1998). It is based both on experience and some influences of the PAS 1032-1:2004-02 learning reference model. The general structure of the process model is shown in figure 1.

The model contains all the steps from the initial idea to the completed learning module. The author receives an orientation to all the steps and to the tools to be used during module production. Figure 1 shows the three general stages of the process model. First stage is reached when the general concept is finished. If some of the formal requirements on the concept are not met, the concept has to be revised.

If all aspects of stage one are completed satisfactorily, production can be started. After production is complete, the second stage is reached and another evaluation is conducted. Again, once this is completed satisfactorily, the module will be field-tested with students. This testing occurs at stage three. If the learning objectives are reached, the module is considered finished. The model is permanently examined and refined, in order to be a valid reference for the authors.

5.3 Effort Calculation Scheme

Based on the general content classification described in section 2.4, a tool for calculating the study time of the learning module and the corresponding module production effort was developed. This Microsoft Excel based scheme ensures that the module concept can be implemented within the scheduled time.

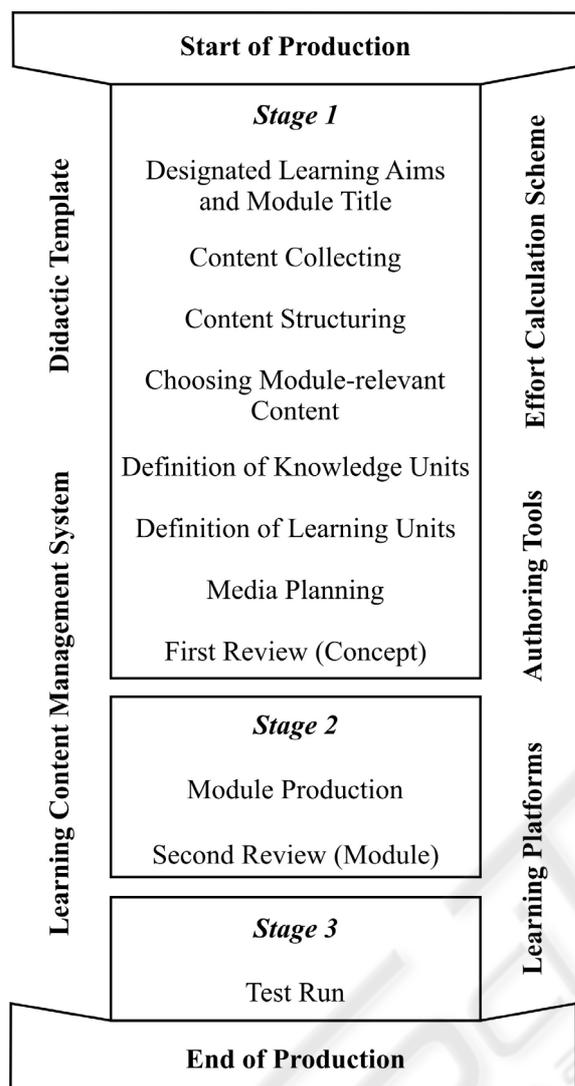


Figure 1: Summary of the event-driven process chain describing the production process in SECo project.

Furthermore, it helps to estimate the study time of the module.

The scheme is based on a classification of all relevant media types that may be used within the learning modules. Each media type is described by its standard study time per unit and the corresponding production effort. The mandatory proportions of the content classes only allow such module concepts that fulfil the requirements on both production effort and target study time of the planned module.

For example, a module concept for a four-hour module could be a mix of the following media types:

- 6x text1 (orientation);
- 4.5x text2 (content);
- 4x picture;

- 4x diagram;
- 5.5x sound recording;
- 10x interactive animation;
- 6x non-interactive animation;
- 9x video;
- 29x self-test;
- 4x test.

This is a valid mix of media types concerning the constraints described in section 2.4. For each media type, the product of the number of media elements and the standard learning time per unit is calculated. Afterwards, the products are summed up. The same is done concerning the standard production effort per unit. As a result, these two sums indicate the degree of conformance to the requirements defined for the learning modules in SECo. To be valid, the planned learning time has to fit exactly to the expected time. On the other hand, the production effort has to be in a range of 10 per cent to the expected value.

The effort calculation scheme supports the author in planning a module that fits the rather formal requirements. It is the second mandatory document besides the detailed module concept at the end of the first stage of the process model.

6 CONCLUSIONS

In summary, the tools and methods developed so far in the SECo project are essential for the coordination of activities on the way to produce standardized e-learning modules.

The dimensions presented are provisional and permanently refined during further project work. Nevertheless, the templates, models and tools developed, are raising remarkable public interest. It's still a long way to go before a generally accepted concept for a multi-dimensional framework of methods and tools for the production of standardized e-learning modules can be established.

The presented results were gained during the first six months of the project with another two years to go. The practical background causes mainly demand-driven solutions, which is important for compliance with project targets. An accurate definition of standardization and quality in the SECo project is still pending, which was compensated by a preliminary argumentation about the aspects of standardization.

When it comes to the production stage and the modules, which are produced on the basis of the templates, tools and methods, worked out so far, it will quickly become evident, whether the

standardization, which was aimed at, is achieved.

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