

Faculty of Behavioral Sciences, Master of Science program 'Technology Application in Education and Training'

**Final Thesis:** 

# Development of Templates for Learning Objects within the Learning Content Management System learn eXact for the Digitale Universiteit

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# Summary

This research project aims to facilitate the work of content developers by providing templates for creation of e-learning content in the form of Learning Objects. The project was initiated within the scope of the project conducted by the Digitale Universiteit consortium and was intended to solve problems which DU's content developers meet during their work on collaborative creation of e-learning materials.

The content developers faced some problems which they wanted to solve by using templates:

- Reusability problem. The template should provide universal LO model which can be reused in different contexts for creation of different kinds of LOs with different purposes, granularity and complexity.
- Instructional design problem. The template should provide guideline for instructional design because not all content developers are specialists in instructional design and are able to create didactical structures.
- Layout and interface problem. The template should enable creation of attractive and effective pieces of learning material (LOs) with nice layout of interactive content.

Therefore the templates are intended to provide two main elements: an abstraction of didactic structure and its rendering.

In order to define what exactly templates are needed and what templates can be done a number of research activities were carried out: literature review and inventory of DU's content developers' views on pedagogical approaches and technologies.

Literature review provided theoretical basis for the creation of templates. Several questions were investigated. First, the problem of e-learning content and its organization in the form of Learning Objects was considered. Here the issues of reusability, granularity, metadata description, technology standards, LO's structure and packaging were discussed. The conclusion was made that CISCO's Reusable Learning Objects Strategy (Barritt, 2001) could be adopted as a framework for LO's organization. This literature review enabled to provide understanding of the possible e-learning content organization which leads to understanding what structure of LOs should be reflected in the templates. This allowed building the structure of templates based on desired structure of LOs.

Second, issues related to templates were considered, such as the definition of templates, their roles, their possible functionality, and examples of existing templates. During this review the reference was made to the research of Boot and Merrienboer (2005) who rated working with didactical meaningful objects higher than with multimedia objects and argued for using templates based on meaningful didactical structure. Therefore the conclusion could be made to use pedagogical approached as a core of templates' didactical structure.

Consequently, the third question involved the used pedagogical approaches. Literature review of pedagogical approaches supplied a short overview of six pedagogies, including Problem-based learning, Project-based learning, Task-oriented learning, Experiential learning, Collaborative learning and Skills-based learning, and allowed elaborating of LO models for some of them based on their learning scenarios.

Fourth, technical issues related to technologies and tools for e-learning content development were considered. This implied describing Learning Content Management Systems in general and learn eXact in particular. This software application was chosen by default as far as it was an application used by the Digitale Universiteit. The literature review related to the technical issues explained how templates were realized within concrete software application and what kind of limitation the learn eXact imposed on the templates.

The inventory of DU's content developers' views on pedagogical approaches and technologies allowed designing templates with respect to the preferences and requirements of the target audience. The inventory was arranged in the form of questionnaire distributed among DU's project leaders and content developers. Eight responses were received and analyzed. The results of analysis enabled to

design templates according to intended user's preferences in pedagogical approaches and supporting technologies, template goals and functionality, interfaces of templates and content developed by means of templates. The results of analysis demonstrated that the most popular and desirable pedagogical approach was Task-based learning (TBL). Therefore this pedagogical approach was chosen as a basis for intended template. This was further reflected in design and development of the template.

As a result of the given research project a template called TBL approach template was designed and developed. The goal of creation of this template was to support content developers and facilitate the process of creation of modules (courses) that include tasks as one of the main components, and allow detailed description of the task according to TBL pedagogical approach.

The product was designed according to the method of user-centered design (ISO 13407, 1999) based on the inventory of target group's preferences and requirements (DU's participants) in respect to pedagogical approaches and technologies. Moreover the design of template was grounded on the strong theoretical basis of didactics (various pedagogical approaches were considered, as well as cognitive theories), instructional design (Systematic Design of Instruction (Dick & Carey, 1990), Reusable Learning Objects Strategy (Barritt, 2001), learning technology standards (IMS, SCORM, IEEE), and some other theories related to templates and content development process.

During the design of the template's prototype a first formative evaluation was carried out. This formative evaluation was implemented in four steps:

- Step 1. Analysis of DU pageSet template and its functionality
- Step 2. Analysis of the design of the structure of the desired TBL approach template based on the DU pageSet template, in consultation with an expert
- Step 3. Appraisal during the development of the first prototype of the TBL approach template, in consultation with an expert
- Step 4. Analysis during the development of the pre-final version of TBL approach template, in consultation with an expert.

The goal of the first formative evaluation was to specify the weaknesses of the current version of template for further redesign and improvement. The first step of this evaluation was carried out solely by researcher, while others were implemented in the form of a series of heuristic walkthroughs with a technical specialist and advanced user of learn eXact software.

At the third step of the first formative evaluation a first prototype of the template was developed and evaluated. The results of formative evaluation were analysed and a pre-final version of template was produced and further evaluated at step four. The template was developed with the use of the Extensible Markup Language (XML) that was required for Learn eXact to develop templates for LOs. The XML allows to separate the structure and description of contents from their rendering, hence the abstraction of the structure and the contents organized inside the actual structure of an LO are described using XML elements and attributes and the LO rendering is handled separately using the XSLT technology in Learn eXact.

After the first formative evaluation a final version of template was elaborated. The result product was evaluated (second formative evaluation) by five instructors from the TAET Master Science program of the University of Twente and one expert. These instructors were all potential users of the template but were used as experts in the area of educational science and technology. This evaluation was carried out in the form of usability testing where participants tested the TBL approach template and reflected on using it. During evaluation participants were interviewed and asked to fill in a questionnaire. Two methods of usability testing were used attitude measures and cognitive workload measures. Participants reflected their satisfaction with the product and assessed its effectiveness and efficiency.

The results of the evaluation were very positive. Most of the participants demonstrated enthusiastic attitude to the idea of template itself and its realization in particular. In general all participants agreed that the TBL approach template provides rich framework for describing tasks according to TBL pedagogical approach. They called the use of template satisfactory and helpful, and sometimes even motivating and supporting creativity. One of the instructors was even ready to apply this template for

the next revision of the course, while others called the template logical, reasonable and probably useful in the real situation of content development.

However two instructors demonstrated skeptic attitude to the TBL approach template although they understood particular value of it. One of them denied any idea of instructional design therefore the template itself looked useless and not efficient. Another participant criticized CBT model of presenting content by arguing for development of more interactive content which motivates and stimulates students' activities.

As a result of evaluation the following recommendations for the future development of TBL approach template were made. The first recommendation was to carry out performance evaluation in order to test parameters such as time and effort expenditures, effectiveness, reusability etc. among specific target group (DU's participants). They can be asked to create real pieces of learning materials from their content developer's practice and evaluate their performance. This will enable to make a final conclusion about the ability of the TBL approach template to support content developers in their activities.

Other recommendations regarding to the TBL approach template were related to the areas and trends for future investigation and elaboration. The further development can be connected with the following issues: reusability of the template and its particular components, sequencing of tasks and activities within tasks, extension of interactivity possibilities and improvement of the template interface.

# 1. Introduction

In this chapter the context and problem, main research questions, purpose, scope, objectives and target audience of the research project are described.

# 1.1. Introduction into the Research Problem

In the present day society the matter of education is critical and therefore the popularization of elearning takes place. The reason of rapid and wide distribution and expansion of this type of education is that society requires effective, convenient, flexible, and assured way of education and e-learning is able to provide this. Persistent development of information and communication technologies leads to continuous refinement of e-learning technologies and ensures future growth of this domain. Existing facilities of e-learning enable to apply different pedagogical approaches, provide great flexibility in learning and in different ways improve traditional forms of education.

There are several factors that affect success of e-learning, such as appropriate environment ready for implementation of e-learning including infrastructure and human factor, as well as quality of e-learning technologies, their complexity and efficiency. However the quality of learning depends not only on the form of how the education process is carried out but also on what content is taught and how this content is presented. Consequently one of the most crucial factors that influence quality of education is e-learning content.

The content itself, its fullness and actuality is left for an author. Only the author can specify which content fits the context of the course. Therefore the quality of the content depends on how competent the subject matter expert is. But the way of organizing and sequencing the content, its delivery and presentation can be pre-defined in a standard way. For example, there can be a model depicting relations between desired pedagogies in the course, content, and technologies which support content delivery for different pedagogical approaches.

Such organizational structures can be defined in the form of templates which allow content developers to sequence content within their courses in an optimal way. In order to develop and manage e-learning materials developers use special technologies, particularly Learning Content Management Systems (LCMS). These systems are multi-developer environments where developers can create, store, reuse, manage, and deliver learning content from a central object repository.

One of the LCMSs used in Dutch higher education is the learn eXact LCMS, which enables the use of templates for content development besides all standard functionality. Within the Digitale Universiteit consortium various projects are initiated which are involved in the collaborative development of learning materials using LCMS learn eXact.

This research project is initiated within the scope of the project conducted by the Digitale Universiteit (DU) consortium. The reason of initiating of current research was dissatisfaction of DU's participants by products created with the LCMS. In most cases the participants face two problems: either content developers don't have deep insight in functionality of this system and facilities it provides to build attractive and well structured courses or they don't have sufficient instructional design background to create e-content based on pedagogical approaches supported by computer technologies. As a result, developers create inefficient learning materials which don't meet the initial goals. In order to solve these problems different supportive technologies and guidance should be provided. This will facilitate the work of content developers and reduce time and effort invested into content creation.

The aim of this research project is to investigate how content developers wish to be supported in their work, if using of templates is a solution to the problems and how templates should be organized to meet the requirements of developers.

This leads to the following research question: *How can content developers be supported with templates during the development of learning objects in LCMSs* 

In order to find out problems, preferences and approaches of content developers a survey will be carried out among participants of the projects related to content development within the Digitale Universiteit. For the survey a questionnaire will be distributed among content developers. The results of this questionnaire will be analysed and based on the conclusion the templates will be build.

The outcomes of the project will be templates that can be used in LCMS learn eXact. These templates will facilitate the content development process and will help to develop a uniform style for learning materials.

The outcome product is intended for several groups of people related to content development such as: project managers, instructional designers, and super users. However the primary focus is on the instructional designer's goals to develop content, and therefore templates will also provide solutions for instructional design of courses.

The final stage of the project will contain an evaluation of template. The evaluation will be carried out by the staff of the faculty of Behavioral Science and Technology of the University of Twente (5 TAET instructors). The evaluation will be implemented in the form of two formative evaluations. The results of evaluation will demonstrate whether the use of developed template is effective and efficient and if there is need to continue development and application of such kind of templates.

# 1.2. Context of the Project

The research project is initiated and conducted within the Digitale Universiteit. The Digitale Universiteit is a consortium of ten universities in the Netherlands: Universiteit van Amsterdam, Universiteit Twente, Vrije Universiteit, Open Universiteit, Fontys Hogescholen, Hogeschool INHOLLAND, Hogeschool Rotterdam, Hogeschool van Amsterdam, Hogeschool van Utrecht, and Saxion Hogescholen. The DU focuses on the development and application of digital educational products and knowledge for higher education (Fisser & Geloven, 2003). Important issues for the DU are the changing demand for education, combining working and learning, permanent education, the role of e-learning and the need for cooperation. On average, the DU fosters 30 projects each year with an annual throughput of  $10 \text{ M} \in$ .

The field in which the DU operates is educational innovation, including current opportunities and problems in higher education where ICT can offer a solution. The consortium aims not only at developing services and products, but also at the mutual sharing of developed knowledge, particularly in the field of educational innovation with ICT: developing new didactic concepts, implementation strategies, change management, cost issues and technical choices, etc. This means that the DU is both a product community and a knowledge community.

The organizational structure of the DU is presented in Figure 1. The core activities are carried out by the staff of the DU, which consists of the director, programme managers and support staff. The director ensures the preparation, implementation and evaluation of the policy of the foundation office, is constituent of projects and is in charge of the daily control of the Bureau. The Council of Participants is composed of managers of the participating institutions and monitors the common interests and creates sufficiently administrative basis for the Digitale Universiteit. The Council is among others consulted concerning the multi-year business plan, the annual business plan and policy modifications. The Supervisory Board supervises the Council of Participants of the DU, determines the annual plan and approves the budget, annual account and the annual report. The Programme Board gives recommendation concerning the substantive choices for programmes and the priorities of projects of the DU in preparation for the decision-making of the Council of Participants and the Director. Next to these councils and boards there are contacts in each participating institution. They are the persons within the participating institutions for the Bureau and for the project leaders at the institutions. Furthermore an Educational Service Provider (ESP) has been founded in association with the Dutch SURF Foundation and the establishment of an Exploitation BV (LTD) is explored.



#### Figure 1. The organization of the Digitale Universiteit (Fisser & Geloven, 2003)

As can be seen in Figure 1 there are two major programs in which the projects are carried out, the development program and the virtual learning environment program.

#### The development program

Most of the projects are carried out within the development program, which consists of the following four program lines:

- Digital testing, assessments and digital portfolio
- Digital educational tools: tasks and resources
- Learning and coaching from a distance: dual, virtual and international
- Build up and disseminate expertise

The first three program lines of the development program are mainly aimed at developing content and tools that can be used in education. Examples of these are digital learning material for the Law faculties within the consortium, the development of a DU digital portfolio and a complete curriculum for teacher training that can be followed at a distance. The aim of the expertise program is building up and disseminating knowledge and expertise.

Next to these programs that are focused around the development of content, materials and tools there is a more technological program on virtual learning environments, with a focus on standardization and interoperability.

#### The program Virtual learning environment

In this program, activities are carried out to achieve optimal interoperability between the many different e-learning systems in the ten participating institutions. There are three levels of ambition:

- 1. exchangeability of digital content
- 2. the joint use of e-learning tooling
- 3. full educational interoperability.

The first one is relatively easy to achieve, mainly through the use of standards (like IMS QTI, LOM etc.), although most of the commonly used systems are not fully IMS compliant yet. Where possible and necessary, simple 'connectors' are realized in order to be able to carry digital content from one system to another.

The significant role plays the involvement of DU in the use of a Learning Content Management System (LCMS). After a fairly long selection process the DU is now working with learn eXact in about five projects. This process is monitored closely in order to get a clear perspective on the possibilities of an LCMS as such, and of learn eXact specifically.

The given research project is carried out within the scope of one of the projects conducted by the DU related to use of LCMS learn eXact. The purpose of this research project is to provide content developers of the DU with templates and instructions in order to support them in the process of content development.

The products developed as an outcome of the research project are intended mostly for content developers, however the research project itself follows the interests and meets the requirements of several target groups: instructional designers, subject matter experts, project managers, super users, instructors and students.

The main focus is on instructional designers who develop the content (didactics, structure and sequence of content, logical flow of topics and learning activities, etc.) They will make a decision which template is the most appropriate for the purpose of the concrete course and the way this template can be applied. Subject matter experts – people who are responsible for learning content itself (cognition, specifics, fullness, level of difficulty, etc.) Project managers administrate the process of learning content development. Super users are technical staff that creates the content designed by subject matter experts and instructional designers, by means of authoring tools. Instructors utilize the content in their teaching purposes. Students are final users of the learning content developed by other stakeholders.

In order to be effective the content should meet the requirements and preferences of students, reflect instructors' teaching styles and cover learning objectives therefore templates should provide creation of such kind of content which satisfies all stakeholders especially content developers and instructional designers of the DU.

# 1.3. Goals and objectives of the Project

One of the trends of DU's programs is content development. Several organizations are involved into the collaborative creation of learning materials using learn eXact. During the development of content the content developers faced a number of problems in working with this software such as: (1) content developers are not aware of all facilities and functionalities of the system therefore they don't use it in the full scale, (2) developed materials are quite poor because the content developers use simple tools and structures to form their courses, (3) although the learn eXact provide a few embedded templates, they don't cover all instructional needs and content developers' requirements, (4) content developers don't have enough support in the form of predefined models and built-in instruments for fast and easy creation of attractive and efficient courses.

The *goal* of the given research project is to support content developers with tools that facilitate the process of learning content development.

The main *objective* of this project is to design and develop different templates using the learn eXact software. These templates will enable content developers to create good looking, well structured, didactically correct and pedagogically effective courses. The primary focus of these templates will be on following the rules of instructional design in order to build qualitative content.

The idea of templates is that they are developed with respect to several characteristics that necessarily need to be considered while designing the course, such as the type of subject matter (what should be learned?), instructional method (how should it be learned?), target audience (who should be learned?), etc. Consequently a set of templates will cover different pedagogical approaches and all the effort of content developers will be invested only into choosing of appropriate template and filling it with relevant content. The benefit is that templates lighten the content development process and make uniform style for learning materials.

The templates provide an abstract structure for learning objects. Learning objects are pieces of learning material that can be reused and exchanged between courses. Templates present general models for learning objects' organization.

The process of template development follows similar steps as instructional design of content, particularly the Instructional system development model (ADDIE) which incorporates five phases: analysis, design, development, implementation and evaluation. Therefore the structure of this document has the flow of ADDIE model: analysis (Chapters 2), design (Chapter 3), development and implementation (Chapter 4), and evaluation (Chapter 5). Consequently there are four main tasks of the research project:

- 1. Research
- 2. Design of templates
- 3. Development and implementation of templates
- 4. Evaluation of templates

These tasks will be implemented in the following order which will be accordingly reflected in the document.

The research will be presented in the Chapter 2 that has the following structure. First, literature review will be carried out where multiple definitions related to the research problem will be specified, such as e-learning content, learning objects, technological standards, instructional design, templates, pedagogical approaches and technology support. Second, the inventory of pedagogical approaches and technologies used in the Digitale Universiteit will be described. This inventory will reflect needs and requirements of the DU's content developers in respect to pedagogical approaches and technologies that will be further considered in the design phase. Third, some technical and technological issues will be discussed, such as functionalities of LCMS in general and learn eXact in particular. Forth, the recommendations for the design of templates will be given which implies discussion about data, methods, models and interfaces for the design and development of templates.

The designing phase will be reflected in the Chapter 3. This chapter will specify framework for designing templates and describe design of particular template based on this framework. The design of template will be further implemented in the form of output product of the given research project which will be reflected in the Chapter 4.

The Chapter 4 will describe the processes of development and implementation of the templates designed in the Chapter 3 and resulting product itself. The goal of the development phase is to implement the prototype of templates in order to see how these templates support content developers and further evaluate their efficiency, and redesign and redevelop if needed. An example of the content developed by means of templates in the form of instructional course about using the developed template will be created as well. The goal of the development of this instructional course is to provide the final product with support in using it. The description of the template realisation will be accompanied by the screen dumps from the instructional course. Moreover this course will be used further during evaluation of template and content developed by means of this template which will be reflected in the Chapter 5.

The Chapter 5 will contain description of the evaluation process of the templates. Two types of formative evaluation will be discussed: a series of heuristic walkthroughs with a technical specialist, and usability testing with five instructors from the University of Twente. The framework for two formative evaluations will be described here, including goals of evaluation and methods and tools for data collection. The description of data collection process is followed by analysis of the results obtained during evaluation and discussion about these results along with proposing solution for further template improvement and re-design.

The Chapter 6 will conclude the thesis with short review of what was done within the scope of the research project, go back to the research questions from Chapter 1 and discuss them systematically. This chapter will contain discussion on what have been learned, what the limitations of the study were, how the research could be done differently and also how the study will be of value to in the future.

# 2. Conceptual Issues related to the Content Development

This chapter provides theoretical background for design and development of templates. The chapter presents definitions of basic terms related to the research problem, describes prerequisites for implementing design and development, and gives the explanation of specific and technical aspects of the research project. The conceptual issues related to instructional design and content development are considered here. The section 2.1 E-learning content: structure and characteristics discusses definition of e-learning content, modern trends, principles of its organization and structuring including definition of the term Reusable Learning Objects and their characteristics especially reusability characteristic, as well as international learning standards related to content organization, such as IMS and SCORM, and CISCO's definition of the Reusable Learning Object Strategy. This section is followed by the description how the structure of the e-learning content can be specified in the form of templates. The section 2.2 Templates for e-learning content explains role and purpose of templates, provides definitions of template in the literature, overview of existing projects related to template development, and justify the proposed model of template based on the pedagogical approaches for the future design and development. This requires overview of pedagogical approaches which are discussed in the section 2.3 Pedagogical approaches. This section explains the meaning of pedagogical approaches in the e-learning context and also provides an overview of the most significant pedagogies. The next section 2.4 Inventory of pedagogical approaches and technologies demonstrates which exactly pedagogical approaches and technologies are used in the Digital University in order to design templates that meet the requirement of the target group. The next section 2.5 LCMS: Methods, Tools, Technologies for Content Development explains technical aspects of the project, particularly methods, tools and technologies for content development, as well as specifics of LCMS learn Exact used as a tool by the Digital University and perspective of this system to the templates. The last section 2.6 Conclusion of literature findings and their implications to the template design outlines the main concepts discussed in this chapter and provides recommendation for the future design of templates.

# 2.1. E-learning content: structure and characteristics

This chapter considers issue of instructional content, particularly e-learning content, Reusable Learning Objects and their characteristics including reusability, as well as the problem of e-learning content organization, structuring and development. This chapter contains the following sections: 2.1.1 Definition of e-learning content and 2.1.2 Structure of e-learning content and its characteristics.

## 2.1.1. Definition of e-learning content

At all times the core of any learning process is the content and the way it is delivered to a learner. The better leaning content is build, structured and tailored to learner the more efficient learning process is. No matter what form of education is, the content plays a major role because the content is an item that student learn. However the delivery of the content depends a lot on the form of education in order to fit particular pedagogical approach, such as traditional learning with face-to-face class activities, distance or blended learning, with or without instructor's involvement, with or without ICT support, etc. The content should be necessary and sufficient to meet learner's requirements.

The term instructional content has wide meaning. In general it is a group of subjects consisting of educational material to be acquired in a learning process. This assumes anything that could be learned from abstract in the text-book to audio-record or laboratory experiment, etc. An e-learning restricts this definition to the electronic content which presents "information captured digitally and imparted to learners. Formats for e-learning content include text, audio, video, animation, simulation, and more" (Worldwide Training Glossary of Terms, 2002).

At earlier times Web based instruction presented "a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (Khan, 1997). In 90's the Web was mostly used for presenting information than designing instruction, and people were still experimenting with the Web. Since that time many researches has been conducted to identify factors influencing creation

of meaningful e-learning, including ones that provide the best and most open, flexible and distributed learning environments for diverse learners. (Collis & Moonen, 2001)

Nowadays we can state that such learning environments have various challenges: suitable services and content for the learners, broadband connectivity, user-friendliness and interoperability. Cardinalli (2005) from the Guinti Interactive Labs, emphasized the problem that "Publishing and Media Industry must improve the quality of the learning content and be able to adapt to new ways and formats for publishing and communication" but publishers are not ready yet.

Cardinalli stresses new tendency in development of e-learning content by arguing that 'the open model for content and ICTs is a real business alternative for the future'. Moreover, he pointed that "there is urgent need for qualitative leaps in eLearning infrastructures and technologies along with innovative pedagogical models in order to avoid empty learning platforms or the use of electronic content without relevant virtual learning environment."

Therefore the main focus of the given research project is on the development of a content fitting modern tendencies in Publishing industry and following innovative pedagogical approaches within relevant learning environments. Different aspects of e-learning content development are discussed further. In the following section various issues of characterizing and structuring of e-learning content are considered.

### 2.1.2. Structure of e-learning content and its characteristics

This section provides definitions of Learning Object, describes its main characteristics and focus on the reusability property of the Learning Object. Besides it explains how e-learning content is organized and structured including standardization issues. This contains the following subsections: 2.1.2.1 Definition of Learning Object and its characteristics, 2.1.2.2 Reusability of Learning Objects, 2.1.2.3 Granularity of Learning Objects and 2.1.2.4 E-learning content organization.

#### 2.1.2.1 Definition of Learning Object and its characteristics

Before the web-based content presented HTML documents which had solid and inflexible structures of big and monolithic blocks of information (Moral & Cernea, 2005). However along with technology improvement a new approach to the learning content building has appeared. The concept of building content from Learning Objects almost completely replaced the old model of learning content. The use of semantic technologies in formation of personalized sequences of learning objects allows obtain a considerable increase of the working efficiency for both students and teachers in comparison with inflexible structures of the traditional network courses.

There have been many attempts to define a term Learning Object (LO). One of the most overall reviews of existing references to learning object is provided by Sosteric and Hesemeier (2002). They defined the term Learning Object by (a) rejecting useless theoretical links invoked to theorize learning objects, and (b) reducing the definition of learning objects to the bare essentials.

In the conclusion of their review Sosteric and Hesemeier (2002) proposed the following definition: "A learning object is a digital file (image, movie, etc.) intended to be used for pedagogical purposes, which includes, either internally or via association, suggestions on the appropriate context within which to utilize the object." Finally the most significant and cited definitions were extracted, including the following ones.

The Learning Technology Standards Committee (IEEE LTSC, 2002) defines an object as "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning."

The LTSC provides examples of these objects, including "multimedia content, instructional content, learning objectives, instructional software and software tools, and persons, organizations, or events referenced during technology supported learning." However this is too general definition which embraces all digital and non-digital entities into the learning object category. Therefore many authors made restriction to only digital entities.

Most authors such as Hodgins (2000); Urdan & Weggen (2000); Gibbons, Nelson & Richards (2000) argued that objects are more than mere digital files, they like to attribute several special features to learning objects such as reusability, adaptability, scalability, searchability, etc.

Another important issue is that learning objects have to be linked to the context of use in learning environments. Therefore it is necessary to provide additional information to learning object that allows an instructor or instructional designer to know how to use the object in an educational setting. The IMS (2002) and the IEEE LTSC (2002) have contributed to the specification of necessary infrastructure for contextualized learning objects by developing Learning Object Metadata standards that provide the necessary context for the educational resource.

One of the most counterproductive approaches has been for theorists to draw on the discipline of computing science and, in particular, object-oriented programming, what follows from the definition by Quinn (2000):

"The learning object model is characterized by the belief that we can create independent chunks of educational content that provide an educational experience for some pedagogical purpose. Drawing on the object-oriented programming model, this approach asserts that these chunks are self contained, though they may contain references to other objects; and they may be combined or sequenced to form longer educational interactions. These chunks of educational content may be of any type - interactive, passive - and they may be of any format or media type. A learning object is not necessarily a digital object..."

The issue of modularity was considered by Longmire (2000) who stressed that learning objects must be modular, "free standing, non-sequential, coherent and unitary." Others describe the same idea using slightly different terms. Roschelle, et. al. (1998) state that the object must be adaptable "without the help of the original developers to meet unforeseen needs." According to Ip and Mornson (2001), the object must be constructed in such a way that its users "need not worry about the component's inner complexity." In other words, the learning object should be a "black box" in the sense described in the theory of object-oriented design.

Barron (2000), cites a project sponsored by Cisco Systems (Barritt, 2001) in which the concept of educational or "reusable information" objects is derived from the learning object thinking of Merrill (1983) and Clark (1989). Accordingly, each object is defined in informational terms "as a concept, fact, process, principle or procedure". Writing elsewhere, Clark provides examples of such information objects: "text, audio and animation, learning objectives, practice exercises and feedback".

Later in 2002-2003 the National Learning Infrastructure Initiative (NLII - an EDUCAUSE initiative) formed a Learning Objects Working Group. This group has created an Ontology of Learning Objects which seeks to identify the issues surrounding the creation and use of LOs (Metros, et. al., 2002-03).

Many other initiatives have been created since that time working on the problem of Learning Objects, for example NMC Learning Object Initiative, DLNET, etc. And many definitions and views on LO have been produced. However the only one remains the standard definition provided by LTSC (2002).

The given research project is carried out with the involvement of Guinti's software application learn eXact. Thus it is very important to understand Guinti's perspective on LOs. They provided 2 definitions of Learning Object (1) a self-standing learning resource or resource group, which can be used or re-used in learning contexts with an educational purpose, possibly including pre-assessment and assessment activities (Guinti, 2004a); (2) the basic (simple or complex) unit of a learning experience and as a small, atomic, self-contained chunk of learning that can be reused in different contexts (Guinti, 2004b).

Both definitions conclude that content is structured in an aggregation of "atoms" (LOs), which grant a customizable and flexible reuse, where each atom has its own didactic value and owns the properties of "reusability", "adaptivity" and "scalability". For bigger aggregation Guinti is using a term Course. Consequently the following characteristics of LO can be specified (Guinti, 2004a):

- Easily *Reusable* in other Courses
- Interoperable, i.e. immediately manageable in a range of Learning Management Systems

- Self explanatory, and thus Independent from other LO
- Accessible to different categories of users with different needs and access constrains
- *Durable* in order to enable high Return on Investments in its possible commercial positioning and/or its usage

This concept provides basis for templates by defining LO model in learn eXact software application. Therefore in this research project we will follow the Guinti's definition with the special focus on reusability characteristic which is discussed in the section 2.1.2.2 Reusability of Learning Objects.

#### 2.1.2.2 Reusability of Learning Objects

Many authors argued that the most important property of LOs is reuse in different learning contexts (Wiley, 2000b; Polsani, 2003). In this respect Strijker (2004) provided the following definition of LOs as "digital entities, available for use or reuse in different learning settings".

The main accent of Strijker's definition is on the reusability of Learning Objects. The works of Collis & Strijker (2003) and Strijker (2004) consider the issues related to the reuse of learning objects and the implementation of learning technology standards for reuse of these learning objects in different contexts (university, commercial, and military) and the human and technical aspects involved.

The idea of reusability is very critical for the Digital University. As was mentioned in the section 1.2 Context of the Project, several projects of the DU were initiated involved into collaborative development and sharing of learning materials. Participants of the projects strive to create Learning Objects reusable by all participants of the DU. Therefore reusability property of LOs is the most important characteristic of the content developed within the scope of the DU.

The given research project is conducted under the DU. Thus the focus should be on the assumption that Learning Objects created by means of the templates are reusable in many contexts. This is one of the most important characteristics that form templates discussed in the section 2.2 Templates for elearning content and design of templates described in the chapter 3 Design of templates.

Although the undoubted role of reusability there are some problems related to the LO reusing. Boot & Merrienboer (2005) stressed five problems related to the reuse of Learning Objects: (1) the metadata specification – "it is difficult and extremely labor-intensive to specify metadata for large sets of LOs"; (2) the arrangement – "combining and sequencing LOs into larger arrangements is not always easy and self-evident"; (3) the exchange – "it may be difficult to exchange LOs between developers and e-learning systems"; (4) the context – "effective LOs cannot be created in isolation without an implicit or explicit instructional setting, target group and other contextual descriptions", and (5) the pedagogical function – "it is difficult to express the pedagogical intensions for a LO by means of technical properties such as metadata, leading to sub-optimal reuse".

In their work Boot & Merrienboer (2005) considered three solutions that overcome these problems: (1) templates instead of instantiations; (2) technically automating what can be automated; and (3) using intermediate instead of final product. Later in the section 2.2 Templates for e-learning content we will consider how these problems can be solved by means of templates.

Besides mentioned above problems there is another critical problem that content developers face while creating LOs – how big an LO should be in order to be reusable in many contexts. As the Reusable Learning Project (2005) states "Granularity, or aggregation level, is important in defining and determining reusability".

Willey (2000a) argued that "from an efficiency point of view, the decision regarding learning object granularity can be viewed as a trade-off between the possible benefits of reuse and the expense of cataloging. From an instructional point of view, alternatively, the decision between how much or how little to include in a learning object can be viewed as a problem of "scope."

The discussion about relationships between instructional sense and effectiveness, reusability, context and granularity is presented in the section 2.1.2.3 Granularity of Learning Objects.

#### 2.1.2.3 Granularity of Learning Objects

In a general sense granularity of e-learning content reflects size, decomposability and the extent to which the content is intended to be used as part of a larger content. In order to describe the functional granularity of an LO the IEEE Learning Object Metadata (IEEE LTSC, 2002) used a term 'aggregation level'. According to the scale of IEEE LOM there are four aggregation levels:

- Level 1. The smallest level of aggregation, e.g. raw media data or fragments.
- Level 2. A collection of level 1 learning objects, e.g. a lesson.
- Level 3. A collection of level 2 learning objects, e.g. a course.
- Level 4. The largest level of granularity, e.g. a set of courses that lead to a certificate.

The Learnativity Foundation has developed an Aggregation Model (Wagner, 2002) describing granularity, which can be mapped onto the IEEE LOM aggregation level scale, the following way:

- 1. Content Asset raw media: images, text snippets, audio clips, etc. (Level 1 of IEEE LOM)
- 2. Information Object a text passage, Web page(s), applet, etc. that focuses on a single piece of information. It might explain a concept, illustrate a principle, or describe a process. [Single] exercises are often considered to be information objects. (Level 1 of IEEE LOM)
- 3. Learning Object a collection of Information Objects that are assembled to teach a single learning objective. (Level 2 of IEEE LOM)
- 4. Learning Component a learning component is a generic term for things like lessons and courses that typically have multiple learning objectives and are composed of multiple learning objects. (Level 3 of IEEE LOM)
- 5. Learning Environment a catch-all phase for the combination of content and technology with which a learner interacts. Thus a course written in a course management system is a learning component, but a deployment of the course in a live Course Management System at a particular institution (with a particular enrollment policy, help center, library reserve system, etc.) is a learning environment. (Level 3 or 4 of IEEE LOM)

Graphically Learnativity Content Model is presented in the Figure 2.



A Content Model for Designing Learning Objects

Figure 2. Learnativity Aggregation Model (Wagner, 2002)

Another Aggregation Model is specified by Sharable Content Object Reference Model (SCORM), which includes three levels:

1. Assets - equal to content assets and information objects in the Learnativity Aggregation Model

- 2. Sharable content objects (SCOs) self-contained learning objects or learning components that meet additional technical requirements needed for interoperability with learning delivery platforms
- 3. Content aggregations contain assets, SCOs, information on the order in which these should be delivered and metadata about entire aggregation and its individual components. They are equal to learning objects or learning components in the Learnativity Aggregation Model.

As we see from the Learnativity Aggregation Model (Figure 2) the bigger level of granularity, the less reusability, and vice versa. Therefore it is necessary to find a balance between reusability and granularity of the content depending on the purpose and requirement to the developing content.

Guinti provides the following concept of aggregation levels used in their software applications. They consider Course as a bigger aggregation which is defined as "an organized sequence of learning materials and learning activities (reading, writing and practical work) packaged in a standard, interoperable format such as Content Packaging" (Guinti, 2004a).

Such Courses may be aggregated into Classes, i.e. Courses of a similar or same context, which can be accessed by a number of users. The Courses can be decomposed into its instructional units (LOs). As far as there is still no formal definition of LO they left some degree of flexibility to the person designing or managing courses in specification the level of granularity of LO. Therefore their product eXact Packager allows maximum flexibility in defining the type of content and allows content developers to decide what a LO should be.

This principle is adopted in the given research project. The content developer decides functional granularity of LO developed by means of template. However template has restrictions to Information Object, Learning Object and Learning Component in Learnativity Aggregation Model. The discussion about template structure is presented in section 2.2 Templates for e-learning content. More detailed description of the granularity and structure of e-learning content, as well as recommendations for content design and development are presented in the section 2.1.2.4 E-learning content organization.

#### 2.1.2.4 E-learning content organization

While describing a Content Model based on LOs it is important to consider two critical issues (Moral & Cernea, 2005):

- 1. the technical characteristics which enable content's accessibility, interoperability between various LMSs and reusability in different learning contexts
- 2. the content structure required to increase content's effectiveness

The first issue concerns a common model that could assure the quality of e-Learning contents. In order to standardize a Content Model various initiatives like AICC, IEEE, IMS, Dublin Core and ADL contributed into elaboration of e-Learning standard. As a result Sharable Content Object Reference Model (SCORM) was developed. This is a specification for the development, packaging and delivery of learning material in order to attain the reusability, accessibility through a set of Metadata, interoperability and durability, facing all the technological changes.

The actual standard of the metadata specified by SCORM is the one proposed by IEEE in IEEE LOM which groups specifications from Dublin Core and IMS. The metadata standard body is divided into nine categories based on definitions from the LOM Information Model: General, Lifecycle, Meta-metadata, Technical, Educational, Rights, Relation, Annotation and Classification.

Therefore in the Content Model the LO is organized in a way that regarding the type of learning resources (i.e. narrative texts, tasks, simulations, quiz, graphics, experiments, problems, etc.) all of them are accompanied by the metadata.

According to IMS specification the content is formed in a standard package (Figure 3) which can be transferred between different systems. The IMS Content Packaging Information Model describes data structures that are used to provide interoperability of Internet based content with content creation tools, learning management systems (LMS), and run time environments.



Figure 3. IMS Content Packaging scope (IMS, 2002)

The second issue considers structure of content (or LO model) from the didactical point of view. This LO model is derived from exhaustive studies about the learning/teaching processes and the human perception of information, its maintenance in memory and codification.

CISCO (Barrit, 2001) significantly contributed into the LO model evolution by designing Reusable Learning Object Strategy. Cisco Internet Learning Solutions Group (ILSG) proposed modular reusable objects, easy to locate and modify independently on the format, dividing and subdividing the information until the concept level.

According to ILSG's definition individual Reusable Information Objects (RIOs) form a larger structure called a Reusable Learning Object (RLO). RLO can be any entity of instruction that contains all the essential parts to enhance learning. RLO is a collection of seven, plus or minus two, RIOs that are grouped together to teach a common theme based on a single learning objective. In order to make the collection of RIOs into a complete learning experience, or lesson, an Overview, Summary, and Assessment are added to the package (Figure 4). Consequently an RLO can perform a whole course, a chapter, or a lesson in its minimal expression.



Figure 4. CISCO's Reusable Learning Object Structure (Barrit, 2001)

Therefore according to the Learnativity Aggregation Model the level of granularity of RLO presents Learning Environment or Learning Component, and RIO – Learning Object.

In the given research project the RLO-RIO structure of content organization will be adopted as a core for LO Model of templates. The design of the templates based on the CISCO's Reusable Learning Object Strategy will be discussed in the Chapter 3 Design of templates. There will be considered principles of specifying elements of template according to RLO-RIO hierarchy where basic elements reflect RLO components.

Principles of Template's organization in general as CISCO's RLO, and RIOs in particular are discussed in the next chapter 2.2 Templates for e-learning content.

# 2.2. Templates for e-learning content

This chapter defines the term 'Template'. It explains the role and purposes of templates, as well as necessity of their use. This chapter discusses different approaches to templates, justifies the principles considered in this research as basis for template design, and promotes a model of template based on pedagogical approaches. This chapter contains the following sections: 2.2.1 Role and purpose of templates, 2.2.2 Meaning of template in literature and in the given research project and 2.2.3 Structure of the template.

## 2.2.1. Role and purpose of templates

Nowadays e-learning is wide used in educational purposes both in university and corporate sector. However it is still innovative and rapid-developing domain and many instructors feel difficulties with transferring their courses from traditional form of education into computer-based. The reason is that instructors often are not aware of electronic learning environments and facilities they provide. This leads to lack of motivation or even resistance of instructors in using e-learning technologies.

The goal of this research project is to support instructors and content developers with templates which present ready-made models of electronic courses. Instructors do not need to know all details of complex instructional design process for e-learning content. The only thing required is that they need to choose appropriate template and fill it with appropriate content. Content developers gain from using templates the following:

- Templates make process of content development simpler and faster
- Templates provide structure and guidance during development
- Templates enable to focus on pedagogical issues, and not on technical ones

## 2.2.2. Meaning of template in literature and in the given research project

This section specifies what definitions of template can be met in the literature and what main features characterize templates.

In the literature we can find various definitions of the term 'Template'. Different authors consider it from different perspectives. For example Microsoft (2001) gives the following definition of template as "a file or files that contain the structure and tools for shaping such elements as the style and page layout of finished files". Here the focus is on a structure of elements and a tool responsible for shaping layout for elements in the given structure. Microsoft provides the following examples of templates: Microsoft Word templates can shape a single document, Microsoft PowerPoint templates can shape a presentation and Microsoft FrontPage templates can shape an entire Web site.

Wiki (2005) sees template as "some form of device to provide a separation of form or structure from content". This definition stresses that the main function of template is to provide framework describing the content but not containing the content itself. Wiki gives an example from publishing where "a template may be a predefined layout to give an idea what to write where with boxes and lines; for instance a single-page newsletter template might have a few columns, space for a picture and gaps for the headline and name of the newsletter".

As following from the Free dictionary's definition of template "a document or file having a preset format, used as a starting point for a particular application so that the format does not have to be recreated each time it is used" the main goal of template is to provide particular format that can be multiple reused in different contexts.

So from the definitions above we can conclude that the goal of template is to provide reusing of specified format. The main three components of the format can be emphasized:

1. Structure – abstract structure of elements that is used to form actual structure of elements in the output file (for example, in MS PowerPoint a template contains set of template pages (pages with text, pages with content, combined pages) each of them has accordingly different variants of pages)

- 2. Content data model that specifies which content should be presented in each element of the structure (for example, in MS PowerPoint a template for text page contains title and text area)
- 3. Layout layout, style and form of presentation of actual content on the screen (for example, 'Clouds' template in MS PowerPoint assigns background and heading/text/list style, etc.)

In the given research project the Template is considered as a framework for building Learning Objects. In order to specify characteristics of Template it is required to understand Guinti's view on LOs. According to Guinti (2004b), LO is made out of four components:

- 1. The *resources* used inside the LO, i.e. texts, images, animations and any kind of media used to convey the information to be learned (the raw assets, completely context-dependent)
- 2. The *abstraction of the didactic structure* of the LO, i.e. the way raw assets can be organized and managed inside the LO (the *LO model* that, to a certain extent, can be considered context-independent)
- 3. The *actual didactic structure* of the LO, i.e. the way raw assets are organized and managed inside the LO
- 4. The *rendering* of the LO, i.e. the way the resources and the didactic structure are rendered on a PC or on any other device

The goal of template is to optimize production of LOs that have the same didactic structure but differ in raw assets, as well as production of LOs that have the same raw assets but differ in the didactic structure. In this case template maintains the same abstraction and separates content from actual structure. Therefore the Template (or LO model) can be defined as being made of an abstraction of didactic structure (2) and its rendering (4).

The main purpose of templates is to increase the effectiveness of reuse. In the chapter 2.1.2.2 Reusability of Learning Objects the five problems of reusability were specified. According to Boot & Merrienboer (2005) "templates may help to solve the arrangement, exchange and context problem". They considered different types of templates, such as for organizing lessons, reaching particular types of instructional objectives or for designing computer screens of the lessons. However for all of them from reusability point of view, "an important implication is that templates should contain as little contextual information as possible so that the developer can precisely specify this context-specific information."

Boot & Merrienboer (2005) conducted the research about creating and reusing Learning Objects where they explored creating and reusing of didactically meaningful and multimedia learning objects by means of templates. During the research they rated working with didactical meaningful objects higher than with multimedia objects. Thus in the given research project the templates will be based on meaningful didactical structure. The multimedia-based template (DU pageSet template) is considered and criticized in the section 5.2.1. For the purpose of the given research didactical meaningful structure will be built for the templates.

The principles of didactic structure organization provide basis for template design described in the chapter 3 Design of templates. These principles are exhaustively discussed in the next section 2.2.3 Structure of the template.

#### 2.2.3. Structure of the template

The principles of e-learning content organization were discussed in the section 2.1.2.4 E-learning content organization. The given section explains how those principles are mapped to the template structure. Consequently this section refers to CISCO Reusable Learning Object Strategy and explains the connection between two-level RLO-RIO hierarchy of LO model and didactical abstraction of template. These issues are described in the section 2.2.3.1 CISCO Reusable Learning Object Strategy.

#### 2.2.3.1 CISCO Reusable Learning Object Strategy

In the CISCO's definition of LO model RLO is comprised from small RIOs. Moreover each RLO and RIOs have their own internal structures. This concept can be adopted to combine template didactical structure. More detailed CISCO Reusable Learning Object Strategy is discussed below.

Each RLO contains the following elements: Overview, 5-9 RIOs, Summary and Assessment.

The *Overview* is used to introduce the RLO and act as an advanced organizer for the learner by providing the objective, outline, and scenario for the module. The RLO Overview has six content items:

- 1. Introduction (required) one or two paragraphs that explain the purpose of the RLO
- 2. Importance (required) one or two paragraphs that create interest in the RLO for the learner
- 3. Objectives (required) can be an "informal" objective but must be based on the same objective as the "formal" objective found in the metadata for the RIO
- 4. Prerequisites (required) list the knowledge and skills, or other RIOs needed to complete the RLO.
- 5. Scenario (optional) relates to a job function. Individual RIOs may use this scenario when listing examples, or explaining processes or procedures.
- 6. Outline (required) list the title of each RIO contained in the RLO, as well as the Summary and case study.

The *RIOs* are self-contained chunks of information built around a single learning objective. Groups of RIOs are combined to form a lesson (RLO). Each RIO is built out of three components (Figure 4): Content items, Practice items and Assessment items.

- 1. Content items content related to particular cognitive level.
- 2. Practice items any reinforcement activities that give the learner the opportunity to apply skills and knowledge.
- 3. Assessment items questions or measurable activities used to determine if the learner has mastered the learning objective for a given RIO.

The *Summary* is used to conclude the RLO and tie the scenario and objectives covered in each RIO together. It also offers a suggested course of action for learners to broaden their knowledge and skills in this area. Finally, the Summary is a transition between the RIOs and the final Assessment. The RLO Summary has three content items:

- 1. Review (required) One or two paragraphs that recap what the learner has just learned in the RLO (touch on all the RIOs in this RLO). It restates objectives and importance of this RLO and concludes the scenario established in the Overview.
- 2. Next Steps (optional) suggest other RLOs that are related to this RLO and recommend other areas of study.
- 3. Additional Resources (optional) list URLs, PDFs, documents, and other resources that will help the learner learn more about the knowledge and skills covered in this RLO. Resources are accompanied by one sentence describing each resource.

The *Assessment* is simply a collection of the assessment items that are written to match the objective of each RIO found in this RLO. For each RIO, there are at least two assessment items to form a pool of items. From the point of view of the learner, assessment items appear as a pre- or post-Assessment for the entire RLO. The Assessment serves two functions:

- 1. Prescribes RIOs that the learner needs to take. Determines gaps in knowledge and skills before the lesson and indicates which RIOs fill those gaps.
- 2. Ensures that the learner has achieved mastery of all objectives for a given lesson. Determines gaps in knowledge and skills after the lesson and indicates which RIOs that learners should review.

From the point of view of the author, assessment items are created for each RIO. This consistency is important because if the RIO is reused by another RLO, then its assessment item must be available to the new RLO.

According to this concept RLO presents complex structure which reflect lesson in its minimal expression. CICSO refers RLO as Course or Lesson therefore the template for Course or big piece of learning content can be based on the proposed model of RLO. The way how this is realized in the concrete template is described in the chapter 4 Development and implementation of templates.

The design of templates reflecting smaller Informational Objects (RIOs) can be based on several principles which are described in the next section.

## 2.2.3.2 Templates for Information Objects

According to CISCO's definition RIOs are classified into five types based on modified information mapping (Performance Matrix as defined by Clark (1989)) originated from Merrill's component display theory (Merril (1983)) and Bloom's Taxonomy of Educational Objectives (Bloom & Krathwohl (1994)): concept, fact, procedure, process, and principle. This classification scheme makes RIOs more reusable.

Besides this classification of RIOs, CISCO also provided templates and guidelines for each type of RIO. Depending on type of RIO, it has different set of components of content, and different type of practice as well. Schematically these five templates are presented in the Figure 5.



Figure 5. CISCO's templates for types of RIOs

These templates provide didactical structures for the content. And these models work well if it is needed to create and later deliver learning materials intended for reading. However in many cases for educational purposes it is necessary to carry out task or participate in project. The promoted by CISCO model of RLOs is not applicable in pedagogical approaches other than lecturing-based presentation of learning material, such as task-based learning, project-based learning, problem-based learning, etc. where the core of the content is not learning material but real problem or task which need to be solved.

The proposed in this research project model of template organization is based on pedagogical approaches. The LO model will present didactical structure reflecting learning scenario of particular pedagogical approach. The design of such template organization is described in the chapter 3 and particular realization and further evaluation of the real product are presented in the chapters 4 and 5 accordingly. The overview of pedagogical approaches which are the core for the templates is presented in the section 2.3 Pedagogical approaches.

# 2.3. Pedagogical approaches

This chapter describes possible learning scenarios and pedagogical approaches performed in the elearning content that can be supported by computer technologies. It defines the most valuable approaches and explains the way they are supported by technologies. The chapter discusses the instructional design with respect to pedagogies. The chapter includes the following sections: 2.3.1 Pedagogies in the e-learning context and 2.3.2 Overview of pedagogical approaches.

### 2.3.1. Pedagogies in the e-learning context

There are many pedagogical approaches used in conventional educational practice. According to definition of Center for Research on Education, Diversity & Excellence (CREDE, 2002) "pedagogy means teaching and assisting students through interaction and activity in the ongoing academic and social events of the classroom". In the traditional classroom there are many ways to teach students. One of the explorations in learning and instruction is the Theory Into Practice Database that contains brief summaries of 50 major theories of learning and instruction (Kearsley, 1994-2004).

The increasing use of technology in education has led to a rethinking of current pedagogical approaches. There have been many models and dimensions identified that deal with the use of technology. One of the research programme e-Learning: Research and Resources (2003) aims to explore the future of ICTs and education in relation to pedagogy, policy and teaching and learning practice for post 16 education and training. This research program has specified the list of pedagogies. This list is not exhaustive, but provides an overview of basic learning models.

More comprehensive reports considered learning theories, ICT supporting pedagogical approaches and learning in practice are: CIPD report How do People Learn? (Reynolds, et. al., 2002) and Review of Current Pedagogic Research and Practice in the Fields of Post-Compulsory Education and Lifelong Learning (Cullen, et. al., 2002).

In their research, Cullen, et. al., (2002) developed mapping framework which represents what might be termed the 'distal-proximal interactions' affecting learning outcomes. They provided figure (Figure 6) that shows, the dialectic between 'discourses' and 'practices' is mediated, on the one hand, in the interplay between 'meta-level' theories and concepts about the nature of human and social development (behaviourism; cognitive social learning; psychodynamic theory and so on); 'grand' learning theories (behaviourism; cognitivism and so on), and, in turn, what might be described as 'middle level' learning theories (action learning; conscientisation; communities of practice etc.).

The authors argued that this interplay shapes, and is in turn shaped by, the world of 'practices' that determines the ways in which teaching and learning are conducted in learning settings and scenarios across the different sectors. Broadly speaking, the 'design' of practices can be categorised into three basic categories: transmissive (i.e. essentially replicating traditional teacher-student relationships); situational (i.e. embedded in social relations) or constructivist (i.e. in which the learner is an active collaborator in the learning process and in the production of knowledge). These three categories decompose into multiple constituent elements, including instructional design practices; pedagogic audits; scaffolding techniques; problem-based learning techniques, and so on).



Figure 6. Pedagogical framework (Cullen, et. al., (2002)

The aim of current research project is to specify models reflecting these practices which can be used by instructors to meet their learning settings and pedagogical approaches. Therefore a number of the most valuable and actual pedagogical approaches are described below including the way they can be supported by electronic learning environments.

There is a vast range of learning technologies available for course delivery and support of different pedagogies. The most common electronic learning environments for course delivery are Learning Management Systems (LMS) and Learning Content Management Systems (LCMS) used in the elearning, as well as Course Management Systems (CMS) used mostly for blended learning.

LMSs are defined as systems "to manage learners, keeping track of their progress and performance across all types of learning activities" while LCMSs manage content or learning objects to "serve up to the right learner at the right time" (Chapman & Hall, 2001)

Course-management systems "integrate content delivery, communication, learner activities, collaborative work support, feedback, testing, portfolio development, groupware tools, and administrative tools for the instructor. Selection and management of content objects is only part of the use of an online educational delivery system, and in some cases a minor or non-existent part" (Strijker, 2004).

The level of complexity and advance of a course depends on how far the functionality of electronic learning environment can support learning process and pedagogies. In the current research it is assumed that LMS or CMS has similar functionality to the following systems: Blackboard, TeleTOP, Lotus Learning Space and WebCT.

These systems and other learning technologies can be applied in learning process in different ways: partly in the form of supportive tool for face-to-face learning, half scale in the form of blended-learning solutions or full scale in the form of distance learning. In the given research only blended and distant forms of education are considered.

The following overview of pedagogical approaches demonstrates a core concept of each approach as well as the way how they can be supported by e-learning technologies. The following approaches are discussed in the next section:

- 1. Problem-based learning
- 2. Project-based learning
- 3. Task-oriented learning
- 4. Experiential learning
- 5. Collaborative learning
- 6. Skills-based learning

### 2.3.2. Overview of pedagogical approaches

This section presents a short description of each of the listed above pedagogical approach and the way they are implemented within the scope of e-learning.

#### 2.3.2.1 Problem-based learning

The problem-based principles of teaching has been used for centuries however the modern formulation of this approach originates from the medical education of 1980's at universities such as Cape Western Reserve (USA), McMaster (Canada), Maastricht (the Netherlands) and Newcastle (Australia).

The reason of wide distribution of this approach in medical area is that medical schools are typically well-resourced, recruit high achieving and highly motivated students, and have a clear professional context in which to develop the curriculum. The 'pure' medical school model, which has been widely adopted in other contexts, has been based on intensive small group learning in a highly integrated curriculum (Macdonald, 2005).

During the last twenty years problem-based learning (PBL) approach has been adopted in professional and higher education in Australia, Europe, Canada and the United States of America (Boud, 1985; Kaufman, 1985; Albanese & Mitchell, 1993; Berkson, 1993; Woods, 1994) and Asian/Pacific nations as well. Following the pioneering works in medicine the PBL has been adopted in the fields of Nursing, Social Work, Engineering and Architecture (Boud 1985), as well as Law, Teaching, Optometry and Management (Boud & Feletti, 1991).

Savin-Baden (2000) stressed the focus of PBL on problem case rather than subject area and therefore argued that PBL approach can be successfully applied in all areas: "Problem-based learning is thus an approach to learning that is characterised by flexibility and diversity in the sense that it can be implemented in a variety of ways in and across different subjects and disciplines in diverse contexts. As such it can therefore look very different to different people at different times depending on the staff and students involved in the programmes utilising it. However, what will be similar will be the locus of learning around problem scenarios rather than discrete subjects."

The core of PBL is the problem itself. "The principal idea behind PBL is that the starting point for learning should be a problem, a query, or a puzzle that the learner wishes to solve" (Boud, 1985).

The common definition of the term Problem-based learning is provided by Mayo, et. al. (1993) as: "a pedagogical strategy for posing significant, contextualized, real world situations, and providing resources, guidance, and instruction to learners as they develop content knowledge and problem-solving skills".

Many researchers see PBL as a curriculum development and instructional system that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills. For example, Barrows & Kelson, 1993) defined PBL as "both a curriculum and a process. The curriculum consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies, and team participation skills. The process replicates the commonly used systemic approach to resolving problems or meeting challenges that are encountered in life and career".

Torp (1997) specifies PBL as a curriculum approach as well. According to her PBL allows creating a learning environment in which teachers coach student thinking and guide student inquiry into the depths of real-life situations, facilitating learning toward deeper levels of understanding. In Torp's definition of problems they are ill-structured, in that they often change with the addition of new information, are not solved easily, and do not always result in a right answer.

From given definitions we can conclude that main characteristics of learning process in PBL pedagogical approach are:

- 1. Reliance on problems to drive the curriculum the problems do not test skills; they assist in development of the skills themselves
- 2. The problems are truly ill-structured there is not meant to be one solution, and as new information is gathered in a reiterative process, perception of the problem, and thus the solution, changes
- 3. Students solve the problems teachers are coaches and facilitators
- 4. Students are only given guidelines for how to approach problems there is no one formula for student approaches to the problem
- 5. Authentic, performance based assessment is a seamless part and end of the instruction.

There are two commonly cited descriptions of learning scenario used in the PBL provided by Boud (1985) and Bridges (1992). According to Boud an instructional sequence begins with presentation of a problem. Students then work in small groups to analyze the problem and determine what information might be required for a solution. Once the necessary areas of learning are identified students undertake individual study and research before returning to the group to share their findings and apply them to developing a solution to the problem. The final phase involves reflective activity in which what has been learned is summarized and integrated with students' prior knowledge. According to Bridges (1992) whatever the nature of the problems or the sequence of learning activities are, PBL implementations appear to share some common characteristics:

- 1. The starting point for learning is a problem (that is, a stimulus for which an individual lacks a ready response).
- 2. The problem is one which students are apt to face as future professionals.
- 3. The knowledge that students are expected to acquire during their professional training is organised around problems rather than the disciplines.
- 4. Students, individually and collectively, assume a major responsibility for their own instruction and learning.
- 5. Most of the learning occurs within the context of small groups rather than lectures.

Boud and Bridges agreed that the focus in a PBL process is on an authentic problem in a group setting where learning stems from collaborative analysis of the problem and is largely learner-directed. However there is an alternative approach described by Gibson & Gibson (1995) in which teacher education students engaged with a problem individually and prepared a written analysis of the problem in preparation for group interaction.

At the present day a PBL approach can be efficiently supported by computer technologies. A variety of examples of computer use in PBL programs can be found in the literature. For instance, Albion & Gibson (1998) provided reference to the previous researches and projects related to the use of computer technologies. In their work the authors described a preliminary instructional design model for Interactive multimedia using PBL principles.

#### 2.3.2.2 Project-based learning

The project-based learning approach springs from early 1900s. Educators such as Dewey have reported on the benefits of experiential, hands-on, student-directed learning, i.e. "learning by doing" which was reflected in constructivism and constructionism. In constructivism (Perkins, 1991; Piaget, 1969; Vygotsky, 1978) through conducting investigations, conversations or activities, an individual is learning by constructing new knowledge from current knowledge.

Constructionism (Harel & Papert, 1991; Kafai & Resnick, 1996) states that individuals learn best when they are constructing an artifact that can be shared with others and reflected upon. Moreover the artifacts must be personally meaningful, where individuals are most likely to become engaged in learning. Project-based learning is based on principles of constructionism. In project-based learning the focus is on the individual learner that, according to Moursund (1998), leads to student-centered approach which strives for "considerable individualization of curriculum, instruction and assessment".

The theoretical constructivism and constructionism foundations of project-based learning are examined by Grant (2002), as well as the similarities and differences among implementations, including project-based science (Blulmenfeld et al., 1991), disciplined inquiry (Levstik & Barton, 2001) and WebQuests (Dodge, 1995).

Many researches and projects are initiated to explore the project-based learning approach. In many cases these researches concerning application of the approach in children education. A number of the most cited and valuable Web resources comprise The PBL Web Ring. It is a small, carefully selected collection of web sites that focus on aspects of project-based learning which includes:

- 'Project Approach in early childhood & elementary education' provides professional development, self-study courses, and resources for learning about project based instruction in elementary classrooms.
- 'The WEB Project' is devoted to innovative, project-based learning in the arts, humanities, and social sciences by people of all ages.
- 'BIE' (Buck Institute for Education) Project Based Learning presents a specific projectbased learning model where attention is given to developing an engaging, student-focused culture on the classroom.
- 'The Virtual Schoolhouse' is an overview of project-based learning practices from across the US which explains both the principles behind project-based learning, as well as the work of teachers and students.
- 'PBL Web site' provides links to resources mentioned in McGrath's regular column on Project-based learning in ISTE's journal, Learning and Leading with Technology.
- 'The Multimedia Project' specifically focuses on project-based learning supported by multimedia.

According to the Multimedia Project definition "Project-based learning is a model for classroom activity that shifts away from the classroom practices of short, isolated, teacher-centered lessons and instead emphasizes learning activities that are long-term, interdisciplinary, student-centered, and integrated with real world issues and practices".

BIE emphasizes the central role of project work in curriculum and defines project-based learning as a "systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks".

From these definitions of project-based learning approach the following main characteristics can be specified:

• Student's self motivation by engaging in the own learning - project-based learning provides opportunities for students to pursue their own interests and questions and make decisions about how they will find answers and solve problems

- Interdisciplinary learning students apply and integrate the content of different subject areas at authentic moments in the production process, instead of in isolation or in an artificial setting
- Relevant learning establishing connections to life outside the classroom, addressing real world concerns, and developing real world skills
- Teachers may play the varied roles of coach, facilitator, and co-learner.

The learning scenario for project-based learning is specified by BIE the following way. Students make decisions within a prescribed framework. They design the process for reaching a solution for a problem. They are responsible for accessing and managing the information they gather. Students regularly reflect on what they're doing and evaluation takes place continuously. A final product is produced and is evaluated for quality.

#### 2.3.2.3 Task-oriented learning

The term task-oriented or task-based learning mainly originates from the literature on language education (Prabhu, 1987; Nunan, 1989). The first significant work in the field of task-oriented learning was made in India (1979-1984) in the form of Bangalore/Madras Communicational Teaching Project conducted by Prabhu (Prabhu 1980, 1984, 1987). Prabhu was not the inventor of language learning tasks however in the Bangalore Project the tasks were first considered as a core of course organisation.

According to Prabhu's definition a task is (Prabhu 1987:p24):

"an activity which requires learners to arrive at an outcome from given information through some process of thought, and which allowed learners to control and regulate that process".

However this is rather indeterminate definition oriented towards cognition, process, and teacherfronted pedagogy. In many aspects Prabhu's pedagogic proposals are similar to those of the Natural Approach (Krashen & Terrell, 1983). They claimed that the learner's attention is focused on meaning, i.e., task-completion, not language, i.e. explicit grammar teaching. This approach gained great interest however was strongly criticized: Greenwood (1985) provided a brief critique, Beretta and Davies (1985) carried out an evaluation of Bangalore Project. In the Beretta and Davies's discussion two main issues were concerned: the kind of input to which pupils were exposed and the absence of overt feedback on error. Long and Crookes (1992) criticized Prabhu's procedural syllabus by saying that tasks themselves were chosen without recourse to needs analysis, the grading of tasks was rather arbitrary, there were no clear increase in the difficulty of successive tasks and no clear guidelines for sequencing of tasks.

Candlin provided a much more detailed definition of task than Prabhu as (Candlin, 1987:p.10):

"one of a set of differentiated, sequencable, problem-posing activities involving learners and teachers in some joint selection from a range of varied cognitive and communicative procedures applied to existing and new knowledge in the collective exploration and pursuance of foreseen or emergent goals within a social milieu."

Candlin (1987) and Breen (1987) worked towards a "process syllabus" that considers tasks rather than words, forms or functions as an organisational unit. According to Breen a task-based learning is organized as a "bank of alternative activities and tasks" provided by course designer from which the teacher and learners could select appropriate ones (Breen 1987). Breen advocated a far more active role for learners than Prabhu, whose method was very teacher led. Although this links to theories supporting learner autonomy, it also relies on the learners' receptiveness and high degree of teacher ability. Candlin addressed another Prabhu's problem of vague grading and sequencing of tasks. He argued that tasks may be made gradually more complex by increasing such elements as "cognitive load", "communicative stress", "particularity and generalisability", "code complexity and interpretive density", "content continuity", and "process continuity" (Candlin 1987: p.19-20).

Long and Crookes (1992) criticized the process syllabus. In some respect they "concern about the logistical feasibility of implementing process syllabuses in certain contexts, not flaws in the process syllabus itself". The main problem that they saw was that the process syllabus, like Prabhu's

procedural syllabus still has "no explicit provision ... for a focus on language form". Long and Crookes provided their rationale for developing Task-Based Language Teaching with the focus on the form based on SLA research (Long and Crookes 1992). They also stated the importance of a needs-analysis in deciding which tasks to select which was reflected in their definition of task: "a piece of work or an activity, usually with a specified objective, undertaken as part of an educational course, or at work." (Long and Crookes 1992).

Following the concept of Long and Crookes Willis developed "A Framework for Task-Based Learning (TBL)" (Willis, 1996) that provides a guide for classroom teachers to use a TBL approach in their classrooms. As predecessors Willis aimed to include a focus on form in her approach.

The Willis's framework is rather rigid. The class begins with a pre-task, where learners discuss the topic, and perhaps hear other speakers performing a task similar to that they will later complete. This is followed by "task cycle", including the task, planning and a report – the idea being to work from fluency in the task to greater accuracy through planning to a report. Lastly there is a section on language focus, and practice, working on language items that may have occurred or been required during production of the task. This framework is considered more detailed in the section 3.5.2 Conceptual model of Task-based Learning template of this research project.

By the 'task' Willis meant a goal-oriented activity with a clear purpose. Doing a communication task involves achieving an outcome, creating a final product that can be appreciated by other. Typology for TBL task design developed by Willis (1996) includes:

- 1. listing
- 2. ordering, sorting, classifying
- 3. comparing, matching
- 4. problem solving
- 5. creative tasks, project work
- 6. sharing personal experiences, anecdote

Each type involves different cognitive processes. The first three types increase in cognitive complexity from one to three, but are generally cognitively less challenging than the three at the bottom. These may involve more complex cognitive operations or combinations of simpler task types.

Such definition of task and framework for task-based learning is not restricted only by language courses domain. The concept of task-oriented learning is used as a general idea across different subject areas. Regardless the domain of application of task-oriented learning this approach has the following common characteristics:

- A problem or assignment is available
- There is a meaningful context
- A series of actions to come to the desired result
- Different information and tools available
- Make use of theory and methodology
- A task can be: a problem description, assignments, study tasks, small cases, learning task, discussion task, strategy task, application task, problem solving task, project tasks, etc.
- Tasks can be structured or open.

The research project related to task-oriented learning approach (2004) conducted within the scope of the the Digitale Universiteit investigated the problem of general description of tasks. It proposed the following model. In order to make initial design of task-based learning and characterise the task as a whole an instructor should fill in the following elements of task description which consists of:

- Title of the task
- Short description of the task
- Objectives of the task objectives that will be reached in this task
- Previous knowledge entry knowledge and skills needed for this task
- Goal and end-product of the task
- Expectations from the student what is requested of the student to reach the goal

- Way of grading way of testing whether the goal is met
- Criteria for grading criteria for judgement of performance
- Possibilities for extra help ways of receiving extra support for the task
- An example of task

In the given research project the Willis's framework (1996) will be considered as a model for organization of a course based on the TBL pedagogical approach and the description of the task itself will be taken from the model of the DU's project Zelfstandig leren in een digitale omgeving (Fisser, et. al., 2004).

#### 2.3.2.4 Experiential learning

Experimental learning is one of the most effective methods of adult learning for developing tacit knowledge needed by a person or group in order to perform in an organization. Based on the works of Dewey (1938/1997), Hahn (1836/1965) and Kolb (1984) experimental learning involves into structured experiences, combined with meaningful reflection, as a way to maximize learning. The structured experiences can be from classroom "solution-finding" activities and team initiatives to outdoor, adventure-based ropes challenge courses, the performing arts, Service Learning and Action Learning. The experiences are integrated with facilitated reflective processes that help learners explore what happened during the experience, analyze the patterns that emerged, strategize for the next experience and transfer learning to another environment (work, home, school, etc.).

Compared to traditional learning (where content is delivered through lectures or presentations), experiential learning is participative. It takes place in purposefully constructed "micro-worlds" (or experiential learning laboratories) in which content is delivered and potentials are discovered while the learners are immersed within the context and community in which the learning will be applied. There are two kinds of learning scenarios related to experiential learning:

- Experiential learning by yourself. It is also known as "informal education" and includes learning that is organized by learners themselves.
- Experiential education. It is learning through programs and activities structured by others. Principles of experiential learning are used to design of experiential education programs and emphasis is placed on the nature of participants' subjective experiences. An experiential educator's role is to organize and facilitate direct experiences of phenomenon under the assumption that this will lead to genuine (meaningful and long-lasting) learning. This often also requires preparatory and reflective exercises.

In order to understand how the process of learning works it is necessary to consider Experiential Learning Cycles. Experiential Learning Cycles models are commonly used to help structure experience-based training and education programs. Neill (2004) made an overview of nine experiential learning cycle models.

In general the main characteristics of experiential learning are:

- Students "learn by doing" and by reflecting on the experience
- Learning activities can include, but are not limited to, hands-on laboratory experiments, practicums, field exercises, and studio performances
- Most models of experiential learning are cyclical and have three basic phases: an experience or problem situation; a reflective phase within which the learner examines the experience and draws learnings from that reflection; and a testing phase within which the new integrated insights or learnings are applied to a new problem situation or experience.

#### 2.3.2.5 Collaborative learning

Collaborative learning refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful.

In the computer-supported collaborative learning group members may never meet face-to-face and communicate virtually. However they are highly reliant on others in the group for the quality of their learning. In such environment where most learning takes place via group interaction, the instructor is likely to act more as a facilitator than as an active deliverer of knowledge. In group learning environments the emphasis is rather on real-world abilities such as communication, problem-solving, and articulation of solutions than on memorization, rote learning, and cramming for examinations.

According to Johnson, Johnson and Smith, (1991) there are three general types of group work: informal learning groups, formal learning groups, and study teams. Informal learning groups are ad hoc temporary clusters of students within a single class session.

Formal learning groups are teams established to complete a specific task, such as perform a lab experiment, write a report, carry out a project, or prepare a position paper. These groups may complete their work in a single class session or over several weeks. Typically, students work together until the task is finished, and their project is graded.

Study teams are long-term groups (usually existing over the course of a semester) with stable membership whose primary responsibility is to provide members with support, encouragement, and assistance in completing course requirements and assignments. Study teams also inform their members about lectures and assignments when someone has missed a session. The larger the class and the more complex the subject matter, the more valuable study teams can be.

In this research only formal groups are considered.

The model developed within the scope of SALDO project states that there are five themes which are considered to be important while teacher is making a decision (Ogg, Schoonenboom & Elk, 2004). Decisions are mostly in the form of choices, both in designing learning activities and in carrying out these learning activities. These themes include: 1) how to optimize group processes, by using ICT 2) kind and content of assignments and the products which have to be delivered 3) roles and tasks and the coordination of both 4) assessment and 5) tutoring.

According to Gross Davis (1993) general strategy for collaborative learning is the following. Teachers need to explain carefully to class how the groups will operate and how students will be graded. When making any assignment, explain the objectives of the group task and define any relevant concepts. In addition to a well-defined task, every group needs a way of getting started, a way of knowing when its task is done, and some guidance about the participation of members, as well as how students will be graded. Give students the skills they need to succeed in groups.

#### 2.3.2.6 Skills-based learning

Skill-based learning has emerged as one approach that ties skills directly to job roles. This type of training addresses the broad range of skills required to do a certain job by offering courses in modules that students can progress through. Course requirements are based on an individual's current skill level, and are no longer related to specific prerequisite courses. The focus of skill-based training is to make learning immediately applicable in a job.

The traditional view of expensive instructor-led, classroom-based training focused on discrete topics is being replaced by a concept of continuous, skill-based learning delivered through multiple media, with content inherently aligned to corporate goals, strategies, and tactics. General courseware is being replaced by the need for preplanned, integrated, and comprehensive skill-based training plans that are essential for companies to be able to recruit, retain, and retrain their employees.

The overview of pedagogical approaches presented above provides insight into some of the most valuable pedagogies. The inventory of DU's participants presented in the section 2.4 shows which of the approaches are the most popular, how they are supported by technologies and how they can be mapped on templates.

# 2.4. Inventory of pedagogical approaches and technologies

This chapter describes the inventory of pedagogical approaches and technologies. This inventory provides basis for template design with respect to preferences and requirements of the target group. This chapter includes the following sections: 2.4.1 Research strategy and design, 2.4.2 Population and sample and 2.4.3 Analysis of responses.

### 2.4.1. Research strategy and design

The goal of this research project is to find out how content developers can be supported by templates. Therefore the purpose of the inventory is to explore how content developers approach content development and use of templates. Consequently this investigation answers the following questions: how content developers see instructional content and use of computer technologies for content delivery, what pedagogical approaches and learning scenarios are applied for content delivery, what is the attitude of content developers to use of templates and how they assume to be supported by templates.

In order to carry out this investigation a qualitative research method was used. The instrument for the data collection is a questionnaire. The full content of questionnaire is presented in the Appendix 1.

This questionnaire is used for need analysis to inventory the content developers' perspective on instructional content and templates. The responses to the questionnaire are used to design such templates which meet the actual requirements and preferences of content developers.

The questionnaire is divided into five parts:

- 1. *General information about intended course*. While attempting to create templates for courses it is required to understand what courses are normally developed, for whom and with what purpose. This will help to specify the orientation of templates themselves. Therefore the first thing is to answer questions: what kinds of courses are developed in appropriate context of the DU (field, specialization, goal, target group, etc.). Section 1 of the questionnaire provides general information about intended courses, such as title, goal, type of course delivery, type of students, duration, etc.
- 2. *Pedagogical approach and learning scenario in the course* This part explains on which pedagogical approaches and learning scenarios the courses are based. This section provides information about the most popular models and learning scenarios which are implemented in courses. Analysis of section 2 will enable to choose the most valuable and common used pedagogies for future design of the templates as far as the core of templates in given research project is pedagogical approaches.
- 3. *Technologies supporting course delivery*. The issue of technologies supporting learning process is critical because they specify what method of course delivery is practiced by DU's content developers. This method is reflected in the template along with pedagogies. Section 3 specifies which technologies are used to support pedagogies mentioned in the second section.
- 4. *Goal of using templates.* Based on analysis of the first three sections it is possible to create basic framework for templates. This framework concerns domain of template application, conceptual model based on pedagogical approaches and supporting technologies. To make this framework clearer and more specific it is necessary to ascertain the content developers' point of view on exact template. The Section 4 contains direct questions about user's experience of work with templates, their expectations, wishes and purposes.
- 5. *Desired architecture and interface of templates and intended course*. This section investigates how content developers see templates from practical perspective of their use. Here are the questions about concrete interfaces and features of physical templates. These questions affect the ease of use and the efficiency of physical templates.

Summarizing the listed issues it is seen that questionnaire consider templates from different aspects (conceptual, performance, user expectation, etc.). The information obtained from this questionnaire should ensure design and development of desired templates.

## 2.4.2. Population and sample

For the purpose of this investigation the project leaders within the DU were identified as target group for the research because they are seen as experts. The target group is a group of content developers and project leaders involved into the projects related to content development within the Digitale Universiteit. These people contribute into the content development. They are either users of authoring tools or instructional designers. All of them play a leading role within DU's projects. Therefore their opinion about content development process and technologies supporting this process is the most valuable for given research which is carried out in the content of the DU.

The questionnaire was sent by e-mail to the 12 participants of the DU consortium. Eight responses were collected, which is 67%. All 12 projectleaders involved in content projects of the DU where asked to cooperate. The goal of investigation is to get explicit information which is easy to process and analyze. This investigation is rather intended for definition of the basic principles than for statistic collection. This is qualitative but not quantitative research. Hence, there is no need in big number of respondents and statistical calculations. The leading figures can provide information about general view of organization to the problem.

Boundaries of the survey are restricted by the DU as far as the research project is carried out in the context of the DU. Therefore only technologies and electronic learning environments used in the DU are considered in this investigation.

Although the investigation is restricted by the context of the DU the questions from the questionnaire are general by nature. There are no specific questions about particular software application. And so responses reflect common trends and current situation in the field of content development.

### 2.4.3. Analysis of responses

The analysis of results is carried out sequentially question-by-question. As far as the number of responses is not big it is easy to track the connection and logic of answers of each respondent. The analysis of each question is presented below. The full recording of responses is schematically presented in Appendix 2.

#### 2.4.3.1 General information about intended course

This section demonstrates the development of which course the respondent is involved in. This section allows correlate the specifics of each course (area, form of education, type of students, etc.) with pedagogies and technologies required for course delivery. These relations are very important in order to understand how content developers see objectives and goals of their courses and how they realise them based on pedagogies and technologies.

The responses show big variety of fields from Statistics and Mathematics to Computer science, Social science, Information science (e-business), Business studies, Science and science didactics. Besides variety of the fields the questionnaire demonstrates some difference in course duration from 7 to 12 weeks where some of the courses are flexible (MathMatch course) or depends on number and complexity of components comprising course (set of LOs in Science in Teacher Education course or set of tasks in TISO course).

One of the most important questions in this section is definition of goal of the courses. According to responses the goals are: (1) Provide explanatory information – introduction into the problem area, (2) Provide knowledge and experiencing them on practice, (3) Remediation of knowledge, (4) Provide academic competences to gain degree, and (5) Improve skills.

Form the questionnaire we see that five content developers wish to create complete pieces of learning materials intended for particular purposes from introduction and knowledge remediation to practising, skill improvement, developing new knowledge.

However two respondents consider not complete courses but databases of small LOs or tasks. The database of LOs is not in our focus because there is nothing said about LOs themselves. They assumed to be independent, self-constrained chunk of information. And it is a matter of user how to choose

them from database and study in their own manner. As far as there is no concern to pedagogies it is out of the scope of consideration. The database of tasks directly points to the task-based pedagogical approach.

Other five courses by their nature reflect elements of different pedagogies: traditional lecturing, experiential learning, collaborative learning, problem-based learning, task-based learning and skillbased learning. This leads to the conclusion that all these courses will follow different learning scenarios because they are based on different pedagogical approaches. According to this information we can assume that there is no one solution for such different courses and consequently there is no one solution for course templates. However it is possible to design templates for pedagogical approaches used in each course and therefore built courses using appropriate templates. More detailed analysis of pedagogies is considered in the following paragraph.

According to the responses almost all courses are intended for all categories of students and for all types of instruction. Only one course (Statistic) totally excludes full-time students, and the learning process is conducted individually. Three respondents excluded distance students that implies some kind of face-to-face activities. All face-to-face activities are implemented out of the electronic learning environment but electronic courses might contain descriptive information about these activities.

The majority stated that courses must be available for all students of all forms of education. This means that the courses should be organized in a way where student can learn individually or with somebody's assistance. Courses must be well structured and clearly presented as for distance students as for fulltime students.

The course itself should be interoperable. Three respondents pointed that courses must be able to be played in any kind of electronic learning environment. However as many participants of the DU use Blackboard system a big focus is on this system and its compliance.

#### 2.4.3.2 Pedagogical approach and learning scenario in the course

This section reflects on which pedagogical approaches and learning scenarios the courses are based. This section is the most critical for specifying which pedagogical approaches are the most valuable in e-learning and which of them should be presented in the templates.

Question 1 shows that according to content developers' opinion the first three most valuable pedagogies are Task-oriented learning, then Problem-based learning, then Collaborative learning. The comments about pedagogies that they use in intended courses are almost the same: task-oriented, problem-based, project-based, skills-based learning and collaborative learning.

Question 2 demonstrates different percentage of methods of learning in different context. For example in the Basic statistics course with the goal introduction in statistics the main focus is on learning by listening (80%) and only 10% is for learning by doing and 10% for learning by social interaction. That implies that traditional education require only delivery of the content (lecturing). In this case all activities are connected with presentation of learning materials.

In the courses based on the task-oriented pedagogical approach (Statistiek and Minor Academic courses) the primary focus is on learning by doing (60-70%). This means implementation of various tasks during implementation students can explore different issues (learning by exploring 10-20%) and communicate with peers or instructors (learning by social interaction 10-20%). Less attention is paid to the learning by listening (0-10%). The main focus of such kind of courses is on delivery and implementation of tasks. For example developer of TISO course argued that 100% of activities are learning by doing.

In the problem-based course (MathMatch: aansluitingsmodule wiskunde) with the goal of knowledge remediation the main accent is on the learning by exploring -50% where 30% is for reading of literature. In the problem-based learning it is also important to carry out tasks (20% learning by doing) and communicate (20% learning by social interaction). It is not the goal of pedagogy to get information/solution from the instructor that is why less important is learning by listening – not more than 10%.
In the project-based learning (Realtime embedded systems (RtES) profile module) almost equal parts of the learning are related to exploring, doing and social interaction (30-35%). Here the goal was gain knowledge of the concepts of RtES and experience in putting these into practice. Therefore students suppose to explore field, get knowledge, practice by doing and communicate for implementation of project. The role of learning by listening is eliminated (0-5%).

In the skills-based learning (Academic Reading in English course) the main focus is on learning by doing (training reading skills -70%). Besides training the course includes some collaborative learning involved through a bulletin board that is supposed to function as a forum for discussion (15%). The role of learning by exploring is not critical – only 10% and learning by listening is eliminated – not more than 5%.

Question 3 reflects principles of instructional design of the courses and is based on Gagne's nine events model (Gagne, 1965). The list of events in enriched with some other common for e-learning events. According to responses the sequence of events depends on the learning scenarios which vary for each pedagogical approach. As far as task-oriented learning is the most popular pedagogy we will consider sequence of events for this pedagogical approach.

Based on the responses related to Statistics and Minor Academic courses the following conclusion was made. The course based on task-oriented approach is organized the following way. The course starts with gaining attention. This may be animated title screen accompanied by sound effects and different auditory or visual stimuli. In order to capture students' attention this start page might contain thought-provoking question or interesting fact because curiosity motivates students to learn.

The second event is informing students of course's objectives. The objectives form basis for assessment and possible certification. They initiate the internal process of expectancy and helps motivate the learner to complete the lesson.

The third event is either Stimulate recall of prior learning or Provide learning guidance. The former is remembering of prior knowledge for implementing tasks. The latter is guiding students in implementation of learning activities in the form of help files, navigation facilities, special documents, etc. According to Kruse (2004) guidance strategies include the use of examples, non-examples, case studies, graphical representations, mnemonics, and analogies.

The fourth event is presentation of content. This implies content delivery and providing theoretical background. This event is followed by presentation of task. This means descriptive information of the tasks related to the theory which concludes with elicit performance (implementation of tasks in practice).

The 7<sup>th</sup>, 8<sup>th</sup>, and 9<sup>th</sup> events are carried out simultaneously that mean communication with peers and instructor and collaboration. They take place along with implementation of tasks.

After task is completed it is followed by self-assessment. If the work is satisfactory it is submitted or presented - tenth event. Then and the instructor assesses learner's performance and provides the feedback. The course is finished with grading.

Here we specified the conceptual model of task-based learning based on the responses of content developers.

Question 4 represents which learning strategies are used in the intended courses. This shows that learning strategies vary depending on pedagogical approaches used. According to responses almost all courses include elements of problem solving and collaboration.

### 2.4.3.3 Technologies supporting course delivery

This section specifies which technologies are used for support of pedagogical approaches. Technologies providing course delivery should be reflected in the model of template along with pedagogical approaches. In order to specify which technologies are supposed to be used for intended courses the following questions are considered.

Question 5 defines the aim of using computer technologies. According to responses one course (Basic statistics) is intended for face-to-face instruction and technologies are used to support these face-to-face activities. Two courses (Realtime embedded systems (RtES) profielmodule and TISO) are intended only for blended learning with appropriate technologies. One course (Statistiek) excludes the use of technologies for support of face-to-face activities. Another course (MathMatch: aansluitingsmodule wiskunde) excludes the use of technologies for support of distance learning. The rest three content developers design their courses with respect that technology will support these courses in all kinds of learning (face-to-face, blended, distance).

Question 6 shows the objectives of using technologies. In all cases technologies are used to store, manage and deliver learning materials. However different ways of using technologies depends on the applied pedagogical approach and context of instruction (question 5). For example for the task-oriented pedagogical approach technologies are used besides content management for providing communication between students and instructors, training particular skills, scheduling and managing learning process and probably testing, grading and monitoring of performance.

Question 7 demonstrates which technologies are the most commonly used. According to the responses the most used technologies are course delivery technologies, then testing and examining, and then communication.

Question 8 demonstrates which exactly technologies are used to support pedagogical approaches. The results of the questionnaire showed that different content developers assume their courses will be supported by different set of technologies. However the main trends are the following. For course content delivery the most used functions are presentation of the content and archive for course materials. For course organization all functionality are useful especially news delivery and notification, and study guide. Among communication functions the most popular are e-mail exchange and discussion forums. Among collaboration functions – file exchange and group work. For assessment and student tracking the most used functions are self-assessment and online test.

### 2.4.3.4 Goal of using templates

This section is the most important in the questionnaire because it directly points to the view of content developers to templates, their experience in using templates and expectation from applying templates.

Question 9 reflects the need of content developers in using templates. Only one respondent from all doesn't need support of templates. Others would like to use them for content development.

Question 10 shows the experience of working with templates. Only two respondents have never used them before. However they wish to use them.

Question 11 specifies the benefit that content developers expect to gain from using templates. According to responses it is seen that the strongest expectation is that templates will reduce time and effort invested into content development. Then content developers want the templates to provide ready-made models and structures of the courses that will enable making instructional design without deep knowledge in this field. Besides that developers think that it is important to concern pedagogical approaches because this will enable to use certain pedagogies in the course without thinking how to structure activities. The issue of interfaces, presentation and ease of use is less valuable however we don't minimize the importance of these features of templates.

Question 12 defines the goal of using templates from content developers' point of view. In most cases they argued that the goal of using templates is to lead during the process of content creation by offering hints, structures and flow of activities within course. The equal number of respondents said that they would want to use separate small templates reflecting specific learning activities as well as complex templates for the whole pedagogical approaches. Among respondents chosen these goals there are people who pointed both of them. However the goal of the question was to specify preferences in using small separate templates or complex and comprehensive ones that present totally opposite approaches. This shows that content developers didn't understand the question in a proper way and their answers can't be considered.

### 2.4.3.5 Desired architecture and interface of templates and intended course

This section defines what are the desired elements, architecture and interfaces of templates and courses. From the ease of use point of view the templates should be organized in a way that ensures high effectiveness, efficiency, learnability and user-friendliness. The preferences of content developers are investigated in this section in order to gain ease of use and efficiency of templates.

Question 13 defines the number of levels of granularity within template that enable easily and effective work with template. According to the responses the average number is 3-4 levels.

Question 14 explores in what way contend developers wish to be supported in using template. The responses showed that developers want to have user guide or other help files and hints about how to use template.

Question 15 defines which facilities templates should provide to the content developers. Based on the responses all three elements are critical from the developer's perspective. They are: layout of elements comprising course, set of learning activities available to use within pedagogical approach, sequence for possible course structuring.

Question 16 defines which elements of the course are mandatory. According to responses all of the following elements should be available in the course: Service functions, Delivering content, Navigation, Table of content. Moreover from the service functions the most important are Glossary, Help and Print functions according to question 17. Question 18 shows what information about course should be described in the course. Based on responses they are: Learning objectives, Prerequisites, Competences, Content, Assessment, and Organization.

Question 19 shows that learning content should include combinations of different kind of resources: Text, Pictures, Audio, Video and Animation. According to question 20 the input formats might be TXT, HTML, SWF, JPG, JPEG, GIF, MP3, PDF, PPT, WMP and AVI. The output formats are SCORM, IMS packages and HTML based on the question 21.

Question 22 defines that practical exercises can be arranged in the form of games, role-play games and simulations. According to question 23 tests or examinations should contain the following types of questions: multiple choice, open question, selection or pointing elements, matching terms and definitions, gap filling, drag and drop, and ranking.

### 2.4.4. Conclusion

From the first part of the questionnaire (General information about the course) it can be concluded that the courses are different by nature especially in the field and goal. Therefore they follow different learning scenarios. Courses must be uniform for all kinds of students (full-time, part-time, distance) and for all types of instruction (group, tutorial, individual). Consequently the templates have to:

- Contain a description of the course as a whole
- Be abstract in respect to the kind of activities probably, templates with rather descriptive information about activity than performance of activity
- Reflect separate pedagogical approaches
- Be reusable in different contexts
- Meet the requirements of different users

From the second part of the questionnaire related to pedagogical approaches we can conclude that the learning strategies and sequence of events depend on the pedagogical approach used for course delivery. The most valuable and popular pedagogies among DU's content developers are: (1) Task-oriented learning, (2) Problem-based learning, and (3) Collaborative learning. The templates based on pedagogical approaches should primarily reflect these three types of pedagogies. The template structures will reflect learning scenarios as they are specified by sequence of events in the questionnaire. For example, for the task-based learning the learning scenario will contain the following subtasks which will be reflected in the template:

- 1. gaining attention
- 2. informing students of course's objectives
- 3. stimulate recall of prior learning or provide learning guidance
- 4. presentation of content
- 5. presentation of task
- 6. elicit performance (implementation of task in practice)
- 7. communication with peers and
- 8. communication with instructor and
- 9. collaboration
- 10. self-assessment
- 11. submission or presentation
- 12. assessment by instructor
- 13. feedback
- 14. grading

According to the responses in the third part of the questionnaire considering course delivery support by technologies it is clear that technology used for intended courses support pedagogical approaches on which the courses are based. Consequently the templates should reflect these technologies and vary in this respect for different pedagogies.

As we see from the questionnaire almost all content developers assume the use of similar technologies for course delivery as far as listed technologies are the most common functionalities of electronic learning environments. However depending on pedagogical approach the main focus will be on different technologies and the scale of use will be different. For example for the Task-based learning the main accent is on (task) content delivery, assignments and grading, communication and testing.

Analysis of responses in the forth part – Goal of using templates – showed that not all content developers have used templates before however most of them would like to utilize them during the process of content creation. The main goal is to be supported by hints, guidelines and structures for complete course. The main benefit they expect to reach is reducing the time needed for content development and effort expenditures.

In the section 2.2 Templates for e-learning content the issues of the optimal template organization and structuring are discussed. The conclusion of the literature review was that templates should present overall abstract structure of a course based on particular pedagogical approach. From the responses it is not clear what the preferences in the size and complexity of templates are. It is not clear whether content developers want to have one template covering one pedagogical approach or several templates to form one pedagogical approach. Therefore the additional research is required.

Analysis of responses about desired interfaces of templates and courses in the fifth part of the questionnaire provides recommendations for template design. From the ease of use point of view templates should have well organized and clear structure with abundance of hints and tips how to use this structure. The structure of templates should contain not deeper than four levels of granularity. The following elements should be available in the structure of template: information about the course, content of the course, navigation, service functions and table of content.

The template should support input of different media formats from text and pictures to audio, video and animation. The output product (developed course) should be interoperable and present a standard package compliant with required LMS (preferred with all existing in SCORM or IMS format).

The template should have a friendly interface. It should provide rich opportunities for practical activities in the form of simulations, role-play games and other kinds of games. Moreover it should provide variety of types of questions for self-assessment and examination and online testing.

All issues mentioned above are investigated regardless specifics of the concrete software application (LCMS). However it is crucial to know what facilities the application provides to a content developer and how template works within this application. Therefore the description of special characteristics of LCMS learn eXact is presented in the next chapter 2.5.

# 2.5. LCMS: Methods, Tools, Technologies for Content Development

This chapter gives a description of LCMSs, particularly learn eXact, the technologies used for content development and management, tools and templates that are available.

# 2.5.1. General description of LCMS

Learning content management systems (LCMSs) are the corporate version of traditional course management systems that were initially developed for higher education. This kind of technology refers to e-learning that "is typically seen as being instructor-free or instructor-neutral, in order to capitalize on an "any time, anywhere" motivation (Strijker, 2004).

A LCMS combines the administrative and management dimensions of a traditional learning management system with the content creation and personalized assembly dimensions of a course management system. A LCMS provides a multi-developer environment where developers can create, store, reuse, manage, and deliver learning content from a central object repository (Chapman & Hall, 2001). Brennan, Funke & Anderson (2001) define a learning content management system as "a system that is used to create, store, assemble, and deliver personalized e-learning content in the form of learning objects".

From these definitions of LCMS it follows that the main role of LCMS is management of e-learning content which is stored in the central repository in the form of learning objects. Although the providers of these systems tend to create unique features and functions, an architecture of these systems normally include the following components: Learning Object Repository, Automated Authoring Application, Dynamic Delivery Interface and Administrative Application. However automated authoring application is mostly related to authoring tool and dynamic delivery interface is rather functionality of LMS. Therefore not all these components may combine an LCMS. In case of learn Exact software application this statement is actual because this LCMS embrace all four components.

In general Learning Content Management Systems are designed to enable content developers with little technology expertise, to design, create, deliver, and measure the results of e-learning courses rapidly. Besides LCMSs' role for the management of learning objects, they are also used as knowledge-management systems to store "pieces of knowledge", as example in the form of presentations, and discussion topics to integrate the knowledge of experts in the process of learning (Strijker, 2004).

# 2.5.2. Characteristics of LCMS Learn eXact

As was discussed above LCMS architecture contains four basic components. The learn eXact platform is made up of four independent and inter operable components as well:

- *eXact Packager* is the client/server application in which the creation of the content takes place. In the given research project this component is mainly considered as it is a component responsible for e-learning content development
- *eXact Lobster*® (Learning Objects Brokerage and Storage Repository) is the heart of the learn eXact platform. It is used to store didactic contents as well as personal data and information derived from the tracking of user activity during the delivery of the Course
- *eXact Siter* is the web-based LMS that delivers and tracks the Course content. It provides course management and user enrollment functions as well as communication facilities like chat, forum etc.
- *eXact Glove* is the VLE able to deliver course content and track student performances. Due to the flexibility allowed by the XML technology, learning contents can be delivered to a wide range of devices workstation, palm top, wearable, mobile, etc.

The architecture of the LCMS learn eXact is schematically presented in the Figure 7.



Figure 7. Architecture of LCMS learn eXact (Guinti, 2004)

According to Harvi (2001) LCMSs differ in levels of flexibility, ability to integrate with other systems and in the implementation of specific features. However, modern web-based LCMSs tend to share the following characteristics and all of them are present in learn eXact.

*Centralized repository*. eXact Lobster® is the digital repository on which the whole learn eXact® platform is based. It is used by eXact Packager to store and retrieve indexed resources, Learning Objects and Courses, and by the learn eXact Web Interface for the management and recording of the whole learning process. It is based on the Tamino® XML Server, supplied by Software AG. It is not only used as a content repository, but it also stores information about: User personal data (IMS Enterprise); Home Page structure and user personalized pages; User tracking data (according to the CMI data model adopted by SCORM); Portal services data.

*Tagging and search.* All content (raw assets, LOs and courses) can be indexed by metadata that comply with international institutions (e.g. IEEE LOM, IMS, Dublin Core). Raw resources can be imported from local or remote file systems and indexed according to metadata IMS 1.1 and 1.2 or Dublin Core (DC).

*Reusable learning objects.* A complete LCMS provides the ability to manage content not just in a monolithic course format but also at a lower level of granularity through learning objects. In learn eXact a learning object can either be instantiated or created. Some models are readily available. Examples of these are tests in IMS QTI format, tracked and non-tracked slide shows, tracked and non tracked HTML pages. Others need to be created in terms of XML structure. An existing style sheet in XSL, a standard format that expresses semantic information to XML structure, can be assigned to learning objects. Alternatively, it is possible to generate a style sheet according to the required layout. Learning objects can be indexed in IMS or DC metadata and published in the eXact Lobster. The tracking for the learning object is based on SCORM or AICC specifications.

*Publishing workflow.* From the perspective of content development eXact Packager is the most important module because the creation of the content takes place here. Resources are imported into the eXact Packager either as existing courses or as knowledge information in the form of Learning Objects. An integral part of content development involves indexing the content and the system uses metadata tagging for this purpose. Content can be classified, stored and retrieved for multiple usage, via the digital repository eXact Lobster®. The system also supports the management of editorial roles

and work flows. The User logs on by means of a user name and a password, to gain access to one of the following Lobster profiles: Indexer, Author, Author Advanced, Packager, Creator.

Packages functionality allows Courses (Guinti's terminology) to be packaged in the selected delivery format through simple graphical interfaces, such as drag and drop. The user can use several types of contents (from resources to Courses) and drag them in the graphical representation of the Course structure. Packages can be indexed with IMS or DC metadata and published on eXact Lobster® Resources and Courses can be imported, both from the file system or from the eXact Lobster (by means of the eXact Packager module). The author has access to a preview of the Course so that it can be viewed as it appears in the learn eXact® delivery environment, the eXact Glove viewer, or in third-party LMS delivery engines, prior to it being packaged and published.

*Support for industry standards.* In the learn eXact when a user packages a course, they can choose from the following packaging formats, in accordance with the appropriate license: SCORM 1.2; IMS 1.1.1; AICC level 1; Microsoft LRN; eBook; HTML; Proprietary formats. New deliveries can be created, by combining existing formats and descriptive metadata sets, according to user needs.

# 2.5.3. Learn eXact's definition of template

The eXact Packager is one of the components of LCMS learn eXact, which is responsible for the design and management of interactive instructional content. The main purpose is the arrangement, sequencing, and structuring of learning objects. Besides these main functions, the packager offers authoring tools for fast and effective creation of learning materials, among them predefined pages or patterns for the instructional content organization in the form of embedded themes and models.

Themes allow creating instructional content using specific page style. A theme library (Themes) provides different graphic options for layout of Learning Objects. A library of predefined themes is shipped with eXact Packager installation, however every user can create his or her own page and structure template (Guinti's meaning). Examples of themes are presented in the Figure 8.



Figure 8. Examples of learn eXact themes

Although Themes and Models have the same goal to provide ready-made solutions for facilitating the process of content development, models have different purpose. In contrast to Themes, Models are responsible not only for the layout of the information. Models and wizards tool allow creating any type of complex Learning Object template (Guinti's meaning), that other content developers can easily develop by just entering data and content resources. eXact Packager is shipped with its classic LO Slideshow template, and the new Synchro LO model, which allows to synchronize PPT slides, images, text or other media, including video/audio recordings. An example of complex model 'Virtual patient' is presented on the Figure 9.

Consequently in Guinti's terminology a term 'template' implies any kind of e-content template from small item to big and complex structure available for further reuse and share among content developers. These templates are in fact Learning Objects that can be built by means of standard eXact Packager's functionality (i.e. layout editor) or other templates available within application.

Learning Objects v x		
B 💦 Learning Objects		
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Figure 9. Example of learn eXact Model (Virtual Patient)

In this research project the term 'template' will be considered in a narrow sense, as a package which is programmed out of the eXact Packager tool and, being embedded into application, works as a specific model for content creation. This presents a predefined structure of LO organization, including interfaces, elements of content, available input and output formats, etc. In the given research project the term template is equal to term 'LO model' specified by Guinti.

# 2.6. Conclusion of literature findings and their implications to the template design

In the given chapter the literature review of several issues related to e-learning content and its development, including technologies and templates was presented. This literature provides basis for the further design and development of the templates for learning objects.

The section 2.1 defines terms e-learning content and Learning Objects, and discusses principles of content organization and structuring. This section contributes into design of template by providing insight in the structure of e-learning content comprised of Learning Objects which is directly mapped onto the template's structure. This section explains the e-learning content organization, main characteristics of LOs such as reusability and interoperability, granularity of LOs, and requirements provided by learning technology standards such as IMS and SCORM. One of the most important topics discussed within this section is CISCO's definition of the Reusable Learning Object Strategy which is adopted as a basic concept for template organization.

The section 2.1 is followed by the description how the structure of the e-learning content can be specified in the form of templates. This is reflected in the section 2.2 which provides definitions of template in the literature, explains possible ways of template organization and justifies the proposed model of template based on the pedagogical approaches for the future design and development.

As it was decided in the section 2.2 to design templates based pedagogical approaches the description of pedagogical approaches is required. Therefore the section 2.3 provides overview of pedagogical approaches which present core principles for building didactic structures of templates reflecting particular pedagogies. This section is followed by the section 2.4 that contains inventory of target group of the project. This inventory demonstrates which exactly pedagogical approaches and technologies are used in the Digital University in order to design templates that meet the requirement of the target group.

The section 2.5 explains technical aspects of the research project; particularly methods, tools and technologies for content development, as well as specifics of LCMS learn Exact. This chapter discusses how the templates are presented within the scope of particular software application, how they are realized technically and what kind of limitations and requirements the learn eXact impose on templates. These technical issues are mostly referred to the development part which is presented in chapter 4. While other issues related to the process of template's design are referred to the chapter 3.

# 3. Design of templates

This chapter describes the design of template, particularly Task-based learning (TBL) approach template. This presents a basic framework for template design, as well as provides detailed description of the particular TBL template design. The chapter includes the following sections: 3.4 Framework for template design and 3.5 Design of Task-based Learning template

# 3.4. Framework for template design

According to definition of template in the sections 2.2.2 and 2.5.3 of the given research project a template presents learning object model. This implies that template is a kind of software application that provides didactical structures for building LOs and is responsible for rendering these LOs. Therefore we can speak about design of template from different perspectives, such as design of software application, instructional design, design of LOs, and interaction design.

From the technical point of view template is a kind of software oriented on particular users (content developers). Thus the design of the template is build on the principles of user-centered design. The methods of user-centered design were adopted from the appropriate works of UsabilityNet (Bevan et. al., 2002), Nielsen (1993), Mayhew (1999) and Vredenburg et. al. (2002). In general process of user-centered design is followed a standard ISO 13407 (ISO, 1999) that defines four user centered design activities: (1) understand and specify the context of use (section 1.2), (2) specify the user and organizational requirements (section 2.4), (3) produce design solutions (chapters 3 and 4), evaluate designs against requirements (chapter 5).

From the instructional design point of view templates can be considered as abstract didactical structures that are used for creation of e-learning content. Broadly speaking templates provide structures (LO models) for learning objects which need to be filled in with appropriate content. Therefore design of LO models is based on the principles of Systematic Design of Instruction (Dick & Carey) that was reflected in Peskurich's guidelines for rapid instructional design (Piskurich, 2000) and Hassel-Coribiell's guide for developing training courses (Hassel-Coribiell, 2001).

The issues related to design of LO were referred to Smith's guidelines for authors of Learning Objects (Smith, 2004). The interaction design principles were addressed to the textbook of Interaction design (Preece, Rogers, Sharp, 2002) and Interactive multimedia instruction (Schwier & Misanchuk, 1993).

Based on this literature the following framework for the design of templates was built. This framework considers all issues mentioned above and presents several stages of templates' design. The stages for template design are the following:

- Stage 1. Analysis of goals of template. This includes description of: goals and objectives, target group, context of use, functionality of template, input and output data, reusability, interoperability
- Stage 2. Building conceptual model of template. This includes description of: narrative description of template operation, description of elements comprising template
- Stage 3. Specifying the abstract structure of template. This includes description of: elements included into the structure of template (LO model), levels of granularity, ease of use, navigation the structure of template, support in using template
- Stage 4. Building informational model of template. This includes description of: formats of input and output, informational scheme (input and output flow)
- Stage 5. Building interaction design of template. This includes description of: graphical design, principles of navigating and browsing the content of template and content of the LO created by means of template

The explicit description of the each of the listed stages within the design framework is presented in the following section 3.5.

# 3.5. Design of Task-based Learning template

This section discusses the design of concrete template, particularly TBL approach template, including analysis of goals of template, building conceptual model of template, specifying the abstract structure of template, building informational model of template, and building interaction design of template.

# 3.5.1. Analysis of goals of template

TBL approach template is intended for creation of e-learning content based on the "Task-based learning" (TBL) pedagogical approach. This template allows developing pieces of learning content from small modules (tasks) to entire courses. Material developed by means of this template will comprise one Learning Object (LO).

This template is specially created for use within LCMS learn eXact therefore the features of this software application, particularly eXact Packager component, will be considered specifically.

### Goals and objectives

The goal of using template is to provide content developers with ready-made patterns in order to facilitate the process of content development. In detail this goal can be seen as support of content developers in implementing TBL pedagogical models by providing proposed solutions for particular pedagogical approach.

The objectives of TBL approach template are:

- To lead a content developer in the process of content creation by offering hints, structures and flow of activities within course based on TBL pedagogical approach
- To provide a content developer with abstract structure that will:
  - o reduce time and effort invested into content development
  - provide ready-made models and structures of the courses/tasks that will enable making instructional design without deep knowledge in this field
  - relate to TBL pedagogical approach that will enable to use certain pedagogies in the course without thinking how to structure activities
  - o provide efficient layout of information on the screen
  - o provide good-looking interface
  - o facilitate re/use and sharing of materials between institutions
  - o facilitate use of functionality of eXact Packager

### Target group

The TBL approach template is intended for content developers including instructors, subject matter experts, instructional designers, superusers and other authors of instructional materials who use LCMS learn eXact as a tool for development of their content.

This template enables developing of attractive instructional materials. It provides predefined interfaces of content, as well as rich functionality for independent elaborating of specific content. The facilities of TBL approach template in combination with facilities of eXact Packager should allow users with little or no experience in HTML, XML programming easily develop complex and good-looking instructional materials. The minimal technical requirement to users are ability to use different digital data formats for inputting into template, and awareness of principles of eXact Packager and TBL approach template functioning.

The template reflects learning scenario of a course based on the task-based learning pedagogical approach. It provides abstraction of the didactical structure of instructional material (LO). So the content developer may not be a professional instructional designer. Moreover ready-made Learning Object Model relieves content developer from instructional designing within the scope of task-based approach.

### Context of use

This template should be used while creating a Learning Object based on the TBL pedagogical approach. This LO can be as a small piece of instructional content (separate task) as a complete course. The complexity and boundaries of the content depend on the content developer's requirements. The main idea of using the TBL approach template is that the instructional module built on the basis of this template will contain all attributes of concrete pedagogies and reflect learning scenario of TBL pedagogical approach.

In order to specify whether the TBL approach is reasonable to used for the content development it is necessary to carry out an analysis of content developer's needs. The analysis implies checking if the principles of task-based learning are applicable for course delivery.

First, it is necessary to consider characteristics of TBL pedagogical approach and answer if they fit characteristics of the intended course. The main characteristics of this approach are discussed in the section 2.3.2.3 Task-oriented learning of this project.

Second, it is necessary to consider learning scenario of TBL pedagogical approach and answer if it is a desired form of structuring the content and course delivery. The main learning scenario of this approach is presented in the section 3.5.2 Conceptual model of Task-based Learning template.

As far as the template provides basic structure of activities it can be applied to any kind of course from any domain. The main requirement is that the delivery of the intended course is organized according to TBL scenario.

### Functionality of template

There are two main functions of the TBL approach template: (1) provide abstraction of the didactical structure for instructional material (LO), (2) guide users in creation of LOs.

The idea of abstract didactical model (LO model) is that it is a model describing organisation of LO in the form of complete module/course containing tasks described according to TBL pedagogical approach. However the LO model considered in this research project doesn't provide facilities for implementation of these tasks by means of course content. It just provides an abstract structure which implies verbal description of intended activities according to the particular pedagogical approach and refers students to appropriate tools for implementation of the activities themselves.

The main goal of such template is to provide content developer with a comprehensive model reflecting pedagogical approach. By applying this model a user can didactically-correct specify a task and don't miss any important information that should be mentioned regarding the task within the context of TBL pedagogy.

According to responses to the question 15 from the questionnaire (Appendix 2) a template should provide the following functionality: layout of elements comprising course, set of learning activities available to use within pedagogical approach, sequence for possible course structuring.

As far as the TBL template supplies pattern for the whole course then it suppose to deliver patterns for all components of the course from title page to final examination and grading. According to question 16 that defines which elements of the course are mandatory, the following elements are mentioned to be available in the course: Service functions, Delivering content, Navigation, Table of content. Moreover from the service functions the most important are Glossary, Help and Print functions according to question 17.

Regarding guidelines for using template the responses for the Question 14 of the questionnaire showed that developers want to have user guide or other help files and hints about how to use template.

### Reusability

As we see from the questionnaire that the same pedagogical approach can be applied for different subjects or even problem areas. Therefore the template should be able to be reused in various contexts. This means that template should reflect only basic principles of task-based learning pedagogical approach in order to be valuable and compliant with different contexts.

The first issue is level of complexity of template. The more complicated template is and the bigger number of components in is containing the more difficult is reusing of it in different contexts. From the one hand, according to the proposed approach, the template should provide the abstract structure of the whole course. But from the other hand this structure shouldn't be too deep or complex. It should provide basic elements the most important from task description point of view.

The second issue is reusability of LOs created by means of the template. It is important to mention that no matter to what scale the functionality of template is used the produced content (separate task or complete course) will present a single Learning Object which can be lately reused in different course. However the bigger this LO is the mode difficult is utilizing of this LO in other context.

### Interoperability

According to the responses from the questionnaire (Appendix 2) learning objects developed by means of TBL template should be interoperable with different instructional content. They should be able to be reusable and embedded into different structures and course formats. Therefore they must be presented in a standard form of IMS or SCORM deliveries. Based on the responses these LOs must be played in various LMSs, including Blackboard and others compliant with IMS and SCORM standards.

# 3.5.2. Conceptual model of Task-based Learning template

### Theory and models used

A model for organizing lessons based on tasks was offered by Willis (1996). Initially this model was developed for language courses; however it may be applied in different domains. According to Willis's TBL framework tasks can be used as the central component of a three part framework: "pre-task," "task cycle," and "language focus." These components were designed to create four optimum conditions for language acquisition. The framework that outlines the roles of the teacher and learners during a task-based learning lesson is the following.

- 1. *Pre-task.* Introduction to topic and task. Teacher explores the topic with the class, highlights useful words and phrases, and helps learners understand task instructions and prepare. Learners may hear a recording of others doing a similar task, or read part of a text as a lead in to a task. In the given research project the description of task itself is taken from the model developed within the scope of the DU's project Zelfstandig leren in een digitale omgeving (2004) (See section 2.3.2.3).
- 2. Task cycle
  - Task. Students do the task, in pairs or small groups. Teacher monitors from a distance, encouraging all attempts at communication, not correcting. Since this situation has a "private" feel, students feel free to experiment. Mistakes don't matter.
  - Planning. Students prepare to report to the whole class (orally or in writing) how they did the task, what they decided or discovered. Since the report stage is public, students will naturally want to be accurate, so the teacher stands by to give language advice.
  - Report. Some groups present their reports to the class, or exchange written reports, and compare results. Teacher acts as a chairperson, and then comments on the content of the reports.

Learners may now hear a recording of others doing a similar task and compare how they all did it. Or they may read a text similar in some way to the one they have written themselves, or related in topic to the task they have done.

3. Language focus

- Analysis. Students examine and then discuss specific features of the text or transcript of the recording. They can enter new words, phrases and patterns in vocabulary books
- Practice. Teacher conducts practice of new words, phrases, and patterns occurring in the data, either during or after the Analysis

Sometime after completing this sequence, learners may benefit from doing a similar task with a different partner.

### Learning scenario in TBL approach



Figure 10. Learning scenario in TBL approach

### Relation between learning scenario and template

The Table 1 presents items in template reflecting instructional design of TBL approach and correlation with learning scenario from Willis's model.

Willis's model	Items in template			
1. Pre-task	Item 1. Home page			
	This template page enables creation of cover page of the module and introductory			
	information about the module			
	Item 2. Task description			
	This template page is responsible for presentation of task description			
	Item 3. Task delivery			
	This template page enables to deliver the content of task			
2. Task cycle	Item 4. Task implementation			
2.1. Task	This template page refers students to appropriate areas where they can upload files and			
2.2. Planning	share knowledge, as well as discuss solution or consult with instructor.			
2.3. Report	Item 5. Report			
	This template page presents the requirements for the report about the task			
	implementation			
	Item 6. Submission			
	This template page directs students to the area where they can submit report			
	Item 7. Presentation			
	This template page directs students to the area where they can submit presentation			
	Item 8. Feedback and peer assessment			
	This template page directs students to the area where they can receive feedback from			
	instructor and peers			
3. Focus	Item 9. Analysis			
3.1. Analysis	This template page provides facilities to describe new task (analysis activity) for deeper			
3.2. Practice understanding of the problem and better perception of knowledge learned				
	Item 10. Practice			
	This template page provides facilities to describe new task (practical activity) for			
	training the skills obtained			
	Item 11. Examination			
	This template page allows to create examination test to assess students			

Table 1. Relation between learning scenario and template

# 3.5.3. Abstract structure of template

### Description of elements of the structure of template

Table	2.	Descri	ption	of	elements	of	the	structure	of	temp	late

Template item	Description
Item 1. Home page	This template item enables to create:
	1) title page of the module – input of title of the module (and other information, e.g.
	author, year, organization, slogan, etc.)
	2) introductory information about the module - this section contains a number of
	links to different sub-sections which provide detailed description of goals and
	learning objectives of the TBL module, instructional method, requirements, etc.:
	• instructor - this section provides information about instructor. Personal data
	include: name, faculty, e-mail
	• objectives – learning objectives of module (module, performance (Mager, 1997))
	• prerequisites - this section provides a list of prerequisites that a student has to have
	before staring this module: knowledge, skills, completed courses
	• competences - this section explains which competences a student should obtain
	after finishing this module
	• content - a list of literature used in this module (text description of resources)
	• assessment - this section explains what the system of grading is, how the learning
	activities are assessed, and how the final grade is calculated
	• organization - this section presents a description of organization of the module

Template item	Description
Item 2. Task	Description of task include following elements:
description	• Title of the task
	• Short description of the task
	• Objectives of the task
	Previous knowledge
	• Goal and end-product of the task
	• Expectations from the student
	Way of grading
	Criteria for grading
	Possibilities for extra help
	• An example of task
Item 3. Task	Presentation of task content including formats:
definition	• Text
	• Audio
	• Video
	• Multimedia
	• Image
	Other combinations
Item 4. Task	This item supports student in implementation of tasks and provides option to add text
implementation	and related link which directs student to:
	• Workspace is an area where all students can locate their documents and share
	knowledge (URL to workspace).
	• Discussion (URL to discussion)
	Consultation with instructor (e-mail)
Item 5. Report	This item allows to add text description of the requirements for the report
Item 6. Submission	Submission area where students put final report (URL)
Item 7. Presentation	Submission area where students put final presentation (URL)
Item 8. Feedback and	Discussion area (URL to discussion)
peer assessment	
Item 9. Analysis	This item allows to describe new task (analysis activity) for deeper understanding of
Item 10 Due the	the problem and better perception of knowledge learned
Item 10. Practice	I his item allows to describe new task (practical activity) for training the skills obtained
Item 11.	Small test (Q11)
Examination	

### Levels of granularity

The responses to the questionnaire (Appendix 2) show that from the usability point of view content developers prefer 3-4 levels of granularity. From the conceptual point of view the structure of template contains two levels of aggregation as was discussed in the section 2.2.3 Structure of the template.

The CISCO's RLO-RIO model is used as a basis for content organization. The first level of aggregation presents a course or in the given research referred as 'Module'. The relations between CISCO model and structure of TBL approach template are depicted in the Figure 11.



Figure 11. Mapping of CISCO's RLO-RIO model on the TBL approach template

At the level of RLO the following elements are mandatory within TBL approach template:

- *Homepage* contains elements that comprise a title page (text and images). This element specifies the layout of information on the title page of the module/course.
- *Module information* includes descriptive information about the module in the whole. This contains the following subelements presented as separate pages: instructor, objectives, prerequisites, competences, content, assessment and organization. These subelements contain in their turn internal descriptive subelements.
- *TBL model* allows creating as much tasks (RIO level) as needed. The task element contains all steps from description and presentation to implementation of the task. Each step has accordingly its own subelements.
- *Summary* aims to conclude the module and suggests some actions for students to broaden their knowledge and skills in given area
- *Examination* enables final testing at the end of the module/course.

The TBL model element within the TBL approach template presents a separate template for smaller LOs at the level of RIOs. This template has its own didactical structure which reflects task-based learning pedagogical approach. Based on the items of template structure specified in the Table 2 the TBL model element contains a set of subelements (ten steps) reflecting a flow of these items in the appropriate learning scenario. Consequently these steps are:

- Step 1. Task description
- Step 2. Task definition
- Step 3. Task implementation process
- Step 4. Report requirements
- Step 5. Submission terms
- Step 6. Presentation terms
- Step 7. Feedback and peer assessment
- Step 8. Analysis
- Step 9. Practice

Step 10. Test

### Ease of use

From the ease of use point of view the following issues should be considered:

- Learnability. It should be easy to understand the principles of template functioning from the first sight. And further using of template should not cause difficulties with remembering of functionality or principles of work.
- Number of operations and clicking. In order to make minimal number of clicking the structure of template should contain minimum levels of granularity with maximum number of subelements on each level.
- Consistence of elements. The template should be consistent in the use of design elements and their titles, language, formatting, appearance, and functionality. This implies that all screens or pages have a consistent layout, color scheme, and overall look. The structure of template should be consistent with appropriate similar titles of elements comprising structure of template. The availability of important elements and hiding of optional ones should be similar for every element and its descendants.

### Navigation the structure of template

The template has branch architecture. The structure of the template presents a tree with *TBL approach* element as a root. Every element matched with the sign contains subelements or children inside. In order to see these subelements a user should click icon then all included elements will appear.

According to the specifics of particular software (eXact Packager), the navigation in the structure of template is available through right mouse button menu. This menu offers either standard for the software application set of operations or a set of operations available only for particular element of the template.

### Support in using template

According to responses from the questionnaire (Appendix 2) content designers wish to be supported in using template. They want the structure of template to be clear and the template itself contain guidelines for working with it. In order to support content developers in fast and easy using template the help is provided in some forms:

- Help file or user guide with comprehensive description of all functionality of template. This document is available in the *TBL approach Help* file. To open this file user should right click at the PBL approach element and select option PBL approach Help at the bottom of the pop-up menu or just click F1 functional button.
- Hints and explanations in the context help files linked with appropriate elements of the template. The most complex elements contain *User guide* files. These files explain the purpose of the element and the way how to operate with the element.
- Tips within opening windows in the preview mode.

# 3.5.4. Informational model of template

### Input and output data

The results of the questionnaire (Appendix 2), particularly question 19, 20 and 21, show that learning content should include combinations of different kind of resources: Text, Pictures, Audio, Video and Animation where the input formats might be TXT, HTML, SWF, JPG, JPEG, GIF, MP3, PDF, PPT, WMP and AVI, and the desired output formats are SCORM, IMS packages and HTML documents.

Formats of input and output are described in the table below.

Element	Input format	Output format
Step 1. Task description		HTML page (step1html)
• Title of the task	Text (TXT)	
<ul> <li>Short description of the task</li> </ul>	Text (TXT)	
<ul> <li>Objectives of the task</li> </ul>	Text (TXT)	
<ul> <li>Previous knowledge</li> </ul>	Text (TXT)	
Goal and end-product of the task	Text (TXT)	
<ul> <li>Expectations from the student</li> </ul>	Text (TXT)	
Way of grading	Text (TXT)	
Criteria for grading	Text (TXT)	
Deadlines	Text (TXT)	
<ul> <li>Possibilities for extra help</li> </ul>	Text (TXT)	
An example of task	Advanced text	
Step 2. Task definition		HTML page (pagehtml)
• Text	Text (TXT)	
Audio	Audio (MP3)	
Video	Video (WMP, AVI)	
Multimedia	Multimedia	
• Image	Image (JPG, JPEG, GIF)	
Other combinations	HTML,XML,SWF,PDF,PPT,VRML	
Step 3. Task implementation process		HTML page ()
<ul> <li>Title of the process</li> </ul>	Text (TXT)	
Description	Text (TXT)	
• URL	URL	
Step 4. Report requirements		HTML page
• Title of the report	Text (TXT)	
Main questions	Text (TXT)	

Element	Input format	Output format
Number of pages	Text (TXT)	
Criteria for grading	Text (TXT)	
New requirement		
• Title of the requirement	Text (TXT)	
Description	Text (TXT)	
Step 5. Submission terms		HTML page
Submission deadline	Text (TXT)	
<ul> <li>Submission location</li> </ul>	Text (TXT)	
New term		
• Title of the term	Text (TXT)	
Description	Text (TXT)	
• URL	URL	
Step 6. Presentation terms		HTML page
Presentation title	Text (TXT)	
Presentation date/time	Text (TXT)	
Presentation location	Text (TXT)	
New term		
• Title of the requirement	Text (TXT)	
Description	Text (TXT)	
Step 7. Feedback and peer assessment		HTML page
• Title of the feedback	Text (TXT)	
Description	Text (TXT)	
• URL	URL	
Step 8. Analysis		HTML page
Title of analytical activity	Text (TXT)	
Description	Advanced text	
Step 9. Practice		HTML page
Title of practical activity	Text (TXT)	
Description	Advanced text	
Step 10. Test		HTML page
QTI test	QTI	

# 3.5.5. Interaction design of template

### Graphical design

In order to build a graphical design of template it is important to consider the following issues:

- Consistency in design elements, language, formatting, appearance, and functionality.
- All screens or pages have a consistent layout, color scheme, and overall look.
- Each page, screen, or section has an appropriate title.

Following established standards of design and conventions that are familiar to learners.

- Place main navigation elements either horizontally along the top or vertically down the left side of the screen.
- Place the titles and headings of pages, sections at the top-left of the screen
- Place company logo at the top-left corner
- Limit the number of icon types.
- If web links are present, do not disable link underlining.
- Make sure web link colors contrast sufficiently with text (both visited and unvisited links).

In the given research project the interface and layout of information within TBL approach template is provided by the DU. The interface is taken from the DU PageSet template. Interface of the TBL approach element has common style applicable for all descendants of the root element. This interface is presented in the figure below.



Figure 12. Interface of the template's page

### Principles of navigating and browsing the content of template

- Keep all navigational elements (buttons, links, etc.) in a consistent location on each screen.
- Keep the look of navigational elements (buttons, links, etc.) consistent from button to button and from screen to screen.
- Make sure all screens or pages provide clear and consistent navigation to all other available screens or pages.
- Allow learners the ability to undo actions wherever possible.
- Make sure the consequences of quitting or exiting are clear if the learner tries to quit while work is in progress.
- Allow the learner to select and sequence tasks when possible, along with dictating a single path.
- Provide an easy way to stop, skip, restart, or revisit animations, video, sounds, and other moving or audible elements.

# 3.6. Conclusion about TBL approach template design

As a result of the design phase a paper prototype of template was created. This includes structure and interface of template as well as data model and interface of content created by means of template.

The conceptual model of template describes which elements comprise structure of template. The main idea of template is that it contains two templates performing two levels of granularity according to CISCO's Reusable Learning Object Strategy where:

- TBL approach template presents level of RLO and describes LO with aggregation level of course or module
- TBL model template presents level of RIO and describes LO in the form of separate task according to task-based learning pedagogical approach

The TBL model template provides framework for comprehensive description of tasks but does not supply facilities for implementation of these tasks. Interactivity of template is restricted to the appropriate degree that standard LO may offer, i.e. it does not provide knowledge sharing, communication or collaboration facilities.

The description of the task is based on the Willis's model of TBL pedagogical approach and contain ten steps in describing of different activities which are normally carried out during the learning process following TBL pedagogy.

The concrete realization of the TBL approach template including conceptual and technical issues is discussed in the chapter 4 Development and implementation of templates.

# 4. Development and implementation of templates

This chapter contains description of developed product in general, including goal and main elements presented in the section 4.1 Description of the TBL approach template, as well as detailed descriptions of each subelement, their purposes and functionalities discussed in the section 4.2 Structure of the TBL approach template. This chapter includes illustrations from eXact Packager: fragments of template structure in relation to the final presentation of the content (examples of layout).

# 4.1. Description of the TBL approach template

The TBL approach template enables to create a complete instructional module. In technical terms this module presents a single Learning Object. In instructional terms it is a big piece of instructional content, such as course or lesson in its minimal expression. The size and duration of the module depends on the content developer's needs and preferences. Only content developer can decide how and with what to fill this framework. It may be, for instance three-hour training or three-month course. The difference is in the density of subelements inside the module.

The idea of template is to provide both a general framework for a course (RLO in CISCO's specification) and framework for separate task (RIO in CISCO's specification). The TBL approach template contains TBL model element which presents a single template embedded in order to provide description of a task according to the task-based learning pedagogical approach.

TBL model element presents an autonomic template which can be used for creation of smaller RIOs – tasks – and form them as separate Learning Objects for further reuse. However in the given case they are embedded into TBL approach template in order to demonstrate how RLO can be decomposed into smaller RIOs.

Besides TBL model element, there can be added any other template for RIO, for example template for problem case reflecting problem-based learning pedagogical approach, template for project reflecting project-based pedagogical approach, or slide-show template for presentation of material, etc.

Reusing of elements can be arranged at the level of RIOs (i.e. task), or at the level of RLO (i.e. the whole module). TBL approach template has a structure composed of several elements making instructional module a complete, self-constrained Learning Object available for reuse in different contexts. The structure of TBL approach template contains the following elements (see Figure 13):



### Figure 13. Structure of TBL approach element

- *User guide* (by default) This is a help file containing guidance how to work with the TBL approach element. It explains the purpose of the element, the way how it is functioning and gives examples how the TBL approach element might be filled in with the content. This is a text field containing pre-defined text. This text must not be replaced, deleted or changed. There could be only one occurrence of this element.
- *Title of the module* (by default) This is a title which is specified for the whole instructional module (LO) and is reflected at the bottom of each page within the module. This is a text field which should be filled in with the content, particularly short name of the module. This title can be, for example, a name of the course if the LO presents a course. There could be no or one occurrence of this element.

- *Homepage* (by default) This element is responsible for depicting of a title page of instructional module. It contains introductory information about the module. This element includes several subelements representing a single title page on the screen. There could be no or one occurrence of this element.
- *Information about the module* (by default) This element presents descriptive information about the module in the whole. It contains a number of subelements describing the module from different perspectives. There could be no or one occurrence of this element.
- *TBL Model* (by default) This is a core element of the template reflecting the model of taskbased learning. Due to this element content developer is able to specify and explicitly describe tasks, and structure them in sequences. There could be no or one occurrence of this element.
- *Summary of the module* (by default) This element aims to conclude the module and tie the objectives covered in each information object, such as Task, together. It also suggests some actions for learners to broaden their knowledge and skills in given area.
- *Examination* (by default) This element presents a final examination at the end of the module testing knowledge and skills obtained from the LO. It allows addition of different kinds of questions. There could be no or one occurrence of this element.
- *Help page (HTML)* (optional) This element is intended for content developers to input help file for students about how to work within the course. This page is filled in with an HTML file. This is an explanatory file containing information about what is the goal and structure of the course, how to navigate among pages, and what is the proposed way of navigating and browsing the course. There could be no or one occurrence of this element.
- Logo top left (36 x 36) (optional) It is a picture which appears in every page of the module demonstrating the Logo of producer of the content or educational organization where this content is used. This element assumes input of the picture of any graphical format, such as .jpg, .gif, etc. The format of the picture is 36 x 36 pixels. There could be no or one occurrence of this element.



Figure 14. Subelements of TBL approach element

# 4.2. Structure of the TBL approach template

This section explains goal and functionality of each element within TBL approach template.

# 4.2.1. Homepage element

Homepage element is responsible for the introduction into the module. This presents a title page. In order to attract the attention of students this element includes several subelements such as text, audio, picture. Within this element a content developer can specify the following subelements (Figure 15):



Figure 15. Structure of Homepage element

- *Title of the homepage* (by default) This is a title that will be reflected on the top of the screen. Normally it is similar to the title of the module specified for the TBL approach element, for example, name of the module/course. However it can be any different text that content developer consider important to be a title of a homepage. There could be only one occurrence of this element.
- *Image* (by default) This presents any graphical picture. The goal of this element is to make homepage attractive and bright for a student. The student should be motivated from the first page of the course that is why the role of good looking and fitting image is crucial. It should catch the attention and encourage student. There could be only one occurrence of this element.
- *Subtitle* (by default) This is a piece of text stressed with the style of subtitle. This element can be applied for pointing the most important issues on the homepage. There could be only one occurrence of this element.
- *Text* (by default) It is any kind of text contained in the homepage. This can be slogan or citation reflecting main idea of the module. The text should be short, clear, valuable and interesting in order to give a short overview of the problem of the module. The text shouldn't be very long and detailed, otherwise it will make homepage overloaded, messy, confusing and difficult to read. There could be only one occurrence of this element.
- *Audio* (optional) This presents any kind of audio file. This is a sound background for the homepage to pay attention to the content of the page. There could be no or one occurrence of this element.

In order to add optional or available element a user should point homepage element, right click and select appropriate element from the pop-up menu.

In order to delete some of the elements a user have to select appropriate one, click right mouse button and choose option 'Delete'.

# 4.2.2. Information about the module element

Information about the module element presents full description of the module from educational and organizational point of view. It contains the following subelements (Figure 16):



#### Figure 16. Structure of Module information element

- *Title of the info page* (by default) presents a heading that introduce this section. By default it has meaning 'Information about the module'. A user can change it into something else, for example 'Information about the course'. There can be only one occurrence of this element.
- *Instructor* (by default) provides information about instructor. Personal data include: Name, Faculty, Location (physical address were instructor is available), e-mail, and possibly picture. There could be no or one occurrence of this element.
- *Objectives of the module* (by default) include the module objective and performance objectives for the module. It presents a description of three components: performance, conditions and criteria. Performance is what the learner will be able to do as a result of instruction. Conditions are the circumstances under which performance will occur. Criteria describe how well learner will be expected to perform each objective. There could be no or one occurrence of this element.
- *Prerequisites* (by default) describe any prerequisite courses, certifications, tests, or activities the learner must complete before starting the module. There could be no or one occurrence of this element.
- *Competences to be achieved* (by default) explains which competences a student should obtain after finishing this module. This includes certification requirements which imply requirements according a curriculum that leads to certification. There could be no or one occurrence of this element.
- *Content of the module* (by default) includes description of instructional resources and gives summary of the module's content. Content element describes learning resources and format in which they will be provided to learners, as well as enables to add links to external and internal resources. There could be no or one occurrence of this element.
- Assessment principles (by default) is an overview of the methodology that will be used to determine the completion of the module. This element explains what the system of grading is, how the learning activities are assessed, and how the final grade is calculated. There could be no or one occurrence of this element.
- Organization of the module (by default) includes three component: Structure of material, Instructional sequence and activities and Delivery schedule. Structure of material describes each part that comprises the module, such as chapters, problems, tasks and exercises. The description of each part includes what it contains, how long it takes, how it fits into the other parts, and its purpose. Instructional sequence lists the order of topics within the module and a brief conceptual description of each. Delivery schedule describes the anticipated time that each content segment will take to complete. There could be no or one occurrence of this element.

### 4.2.2.1 Instructors

This element provides information about instructor. This includes the following subelements (Figure 17):



Figure 17. Structure of Instructors element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Instructor'. There can be only one occurrence of this element.
- *Instructor* (by default) allows addition of any number of instructors' descriptions. Each Instructor element includes subelements (Name, Faculty, Location and E-mail) that are text fields which need to be filled in with appropriate text. There could be not more than one occurrence of these subelements. However Instructor element can occur as much times as needed.
- *Photography* (optional) contains field for inputting photo in any graphical format, e.g. .gif, .jpg, etc. Photo element can occur only once within Photography element. But a user can add as much Photography elements as needed.

### 4.2.2.2 Objectives of the module

This element provides description of objectives of the module. This includes the following subelements (Figure 18):



### Figure 18. Structure of Objectives of the module element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Objectives of the module'. There can be only one occurrence of this element.
- *Module objective* (by default) enables to describe goal of the module in general, for example, 'the module is intended to improve qualification', or 'module aims to teach job-task', etc. This element contains two subelements: Objective title and Description. Module objective element can occur as many times as needed.

• *Performance objective* (by default) allows description of behaviour or skill that learners will obtain in this module. This includes four subelements: Objective title, Performance, Conditions and Criteria. These subelements are text fields which need to be filled in with appropriate text. From conceptual point of view the Objective title element can be any title, like 'Objective 1,2,3...' or 'Student will be able to...', etc. Performance is what the learner will be able to do as a result of finstruction. Conditions are the circumstances under which performance will occur. Criteria describe how well learner will be expected to perform each objective. There could be not more than one occurrence of subelements. However Performance objective element can occur as much times as needed.

### 4.2.2.3 Prerequisites

This element provides description of the prerequisites for the module, such as education, degree, skills, competency, etc. This includes the following subelements (Figure 19):



Figure 19. Structure of Prerequisites element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Prerequisites for the module'. There can be only one occurrence of this element.
- *Prerequisite* (by default) allows addition of any number of prerequisites' descriptions. Each Prerequisite element includes two subelements (Prerequisite title and Description) that are text fields which need to be filled in with appropriate text. From conceptual point of view the Prerequisite title element can be any title, like 'Prerequisite 1,2,3...' or 'Student should know...', etc. The Description element means detailed description related to the title of prerequisite. There could be not more than one occurrence of these subelements. However Prerequisite element can occur as much times as needed.

### 4.2.2.4 Competences to be achieved

This element provides description of the competences that will be achieved at the end of studying of the module. This includes the following subelements (Figure 20):



Figure 20. Structure of Competences to be achieved element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Competences to be achieved'. There can be only one occurrence of this element.
- *Competence* (by default) allows addition of any number of competences' descriptions. Each Competence element includes two subelements (Competence title and Description) that are text fields which need to be filled in with appropriate text. From conceptual point of view the Competence title element can be any title, like 'Competence 1,2,3...' or 'Student will gain degree...', etc. The Description element means detailed description related to the title of competence. There could be not more than one occurrence of these subelements. However Competence element can occur as much times as needed.

### 4.2.2.5 Content of the module

This element provides description of the learning materials (resources) that are used as a basis of the module. This includes the following subelements (Figure 21):



Figure 21. Structure of Content of the module element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Content of the module'. There can be only one occurrence of this element.
- *Resource* (by default) allows addition of any number of resources' descriptions. Each Resource element includes two subelements (Resource title and Description) that are text fields which need to be filled in with appropriate text. From conceptual point of view the Resource title element can be any title, like Resource 1,2,3... or Book/Article/Web-resource, etc. The Description element means detailed description related to the title of resource. There could be not more than one occurrence of these subelements. However Resource element can occur as much times as needed.
- URL (by default) provides link to internal or external resources. There can be 0,1 or many URLs.

### 4.2.2.6 Assessment principles

This element provides description of the assessment methods that will be used within the module. This includes the following subelements (Figure 22):



Figure 22. Structure of Assessment principles element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Assessment principles'. There can be only one occurrence of this element.
- Assessment (by default) allows addition of any number of assessment methods' descriptions. Each Assessment element includes two subelements (Assessment title and Description) that are text fields which need to be filled in with appropriate text. From conceptual point of view the Assessment title element can be any title, like 'Assessment 1,2,3..' or 'Final grade', etc. The Description element means detailed description related to the title of assessment method. There could be not more than one occurrence of these subelements. However Assessment element can occur as much times as needed.

### 4.2.2.7 Organization of the module

This element provides description of how the learning activities are organized within the module. This includes the following subelements (Figure 23):



Figure 23. Structure of Organization of the module element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Organization of the module'. There can be only one occurrence of this element.
- Organization (by default) allows addition of any number of organizations' descriptions. Each Organization element includes two subelements (Organization title and Description) that are text fields which need to be filled in with appropriate text. From conceptual point of view the Organization title element can be any title, like 'Organization 1,2,3...' or 'Structure of material', etc. The Description element means detailed description related to the title of the organization. There could be not more than one occurrence of these subelements. However Organization element can occur as much times as needed.

### 4.2.3. TBL model element

TBL model element presents a separate template for describing a task. The structure of this element depicts steps from the learning scenario for the task-based learning pedagogical approach. Due to this structure the TBL model element allows describing all important aspects related to task because it embraces all learning activities of the TBL.

TBL model element may contain from one to many Task subelements. By default there should be specified at least one task. There is no limit for the number of tasks. Content developer may specify as many tasks as needed, and build sequences of tasks, for instance with increasing level of difficulty. The structure of the TBL model element is presented on the Figure 24.

Task element includes *Title of the task page* element which presents a heading that introduce the Task section. By default it has meaning 'Description of the task'. However a user can change it into something else, for example title of the task, e.g. 'Task 1. Comparison of Complex systems', etc. There can be only one occurrence of this element.



Figure 24. Structure of TBL model element

Besides Title of the task page the Task element incorporates the listed above ten steps. More detailed each step is considered below.

### 4.2.3.1 Step 1. Task description

This element presents full description of the task including organizational and educational issues. It contains the following subelements (Figure 25):



Figure 25. Structure of Step 1 element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Task description'. There can be only one occurrence of this element
- *Title of the task* (by default) presents a full name of the task. There could be no or one occurrence of this element
- *Short description of the task* (by default) provides 1-2 abstracts of task description. This may contain information about learning activities that will be carried out within the task implementation process. There could be no or one occurrence of this element
- *Objectives of the task* (by default) shows what students are supposed to achieve by doing this task. There could be no or one occurrence of this element
- *Previous knowledge* (by default) defines which knowledge, skills and competences a student should obtain to be able to perform this task. There could be no or one occurrence of this element
- *Goal and end-product of the task* (by default) describes what the goal of the task implementation is, and what will be delivered as a final product. There could be no or one occurrence of this element

• *Expectations from the student* (by default) specifies which characteristics and abilities a student should demonstrate during implementation of the task and what results he/she must achieve. There could be no or one occurrence of this element

### 4.2.3.2 Step2. Task definition and example

This element is responsible for presentation of the task or example of the task. This means physical presentation of the task's content (not descriptive information as in the Step1). It allows adding definition to the task or example.

The structure of Step 2 element contains from one to many *Add definition* subelements (Figure 26). There is one task definition specified by default. However a user can add as much task definitions as needed.



Figure 26. Structure of Step 2 element

The task definition requires inputting of a *Title of the page* subelemet, and different data formats (if needed). *Title of the page* provides heading which appears in the top-left corner of the screen. The title can be, for example 'Task definiton' or just the name of the task or example.

The *Add definition* element allows describing the task or example using different forms of digital information such as audio, text, graphics, video, animation, etc. The list of all options available within Task definition and example element is presented in the Figure 27.

In order to add element for a task definition a user should mark Step 2 element, right click and select *Add definition* subelement from the pop-up menu. In order to specify the definition a used should right click Add definition element and choose one of the options shown in the Figure 27.



Figure 27. Subelements of Task definition element

Each task definition can be described as one page or a set of separate pages containing digital information, or it may include *Customizable HTML Page*, *External HTML Page*, and *Generic File*.

### 4.2.3.3 Step 3. Task implementation activities

This element is intended to inform students how they should act during implementation of the task. It refers students to appropriate areas where they can upload files and share knowledge, as well as collaborate, discuss solution or consult with instructor.

Task implementation activities element allows to list different options supporting task implementation. This element contains the following subelements (Figure 28):

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'During task implementation'. There can be only one occurrence of this element.
- *Knowledge sharing* (by default) explains where and how students can download and upload works, as well as refers them to the area where they can share their knowledge. There can be not more than one occurrence of this element.
- *Collaboration* (by default) explains where and how students can collaborate with each other. There can be not more than one occurrence of this element.
- *Communication* (by default) explains where and how students can communicate with each other. There can be not more than one occurrence of this element.
- *Consultation with instructor* (by default) explains where and how students can get extra help from instructor. There can be not more than one occurrence of this element.
- *Different activity* (by default) allows to describe any different kind of activity. There can be no, one or many occurrences of this element.



Figure 28. Structure of Step 3 element

Every subelement within Task implementation activities element except Title of the page subelement contains in its turn three subelements: *Activity title*, *Description* and *URL* as presented on the Figure 28. Each element can contain non-limited number of URLs however Activity title and Description elements can occur not more than one time within particular element.

### 4.2.3.4 Step 4. Report requirements

This element explains the requirements for report about the process of task implementation or any other kind of documentation.

Report requirements element allows to list different kinds of requirements grouped by the topic. There are four main groups specified. However a user can add any new set of requirements using Different requirement element.

Report requirements element contains the following subelements (Figure 29):

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Report requirements'. There can be only one occurrence of this element.
- *Content requirement* (by default) describes requirements and restrictions for the content of the report. There can be not more than one occurrence of this element.
- *Format requirement* (by default) describes requirements and restrictions for the format of the report. There can be not more than one occurrence of this element.
- *Time requirement* (by default) describes requirements and restrictions for the time terms of the report. There can be not more than one occurrence of this element.
- *Grading requirement* (by default) describes requirements and restrictions for the grading conditions of the report. There can be not more than one occurrence of this element.
- *Different activity* (by default) allows to describe any different kind of requirements. There can be no, one or many occurrences of this element.



Figure 29. Structure of Step 4 element

Every subelement within Report requirements element except Title of the page subelement contains in its turn three subelements: *Requirement title* and *Description* as presented on the Figure 29. Requirement title and Description subelements can occur not more than one time within particular element.

### 4.2.3.5 Step 5. Submission conditions

This element is intended to inform students where, when and how they should submit their task or report. It directs students to the area where they can submit their works. Submission conditions element allows to list different kinds of conditions, such as time, location, etc.

Submission conditions element contains the following subelements (Figure 30):



Figure 30. Structure of Step 5 element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Submission conditions'. There can be only one occurrence of this element.
- *Time condition* (by default) describes time conditions for the submission of the task or report. There can be not more than one occurrence of this element.
- *Location condition* (by default) describes place conditions for the submission of the task or report. There can be not more than one occurrence of this element.
- *Different condition* (by default) allows to describe any different kind of conditions. There can be no, one or many occurrences of this element.

Every subelement within Submission conditions element except Title of the page subelement contains in its turn three subelements: *Condition title* and *Description* as presented on the Figure 30. Condition title and Description subelements can occur not more than one time within particular element.

### 4.2.3.6 Step 6. Presentation conditions

This element is intended to inform students about terms of presenting of task solution. It directs students to the area where they can submit presentation. Besides it can define where and when the presentation will take place. Presentation conditions element allows to list different kinds of conditions, such as time, location, etc.

Presentation conditions element contains the following subelements (Figure 31):



Figure 31. Structure of Step 6 element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Presentation conditions'. There can be only one occurrence of this element.
- *Time condition* (by default) describes time conditions for the presentation of the task or report. There can be not more than one occurrence of this element.
- *Location condition* (by default) describes place conditions for the presentation of the task or report. There can be not more than one occurrence of this element.
- *Different condition* (by default) allows to describe any different kind of conditions. There can be no, one or many occurrences of this element.

Every subelement within Presentation conditions element except Title of the page subelement contains in its turn three subelements: *Condition title* and *Description* as presented on the Figure 31. Condition title and Description subelements can occur not more than one time within particular element.

### 4.2.3.7 Step 7. Feedback

This element directs students to the area where they can receive feedback from instructor and peers. Feedback element allows to list different options for getting feedback.

Feedback element contains the following subelements (Figure 32):



Figure 32. Structure of Step 7 element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Feedback'. There can be only one occurrence of this element.
- *Feedback* (by default) describes different conditions for getting feedback. There can be no, one or many occurrences of this element.

Feedback element contains three subelements: *Feedback title*, *Description* and *URL* as presented on the Figure 32. Feedback element can contain not limited number of URLs however Feedback title and Description subelements must occur not more than one time within Feedback element.

### 4.2.3.8 Step 8. Analysis

This element enables to specify analytical activities that need to be carried out by students such as mistakes analysis and correction, and general work revision. Analysis element allows describing various kinds of analytical activities.

Analysis element contains the following subelements (Figure 33):

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Analysis'. There can be only one occurrence of this element.
- *Analytical activity* (by default) describes different kinds of analytical activities. There can be no, one or many occurrences of this element.



Figure 33. Structure of Step 8 element

Analytical activity element contains two subelements: *Analytical activity title* and *Description* as presented on the Figure 33. Analytical activity title and Description subelements must occur not more than one time within Analytical activity element.

### 4.2.3.9 Step 9. Practice

This element enables to specify practical activities that need to be carried out by students in order to remember and remain knowledge and skills learned from the task. Practice element allows to describe different kinds of practical activities.

Practice element contains the following subelements (Figure 34):



Figure 34. Structure of Step 9 element

- *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Practice'. There can be only one occurrence of this element.
- *Practical activity* (by default) describes different kinds of analytical activities. There can be no, one or many occurrences of this element.

Practical activity element contains two subelements: *Practical activity title* and *Description* as presented on the Figure 34. Practical activity title and Description subelements must occur not more than one time within Practical activity element.

### 4.2.3.10 Step 10. Test

This element enables to carry out testing activity in order to specify how good the instructional content from the task was perceived and adopted by the student.

Test element contains the following subelements (Figure 35):

• *Title of the page* (by default) provides heading which appears in the top-left corner of the screen. The title can be, for example 'Test'. There can be only one occurrence of this element.

• *Test session* (by default) allows to add different kinds of questions into the Test element. There can be no, one or many occurrences of this element.

	Test			Digitale Universiteit
	Select the I	right answer(s):	2	?
/	1/5	is the fact true?		
		C No C Yes		
	•	12345	(H) FINISH	
⊇-ஜூ Step 10. Test  ]] TITLE of the PAGE - Text  ஜ Test Session	_	Inhoud 4C CV		Title of the module

Figure 35. Structure of Step 10 element

# 4.2.4. Summary of the module

This element aims to conclude the module and tie the objectives covered in each information object together. It also suggests some actions for learners for future investigation of the given area. Summary of the module element contains three subelements (Figure 36), each of them presents single page:

- 1. Review concludes what the learner has learned in the RLO (touch on all the RIOs in this RLO). It restates objectives and importance of this RLO.
- 2. Next Steps suggest other RLOs that are related to this RLO and recommend other areas of study.
- 3. Additional Resources list URLs, PDFs, documents, and other resources that will help the learner study more about the knowledge and skills covered in this RLO. Resources are accompanied by one sentence describing each resource.



Figure 36. Structure of Summary of the module element

All three subelements of contain title and description subelements.

# 4.2.5. Examination element

The last element of the TBL approach template is Examination element. It allows adding final examination into the structure of the module. This element can occur not more than one time within PBL model element. The structure of this element is presented in the Figure 37.



Figure 37. Structure of Examination element

There are 6 types of questions available (Figure 38):

True false	Multiple choice	Multiple response
Test	Test	Test
	Select the side assesses	Select the side assesses
15 Jothe Spot Sour?	25 Mitol alos the Armo 11 mean?	36 When still Ebigpen?
C 10	C Monet1	E 100
<. NI		
C Yes	@ Answer2	C 1981
	C Array 2	E 200
(4) (4) 1 2 3 4 5 (b) (FINESH)		
	(4) 4) 1 2 3 4 5 (b) (FINISH	(4) 4) 1 2 3 4 5 6 (b) (FINISH
throad 4D DF	Nexad 4D DP	Title of the module
Ranking	Essav	Image hot spot
Test	Test	Test
Sort listed elements:	Pirase asswer the question:	Point to target area:
46 Rank dense by importance	55 Write easily about topic 1.1	66 Pointeingstawa
Answer 3		A STATE STATE AND A STATE A
Anzwer 1 2		
ADSWEE 2		
	(4) (4) 1 2 3 4 5 (b) (FINISH)	
Anzawar 4		
(14)(4) + 2 2 4 5 5 (14)(14)(17)(17)(14)		
() () I Z S T S C () (PINISH)	Inhead (4D D)	×

Figure 38. Types of questions

# 4.3. Conclusion about development and implementation of TBL approach template

As a result of development TBL approach template was produced. This template was programmed outside the LCMS learn eXact and formed in a Guinti's standard package (LO model) which was embedded into the eXact Packager and used as a 'Models and wizards' tool inside the eXact Packager. The template package contains LOmodel.xml file which is responsible for the abstract didactical structure of template and a number of style sheets (XSLT files) for rendering of LO and presentation of the content in appropriate way as presented on the Figure 39.



Figure 39. Structure of files within template package (LO model)

During the design and development phases the formative evaluation was carried out that enabled to gradually improve template within its elaboration period. The overall description of the procedure of formative evaluation and its result is presented in the chapter 5.
# 5. Evaluation of the TBL approach template

This chapter describes the evaluation of the major outcome of the research project, the TBL approach template designed and developed within the scope of this project. This chapter specifies the framework for evaluation including the goal, objectives, methods and criteria of evaluation, as well as an analysis and discussion about the results. It includes the following sections: 5.1 Evaluation framework, 5.2 Results of the evaluation and 5.3 Discussion of the overall results of evaluation.

## 5.1. Evaluation framework

As the goal of the given research project is to develop a template which effectively supports content developers therefore the goal of the evaluation is to assess future user satisfaction with utilizing the template, as well as predicting its eventual effectiveness.

Consequently three appropriate evaluation questions would be:

- 1. Does the template meet the expectations and requirements of content developers?
- 2. How efficient and easy to use is the template?
- 3. How good is the content developed by means of template?

During the time frame of this project, there was not the opportunity for DU content developers to actually use the template. Therefore no direct evaluation of these questions could occur. Instead, the evaluation for this project focused on two preliminary forms of evaluation. These had the goals:

- 1. To examine what strength and weaknesses of template are in order to define features of the template that should be re-designed and improved for the further enhancement of template.
- 2. To assess the template in respect to its potential effectiveness and user-satisfaction.

These questions were addressed via two types of formative evaluation.

For the first objective a technically oriented formative evaluation was carried out during design and development phases. This is a type of evaluation that is normally "used in the development stage to guide an evolutionary process" (Krathwohl, 1998)

This first formative evaluation was divided into four steps:

- Step 1. Analysis of DU pageSet template and its functionality (done by the researcher)
- Step 2. Analysis of the design of the structure of the desired TBL approach template based on the DU pageSet template, (done via consultations with an expert)
- Step 3. Development of the first prototype of TBL approach template (on-going consultations with the expert)
- Step 4. Development of the pre-final version of TBL approach template (consultation with the expert)

All these stages were carried out by the researcher in cooperation with an expert in the field of educational sciences and technology who is an experienced user of learn eXact software. The heuristic evaluation approach was used as an evaluation method. According to Nielsen's (1994) definition heuristic evaluation is a "method for finding the usability problems in a user interface design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the "heuristics")"

This method was used in order to identify usability problems based on established human factors principles. This method provided recommendations for design improvements. However, as the method relies on experts, the output naturally emphasized interface functionality and design rather than the properties of the interaction between an actual user and the product.

In most cases the heuristic evaluation was carried out in the form of template testing and verbal discussions which were recorded and used for further template development. The stages were concluded by the production of final TBL approach template.

For the second objective a second formative evaluation was carried out after developing the product but before it could be used in real practice. This evaluation was implemented in the form of usability testing which is the most appropriate solution for predicting eventual user reactions and results by a group of persons with expertise in the type of software and knowledge of the eventual target users.

The methodology of carrying out usability testing that was used in the second formative evaluation was adopted from Preece, Rogers and Sharp (2002). According to their definition usability testing involves measuring typical users' performance on carefully prepared tasks that are typical for whom the system was designed. During the performance tasks users are watched and recorded. User satisfaction questionnaires and interviews are used to elicit users' opinion. The process is strongly controlled by the evaluator. The typical number of participants is too small for much statistical analysis. User satisfaction data from questionnaires tends to be categorized and average ratings are presented.

As the template was designed and developed according to methods of user-centered design, the decision about methods of evaluation was derived from the works related to user-centered design such as UsabilityNet (Bevan et al 2002), Nielsen (1993), Mayhew (1999) and Vredenburg et. al. (2002). The evaluation methods suggested by these authors were analyzed and the following methods regarding usability testing were adopted for the second formative evaluation: Attitude measures and Cognitive workload measures.

Attitude measures (as a form of subjective assessment) demonstrate how users feel about the tool they are using. This is distinct from how efficiently or effectively they perform with the software. The usual method of attitude assessment is a standardized opinion questionnaire. Cognitive workload measures show the effort users invest in using the tool which reflects how efficiently they work with the software. For the current formative evaluation, the expert respondents would not have the chance themselves to use the tool, so thus only their opinions about the eventual cognitive workload of the product could be asked.

Consequently for the purpose of the usability testing two data collection tools were used: an interview and a questionnaire. The principles for building interview and questionnaire were adopted from Harvey (1998) relating to the evaluation of learning materials for their effectiveness in achieving specific learning objectives.

The developed questionnaire contained three parts: (1) Background information, (2) Evaluation of content developed by means of the TBL approach template and (3) Evaluation of the TBL approach template. The full text of questionnaire is presented in Appendix 5.

- The first part of the questionnaire provides information about general knowledge of learning objects, task-based learning pedagogy, and experience in content development and working with learn eXact.
- The second part of the questionnaire is built on the criteria defined by MERLOT (2000), Muirhead & Haughey (2003) and Moral & Cernea (2005). The criteria are: potential effectiveness as a teaching-learning tool, potential quality of content developed with the template, ease of use, user control and freedom, conceptual design (contents structure) and presentation design for learning of materials developed with the template.
- The third part of the questionnaire for the second formative evaluation of the TBL approach template is based on criteria from Preece, Rogers & Sharp (2002) effectiveness, efficiency, safety, learnability, memorability and utility--and Nielsen's (1993) usability criteria learnability, efficiency, memorability, errors and satisfaction.

For the second formative evaluation the following set of respondents was used: five instructors of the Technology Applications in Education and Training (TAET) Master of Science program of the University of Twente who are experts in educational science and technology; and one expert who

while being a TAET Master of Science Program instructor is a specialist in learn eXact software as well. This sample was chosen for several reasons:

- 1. The number of respondents is five instructors and one instructor/expert. The rationale for this size of group is provided by Nielsen (2000) who argued that "The best results come from testing no more than 5 users". Therefore five instructors implement usability testing and the expert evaluation is considered separately from instructors.
- 2. The use of instructors from the TAET Master of Science program assures that an assessment of didactics is being made by professionals in the field of education and training. Moreover, being instructors in the TAET program they are able to fairly judge about the technical part of the template along with the pedagogical aspects.
- 3. The expert in learn eXact software can competently criticize the template from a technical and system's point of view.

The results of the two formative evaluations are discussed in section 5.2.

## 5.2. Results of the evaluations

This chapter further discusses the ways that the evaluation processes were carried out and the results that were obtained. It describes both formative evaluations.

### 5.2.1. First formative evaluation

The first formative evaluation was carried out during the design and development phases. The evaluation process was divided into four steps:

- Step 1. Analysis of DU pageSet template and its functionality
- Step 2. Analysis of the design of the structure of the desired TBL approach template based on the DU pageSet template, in consultation with an expert
- Step 3. Appraisal during the development of the first prototype of the TBL approach template, in consultation with an expert
- Step 4. Analysis during the development of the pre-final version of TBL approach template, in consultation with an expert.

Each of these steps contributed to the on-going template development. The steps will be described in detail in the following sections.

### Step 1. Analysis of DU pageSet template and its functionality

The original idea of the template design was to use the DU pageSet template as a basis for future development of the TBL approach template. The DU pageSet template was tested by the researcher for several criteria: flexibility, completeness, ease of use and instructional meaning. The results of this analysis are:

The conclusion was that the template provides very limited functionality. This template enables development of course materials only in the form of a slide show. It allows adding various kinds of pages from regular to external and customizable HTML pages with a wide range of multimedia resources. The advantage is that the template provides a large number of types of resources that can be input for the course materials from text and image to movie and animation.

From an instructional point of view the template doesn't provide any kind of support for content developers. It gives a very broad range of granularity for the produced LOs, from as small as the definition of a term to as large as a full lesson or even the learning material for an entire course, depending on the content developer's own requirements, abilities and imagination. The DU template doesn't provide any guidelines, hints or models for instructional design.

Another weakness of the DU template is that the structure of the template is not completely clear. Also, the interface of template is not user friendly. There is inconsistency in the titles that makes it very difficult to get started and operate with the template.

The advantage of the DU template is that the template enables the creation of good looking and attractive courses with high interactivity (within the linearly presented pages) and rich media formats. The only disadvantage of the content interface is its not handy navigation. The table of contents is presented as a separate window, not embedded into the main frame.

The decision was to use the DU interface for content presentation and the options for adding various types of resources. However it was concluded that the structure of template itself needed to be changed.

# Step 2. Design and analysis of the structure of the desired TBL approach template based on the DU pageSet template, in consultation with an expert

The structure of the template was built according to the ten-step TBL learning scenario based on Willis's model (1996; see section 3.5.3 Abstract structure of template) by means of the DU pageSet template. The conceptual structure of new template was accepted by the expert. However the realization of the template was criticized by the expert, from the points of view of efficiency and ease of use. As the structure was made by adding new pages which allowed incorporation of only one- or two-level deep granularity, sometimes there were not enough facilities to create elements which required a deeper level. Another disadvantage was that all the elements of the structure had the same names: page/text/image etc. depending on functionality of element. According to the expert, such a kind of structure is difficult to use because it is not clear and the organization of elements is mostly irrational due to the template restrictions.

The decision as a result of this step of the first formative evaluation was to create a predefined structure which reflected the abstract didactic structure of a learning object based on TBL. In addition it was decided to name each element within the structure with an unique and explicit title which demonstrates the functionality of the element.

### Step 3. Development of the first prototype of the TBL approach template and consultation with an expert

After the first prototype of a new TBL approach template was created it was tested by an expert for efficiency, effectiveness, ease of use and pedagogical value. The conclusion was that the template better fit the characteristics of the particular pedagogical approach than did the original DU template. The expert felt that it is a very supportive tool for content developers from the technical and instructional-design points of view.

However some disadvantages were found that the expert recommended be changed. First the inconsistency of the titles of several elements was specified. The word 'course' was changed into 'module', for example in the 'Information about the module' element. Most of the elements contained similar sets of subelements that were re-defined in a standard way: 'Title'+ 'Definition'+ 'URL'.

Second the expert commented on the inconsistency of the structure of the subelements. It was decided to present most of the elements in a general way that allows avoiding restrictions by concrete terms and provides generalization to the level of title-description.

### Step 4. Development of the pre-final version of the TBL approach template and consultation with expert

When the pre-final version of the TBL approach template was complete it was tested by the expert for the most of the parameters specified in the evaluation framework (section 5.1). The expert's opinion was that the template would be an effective and efficient learner-teacher tool. However from the point of view of learnability and memorability the expert felt that the template was not enough supported. Therefore the decision was to develop a help system which facilitates the use of template. As a result an 'User guide' element was added for each complex element of the structure. The aim of such files is to provide explanatory information about the associated elements and their descendants including purpose, functionality and examples. Besides user guides and hints, an example module was elaborated by means of the TBL approach template which demonstrated functionality of each element by providing descriptive content. (This was illustrated via the screen dumps in Chapter 4.)

All of the expert's remarks and recommendations were considered by the research, weaknesses were modified and template improved. The template was re-designed and the final version of template within the scope of this research project was produced. The formative evaluation of the final stage of the product is presented in section 5.2.2.

### 5.2.2. Second formative evaluation

The second formative evaluation was carried out after the development and implementation of the TBL approach template by five instructors and one instructor/learn eXact expert from the TAET Master of Science program. The evaluation involved usability testing in the form of an one-hour evaluation session including an interview with each participant in the evaluation. During the evaluation session the participants were asked:

- To listen to the introduction given by the researcher and browse the template
- To communicate and give opinions about their first impression of the template
- To test the template by doing simple tasks
- To fill in the questionnaire

The results of the evaluation sessions were recorded. For some of the respondents, there was no time to test the template by doing a simple task. The results of the questionnaire are presented in the Appendix 6. The detailed analysis of results of the second formative evaluation is described in the following three subsections. These subsections involve an analysis of responses from the questionnaire.

### 1. Background information

As it is seen from the questionnaire almost all of the TAET instructors are aware of the task-based learning pedagogical approach but not all of them use this approach in their teaching practice. All of the instructors have (more or less) a considerable amount of experience in creating content for their courses. Although all the instructors know the concept of Reusable Learning Objects only half of them use this concept for creation of their courses' content. While all of the instructors are professionals in technology applications for education and training and aware of LCMSs none of them had ever tried to use *learn eXact software* for course content development and only the instructor who was also an expert in this area was familiar with this software application.

This background information ensures that the participants in the evaluation are people with considerable teaching and content developer experience. However only half of them regularly use the TBL pedagogical approach. So while evaluating the degree of compliance of the TBL approach template to the principles of TBL pedagogy we can make allowance that they don't really practice this approach and thus may not able to fully judge the effectiveness of the template and its pedagogical value.

Another assumption is that participants have enough computer skills to quickly get used to the new software. However this doesn't eliminate the factor that none of them had ever used the software before. Thus some responses about ease of use and efficiency of the template are doubtful because the reason of negative answers might be not the weakness of the template itself but just lack of experience and adaptation to the not-traditional software application. Moreover the learn eXact application itself is a very complicated system which makes evaluation even more difficult. As one expert commented "Ease of use depends also on the authoring tool that requires a lot of support". However, all respondents have had experience with other authoring tools and systems, so could make an informed judgment about the ease of user of the template.

### 2. Evaluation of content developed by means of the TBL approach template

The responses to the questionnaire showed that the participants in general agreed that the TBL approach template could support the development of effective learning content from both the teachers' and students' perspectives. This template enables the creation of media-rich learning materials that can help make the presentation of information attractive, motivating and stimulating. However not all respondents agreed that the content developed by means of the template will really improve the ability of teachers to teach and learners to learn.

The goal of the template was to create content that improves the learner's ability to study the presented materials and here most of the participants indicated a neutral attitude. The reason for such neutral positions is that the participants didn't see any real content created by the template and therefore it was difficult for them to judge the effectiveness of potential learning content just by assessing the structure of the content and imagining how a LO might be possibly worked out.

Regarding compliance of the template with TBL pedagogy all participants demonstrated strong agreement that the template embraces all the main characteristics of this pedagogical approach and supports the realization of the TBL scenario. All participants stated that the template enables explicit description of a learning task as well as efficient presentation of the instructions for the task.

The structure of learning content presentation was assessed in general as logical, didactically correct, clear and efficient. Moreover all elements of the template were referred to as potentially useful. However more neutral attitudes were demonstrated regarding the analysis, practice and test elements. The respondents were more positive about the rest of the elements in the template. However many participants mentioned that it was difficult to judge the structure of eventual content presentation without seeing real content.

One of the participants was critical of the usefulness of the elements from the didactic point of view. She mentioned that "Describing is not enough for supporting activities such as collaboration". This is an important comment. However such kinds of support for interpersonal interactivity is provided by the learn eXact learning management system (for example, through the provision of chat and discussion tools) and thus out of the scope of the content objects themselves. But increased possibilities for interaction with the content could improve the effectiveness of the content.

In respect to the structure of content presentation one of the experts made a comment that "For the tasks some steps may be appropriate sometimes but not always. Some steps may never be used." However this problem is easily solved by the template. The template doesn't force the author to use all the elements of the structure. It only provides the maximum set of possible elements for task description. It is the content developer's decision which of them to use and in what sequence.

Questions about the interface of the learning content presentation demonstrated generally positive attitude to the style and layout of pages. However most of the participants reflected a neutral or even negative reaction to the attractiveness of page presentation and expressed doubt that such a kind of page presentation facilitates the perception of information. The participants expected to see different (and common available for example via html) possibilities for content presentation which are out of the scope of the given TBL approach template. The main focus of the template was rather on the task description than of the presentation of learning materials. However their general criticism of the linear presentation is fair.

Regarding the ease of use of the content developed by means of the template all participants gave positive feedback by saying that the navigation is simple, all elements of the content are easily accessible and accessing the learning content doesn't need much documentation or technical support.

### 3. Evaluation of the TBL approach template

From the responses on the questionnaire it is seen that all the participants agreed or even strongly agreed that the template has the potential to be an effective tool which does what it is supposed to do and has the potential to help a content developer to perform his or her tasks. Moreover all of them stated that the template provides enough support to carry out activities and gives a lot of flexibility in creation of content.

However one participant disagreed that the use of the template will save time and effort. He had initially negative perspective to any kind of structuring based on instruction design that calls for an 'extra-detailed' description of learning activities. He called this "wasting time". However the idea of this question was not about workload of content developer but more about technical aspects. If a content developer doesn't need any element he can simply delete it from the structure which demonstrates the flexibility of the template. Technically, for authors taking a detailed approach to the

design and development of a LO, the template can save time and effort in comparison with the DU pageSet template for example.

In respect to the eventual utility of the template, most of participants agreed that the template provides an appropriate set of functions that enable content developers to carry out their tasks in the way they want to do them, again if they wish to make learning objects in this sort of structured way. The rest of the respondents were neutral because they didn't work with the template in a real situation with concrete content so they were not able to judge about the sufficiency of its functionality.

In respect to learnability most of the participants argued about its high level. They said it appears easy and fast to get started with the template and learn its functionality. However the one expert stated that the functionality of the learn eXact software is not traditional. Thus it is more difficult to get started with the software itself than with the template. He mentioned that "I think that the technical problems within the authoring tool are the biggest reason why use will be problematic. The inflexibility of the authoring tool in lex makes it hard to use. What is created is hard to check because you won't see directly what is created". So from his point of view the technical aspect of the software application has a bad influence on the learnability and ease of use of the template itself.

Most of the participants indicated that, from what they had seen, there was a high level of memorability in the template. However they were neutral regarding errors and their occurrence. They didn't have opportunity to test the functionality so they couldn't judge about the number of errors that might occur.

Most of the participants were satisfied with the design and structure of the template except one. She criticized the linear structure of the content likely to be produced and argued that a template should stimulate the creation of more interactive interpersonal activities rather than content.

Almost all the participants agreed that the template is consistent in the structure of elements, their names and functionalities. However some of them criticized the following sub elements of the TBL model element: analysis and practice, by saying that "it's not obvious what was meant by the title. Other activities seem to be responsibility of instructor while these are responsibility of a student." For some participants the goal and functionality of these elements were not clear, as well as the goal and functionality of the Task implementation activities, Presentation conditions and the Logo top left elements.

In general the respondents had a good impression of the template, within its own frame of reference. Most of the participants thought that it would be satisfying, helpful and even rewarding to use this template. They called the support of interaction design with the template helpful and satisfactory as well. Some of the participants even mentioned that the use of the template could motivate and even support the creativity of content developers.

So the general attitude of the respondents is positive. However different participants stressed different aspects related to improving the template and demonstrated different behaviors in reacting to it, which are discussed in section 5.3

## 5.3. Discussion of the overall results of evaluation

Most of the participants of the evaluations emphasized the helpful character of the template. But all of them see the application of the template differently. Some of them were just satisfied with the idea of template and its realization. They mentioned that the template is effective and efficient, however they didn't work with template carefully so they could judge only the idea and reflect a first impression. One of such final remarks was that the template could be "very useful and efficient for instructors/course developers".

Moreover one instructor even wanted to use this template further for her own teaching purposes. She was the only instructor who tried to describe a small example of her course by means of the TBL approach template. She commented: "The tool (lex) is probably handy but I have to practice more. I really like the template itself and would like to use it in my course". She is a specialist in the TBL pedagogical approach so her view on the didactic value of the template is very important. However she as well as the expert experienced difficulties with adaptation to the learn eXact software itself.

Another participant continued this idea of difficulties with the learn eXact tool, that although the template itself makes a good impression after some explanation, it seems too complicated from the first sight for unfamiliar users and there should be extra motivation for using it. He said "I imagine this costs a lot of time for content developer if they just use the templates. It would be a crucial task to make them feel the templates could save time and effort at a longer term basis. Thus an introduction should be quite motivating to users."

In addition to positive reactions there were also some critical comments. One of the participants mentioned that although the template seems very well structured and logical he will never use it in his own practice. The reason is that such long descriptions of exhaustive information doesn't really increase the effectiveness of the content developed by means of the template. He argued that content development with the use of such a kind of templates requires redundant time and effort investment while the structuring of information might not bring the desired improvement of students' performance. In general he followed a more-intuitive approach to content development than a traditional instructional design approach, so the idea of the template itself seemed not valuable for him.

Another critical opinion reflected the same idea of extra effort but discussed this problem from a different perspective. The participant said "I understand the value, but it is too much focused on what I will type in, rather than helping me thinking of interesting things for students to do". From her point of view the main idea of the course is to allow students to be active, for the instructor to guide, motivate and stimulate them for different sorts of activities during the whole learning process, and such organization of content doesn't provide continuous support for this type of learning, it is just one fixed description of the task which doesn't really much support the implementation of the task itself. Such organization "reflects an instructor-peer neutral CBT-module more than the development of an 'activity design'." According to her comments "the danger is that the linear steps, 1,2,3, while logical doesn't translate to students being active and getting ongoing feedback, support, and interaction." Her recommendation was to change the linear flow of activities into more interactive forms of operating with the content. Regarding motivating content developers she proposed to "have a library of examples that will help to motivate the author/instructor".

So from all these comments, remarks and criticisms we may conclude that the template itself is well structured and didactically correct as far as it reflects its particular theoretical background. However in practice this approach might not work effectively.

Consequently the next step should be an evaluation of real content developed by means of the TBL approach template and assessment of its quality, effectiveness and efficiency. A couple of different evaluation events should be carried out. First, performance evaluation where content developers will be asked to carry out a particular set of tasks that will allow measuring of the exact performance of the target audience, including time calculations and effort expenditures. Then the real products created by content developers should be assessed for their quality. In this way we can measure the real output of working with the template. This implies that the performance evaluation should take place among DU's content developers as they are the main target group. Although TAET instructors are also potential users of the template they had never worked with learn eXact and didn't have a goal of creating courses by means of this software application which made the results of evaluation less valuable then they will be with a real user evaluation.

The overall conclusion of the research project and proposed recommendations are presented in the chapter 6 Conclusions and Recommendations.

# 6. Conclusions and Recommendations

This chapter concludes the results of the research project and gives recommendations for future development of the research by analyzing main problems, proposing appropriate solutions and specifying trends and directions for further investigation and elaboration. This chapter includes the following sections: 6.1 Conclusions and 6.2 Recommendations.

# 6.1. Conclusions

Based on the two formative evaluations in the form of a series of heuristic walkthroughs with a technical specialist, and usability testing with five instructors and one expert from the University of Twente, the following conclusions can be drawn in relation to the goal of the project, which was to support content developers with tools that facilitate the process of learning content development.

The results of the evaluation were very positive. Most of the participants demonstrated enthusiastic attitude to the idea of template itself and its realization in particular. In general all participants agreed that the TBL approach template provides rich framework for describing tasks according to the task-based learning pedagogical approach. They called the use of template satisfactory and helpful, and sometimes even motivating and supporting creativity. One of the instructors was even ready to apply this template for the next revision of the course, while others called the template logical, reasonable and probably useful in the real situation of content development.

However two instructors demonstrated skeptic attitude to the TBL approach template although they understood particular value of it. One of them denied any idea of instructional design therefore the template itself looked useless and not efficient. Another participant criticized CBT model of presenting content by arguing for development of more interactive content which motivates and stimulates students' activities.

Considering this positive and negative feedback we can make some conclusions in respect to the following critical issues related to the primary goals of the research project:

- 1. The support of content developers
- 2. The need for instructional design
- 3. Effectiveness and time consuming factor
- 4. Quality of content developed by means of template
- 5. Using the template in learn eXact and efficiency for instructors

More detailed description of each of the conclusions is presented in the following sections.

### 1. The support of content developers

General impression of the instructors on the TBL approach template was good and it seemed to provide big support for content developers. Participants of evaluation in general were satisfied with the template and its facilities and functionalities. They liked the way a task can be described by means of template. They called it didactically correct, theory-based and logical.

As the participants were instructors but not content developers they were more concerned about possibilities for content creation and pedagogical aspects rather than evaluation of technical parameters such as ease of use and efficiency of a kind of software application. Therefore they judged more from the perspective of instructors than content developers, and were less concerned about typical problems of content developers.

In respect to ease of use participants found it clear and easy to interact with TBL approach template and content developed with the use of the template. During evaluation participants mainly demonstrated their attitude and gave some recommendations for future improvement, they did not really work with the TBL approach template. Thus they did not have opportunity to measure more specific performance parameters such as time and effort expenditures. However they mentioned that the template looked promising and quite supportive.

### 2. The need for instructional design

One of the participants of evaluation criticized TBL approach template by saying that "there is no need in such detailed structuring of information". He was against the idea of template as didactic structure based on principles of instructional design. However one of the main goals of template was to provide didactical meaningful structures of LOs in order to content developers with no or little experience in instructional design could easily create effective courses just by utilizing template.

According to responses the template proved to provide big support for content developers from the perspective of instructional design and consequently one of the main goals of template was met. Instructors stated that the template supplied effective framework for explicit description of tasks according to task-based learning pedagogical approach. However all of the participants mentioned that the real effectiveness and efficiency of content developed by means of this template was still difficult to assess because no real course was evaluated. Therefore the next step is to carry out evaluation of the real content developed by means of TBL approach template.

Initially there was an assumption that content developers need help in instructional design and the aim of evaluation was to measure if the template really facilitated content development and if the proposed structure was effective and efficient. However this critic gave new idea for further research, which aims to assess if the approach to template organization is efficient itself.

### 3. Efficiency and time consuming factor

One of the instructors criticized TBL approach template by calling it "waste of time". The instructor considered the time consuming factor as a consequence of extra-detailed description of the task. But the first argument of researcher is that there is no need to describe all predefined elements of the structure. Content developers are able to skip unnecessary parts that demonstrate the flexibility of the template. The second argument is that another main goal of TBL approach template was to save time and effort of content developers in implementing the same tasks in comparison with other templates (such as DU pageSet template) or standard functionality of eXact Packager.

The second formative evaluation didn't show that the TBL approach template really enables to save time and effort of content developers while creating content. Participants didn't have much time to work with the template and compare it with different ones. Performance evaluation is needed to be carried out in order to test these parameters. Moreover the concrete target group (DU's participants) has to perform the evaluation to make a final conclusion about the ability of the TBL approach template to support content developers in their activities.

### 4. Quality and effectiveness of content developed by means of template

Although most of the instructors were positive about possible presentation of the content they stressed that they were not able to assess the quality and effectiveness of the content developed by means of TBL approach template because no real content was evaluated.

One of the instructors demonstrated doubts about effectiveness of courses developed by means of TBL approach template. The instructor emphasized the problem of lack of the interactivity of the content and poor possibilities for teacher and students to be active. Moreover the instructor criticized linear flow of the content and called it boring and not motivating to work with such kind of content. It is very important issue which needs to be considered and improved.

The interactivity problem is partly a restriction of Learning Objects in general that they can not include activities such as communication or collaboration, which are provided by the platform on which the content is launched. For example communication functionalities in the form of discussion forum should be provided by the Learning Management System. In general the comment about interactivity of the content is actual and valuable. Thus one of the trends of further research might be a problem of interactivity of e-learning content and possibilities to solve this problem by means of templates.

### 5. Using the template in learn eXact and efficiency for instructors

There are some technical limitations due to the use of particular software application learn eXact. This impose limitation on technical possibilities of the eXact Packager, programming abilities of researcher and abilities of users to adapt to the software itself to perform some activities with the use of TBL approach template. Many participants of evaluation noticed the complexity of the software which made the ease of use more problematic.

Participants of evaluation were not advanced users of exact Packager. Thus their assessment of ease of use and efficiency of template is approximate. For many instructors first impression from the template was suspicious as it looked too complicated. However after short explanation they realized that extradetailed organization of template is even supportive and the reason of template's complexity is partly a standard facility of eXact Packager. Probably the complexity issue will be initially clearer for more experienced and advanced users of learn eXact. However this assumption should be proved by evaluation of real content developers.

### Overall conclusion

The TBL approach template proved to be valuable as from content developers' perspective as from instructional designers' and instructors' perspectives. However for inexperienced users of learn eXact software the template itself may seem too complicated while the reason is partly a standard restriction of the software application.

The evaluation showed that instructors can get benefit from using these templates but the primary focus was on content developers. Participants assessed template as supportive tool. Moreover they noticed that it is easy to use such kind of template due to its comprehensiveness and support by multiple hints, guidelines and explanatory information. The participants stated that template might be effective and efficient. However preliminary evaluation of the instructor's attitude is not enough to measure these parameters. The performance evaluation of the target group is required.

## 6.2. Recommendations

Based on the conclusions the following recommendations for the future development of TBL approach template can be made. The first recommendation is to carry out performance evaluation in order to test parameters such as time and effort expenditures, effectiveness, reusability etc. among specific target group (DU's participants). They can be asked to create real pieces of learning materials from their content developer's practice and evaluate their performance. This will enable to make a final conclusion about the ability of the TBL approach template to support content developers in their activities.

If the result of this evaluation is positive, the recommendations from the responses will be taken as guidelines for further re-design and improvement of templates and TBL approach template will be completed as a final product ready for implementation in the Digitale Universiteit.

If the result of evaluation is negative then the general concept of template organization should be revised. A possible way of template organization might be based not on the pedagogical approaches but for instance on separate learning activities. In this case learning objects will present different levels of granularity, instead of course and task description they will be smaller pieces of content aimed for single learning objective and intended for support of particular learning activity. From the one hand this will allow development of smaller structures which is good from reusability point of view. But from the other hand, (1) it will be more difficult to build general models because there are too many learning activities and each of them has its own specifics, (2) this will reduce pedagogical context and meaning for instructional design.

Other recommendations regarding to the TBL approach template are related to the areas and trends for future investigation and elaboration. The further development can be connected with the following issues: reusability of the template and its particular components, sequencing of tasks and activities within tasks, extension of interactivity possibilities and improvement of the template interface.

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# 8. Appendices

## **Appendix 1** QUESTIONNAIRE (for content developers)

Enschede, 1 May 2005

Dear Sir/Madam,

The aim of this questionnaire is to explore how content developers can be supported by templates during the development of course material. The responses to the questionnaire will be used to design such templates which will meet the actual requirements and preferences of content developers.

In order to examine on which pedagogical approaches and learning scenarios the courses are based, which technologies are used to support these pedagogies, and what are the desired elements, architecture and interfaces of templates and courses, we need your help to complete the following questionnaire. Your knowledge and experience in this field is valuable for further development of the tools used.

If you have more than one course, please refer only to the newest developments. The questionnaire is divided in 5 parts:

- e questionnaire is divided in 5 parts:
  - 1. general information about intended course
  - 2. pedagogical approach and learning scenario in the course
  - 3. technologies supporting course delivery
  - 4. goal of using templates
  - 5. desired architecture and interface of templates and intended course

Please use the word processor to tick the most appropriate box(es) with an **X** or delete the options that are not applicable to your situation and fill in your opinion in the blank spaces provided. It will take approximately 20 minutes to fill in this questionnaire.

Please return this questionnaire before May 30<sup>th</sup> by email to <u>a.strijker@utwente.nl</u>

Thank you in advance!

### 1. GENERAL INFORMATION ABOUT INTENDED COURSE

Course name	:			
Goal of the course	:			
Specialization or domain area :				
Course duration:	weeks hours			
Student categories	Full-time students Part-time students Distance students	yes □ yes □ yes □		no □ no □ no □
Type of instruction	Group (instructor-led, group) Tutorial (instructor-led, individual) yes □ Individual (self-learning) yes □	yes □	no □ no □	no 🗆
The course can be supported by	<ul> <li>□ Blackboard</li> <li>□ Lotus Learning Space</li> <li>□ TeleTOP</li> <li>□ WebCT</li> <li>□ Other(Please fill in the name of the could be could be</li></ul>	rse mana	gement	system)

### 2. PEDAGOGICAL APPROACH AND LEARNING SCENARIO IN THE COURSE

1. Please make a rank for the most valuable and used pedagogical approaches (from 1 to 8):

Which of the listed or maybe different pedagogical approaches are you going to use in your course and in what way?

2. Specify what pedagogical approach will be used in the course and to what extend (put the percent from 1 to 100 next to the applied pedagogical approach)

		-		 	
Learning by listeni	ng				
Learning by explor	ing				
Learning by doing					
Learning by social	inte	ractio	n		

3. What learning events should be included into the course and in what sequence?

Gain attention	
Inform learners of objectives	
Stimulate recall of prior learning	
Present the content	
Present tasks	
Provide learning guidance	
Elicit performance (practice)	
Communication with peers	
Communication with instructor	
Collaboration	
Presentation of student's work	
Provide feedback	
Instructor assesses performance	
Peer assessment	
Self-assessment	
Enhance retention	
Other	

4. What learning strategies are supposed to be used in the intended course?

Traditional lecturing – teachers are the main actors, they deliver content and guide students to neat solutions to contrived problems

Problem solving – students act as professionals and confront problems, teachers pose real world situations, and provide resources, guidance, and instruction to learners

Participating in Project – students are main actors cooperating in one project, they make decisions within a prescribed framework, design the process for reaching a solution for real world problem

Skills development - students train the skills which are directly related to job roles

Task implementation - students implement some work on tasks in relation to function or profession

 $\label{eq:collaboration-students} \mbox{ work together in a formal and informal group, by sharing information, questioning and discussing with each other$ 

Others \_\_\_\_

### 3. TECHNOLOGIES SUPPORTING COURSE DELIVERY

- What is the aim of using computer technologies in intended course? To support face-to-face class activities To support distance learning To support blended learning
- 6. What are the objectives of using electronic learning environment (ELO) in intended course? To store, manage and deliver learning materials
  - To provide communication between students and instructors
  - To provide collaboration among students
  - To train particular skills
  - To schedule and manage the learning process

To test and grade students

To control and guide students

To monitor students' performance

7. Please make a rank for the most used functionalities of ELO (from 1 to 6):

Course content delivery	
Assignment delivery and grading	
Communication	
Collaboration	
Simulation	
Testing and examining	

8. What technologies and functionalities of the ELO will be used to support the pedagogical approach? Course content delivery

Presentation of content	
Adaptive learning content de	elivery depending on student's characteristics
Archive for course materials	s, such as presentations, documents, etc
URL links	• • •
Virtual laboratory	
Simulations	
Role-play game	
Content sharing/Reuse	
Nothing	Other
Course organization	
News delivery and notificati	on
Calendar	
Roster	
Study guide	
Nothing	Other
Communication functions	
Email exchange	
Discussion forums	
Real-time chat	
Video services	
Nothing 0	Other
Collaboration functions	
File exchange	
Whiteboard	
Group work	
Application sharing	
Nothing	Other
Assessment and student tracking	
Student portfolios	
Assignment delivery and gr	ading
Online test	
Self-assessment	
Nothing 0	Other
-	

### 4. GOAL OF USING TEMPLATES

9.	Do you need the support of templates while creating the content?	yes □	no 🗆
10.	Did you use templates before?	yes □	no 🗆

11. Please make a rank of the most strong expectations from using templates (from 1 to 6)

They will reduce time and effort invested into content development	
They will provide ready-made models and structures of the courses that will enable making	
instructional design without deep knowledge in this field	
They will relate to pedagogical approaches that will enable to use certain pedagogies in the	
course without thinking how to structure activities	
They will provide efficient layout of information on the screen	
They will provide good-looking interface	
It will be rather easier to use templates than standard features of the LCMS	

12. What is the goal of using templates from your point of view?

To lead a content developer in the process of content creation by offering hints, structures and flow of activities within course

To provide content developer with separate templates which reflect specific learning activities. The content developer will need to utilize them in appropriate way to meet his own pedagogical approach.

To support content developer in implementing pedagogical models by providing proposed solutions for particular pedagogical approaches.

-			
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υı		CI	

# 5. DESIRED ARCHITECTURE AND INTERFACE OF TEMPLATES AND INTENDED COURSE

- 13. If templates have a branched architecture how many levels of granularity would you like to see in order to operate with template easily and effective?
- 14. What kind of support would you like to have in using templates? User guide how to use template Tool tips Right mouse button menu Graphical icons reflecting functionality Other \_\_\_\_\_
- What should templates provide for content developers? Layout of elements comprising course Set of learning activities available to use within pedagogical approach Sequence for possible course structuring Other \_\_\_\_\_
- What are the main elements which should be present in each course? Service functions Delivering content Navigation Table of content Other \_\_\_\_\_
- 17. What kind of service functions should be presented in the course? Glossary Help Print Log off

Other \_\_\_\_\_

18. What sections need to be included into course information to inform learners of objectives? Instructor Learning objectives Prerequisites Competences Content (learning materials) Assessment Organization 19. The learning content might include: Audio Video Animation Pictures Text Combinations 20. What type of material will be used? TXT HTML SWF JPG, JPEG, GIF MP3 PDF PPT WMP AVI VRML 21. What output format would you like to get? HTML OTI SCORM IMS packages Word documents SWF Other\_ 22. Practical exercises should be presented in the form of: Games (quizzes) Role-play games (dialogs) Simulations (pointing areas on the screen) Other 23. What kind of questions should be provided by templates? Multiple choice Open question Selection or pointing elements Matching terms and definitions Other

# Appendix 2

Section 1.	General	information	about	intended	course
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#	Course name	Course goal	Field	Duration
1	Basic statistics	Introduction in statistics		10 weeks
2	Realtime embedded systems (RtES) profielmodule	Gain knowledge of the concepts of RtES and experience in putting these into practice	Realtime embedded systems (Computer science)	
3	Statistiek	doel van de cursus is het begrijpen en kunnen toepassen van (elementaire) statistische methoden en technieken, zoals die kunnen voorkomen bij de uitvoering van wetenschappelijk onderzoek	Bewegingswetenschappen, Human movement science	6 ECTS
4	MathMatch: aansluitingsmodule wiskunde	Bijspijkeren van wiskundekennis remediation of Maths knowledge for Bachelor's and Masters'students in technical studies and sciences	Maths knowledge for Bachelor's and Masters'students in technical studies and sciences	flexible, about 12 weeks
5	Minor Academic	To Otain academic compencies for acces to master	Business Studies	7 weeks 4 hours
6	Academic Reading in English	to help students, particularly HBO students who continue their studies at academic level, improve their academic reading skills, this will have a positive impact on the efficiency and speed of their studies	Faculty of Economics and within that area Marketing, Business Administration and Economic, plus the Faculty of Social Sciences, specialisations: Beleid, Communicatie & Organisatie and secondly, Cultuur, Organisatie en Management	8 weeks 50 hours
7	Science in Teacher Education	To have a flexible database with LO's for teacher students in science (different science courses are made with the LO's in de database)	Science and science	Complete set of LO's should be enough for the science discipline part of the curriculum for teacher education (90 ects)
8	TISO	Development Learning tasks based on files, documents, dossiers	Information science / eBusiness	Depends on granularity of tasks

### Students categories:

	Full-time students	Part-time students	Distance students
1	+	+	
2	+	+	+
3		+	+
4	+	+	
5	+	+	+
6	+	+	+
7	+	+	
8	+	+	+

### Type of instruction:

	Group (instructor-led, group)	Tutorial (instructor-led, individual)	Individual (self-learning)
1	+	+	

2	+		+
3		+	+
4	+	+	+
5	+	+	+
6	+	+	+
7	+	+	+
8	+	+	+

LMS:

	Blackboard	Lotus Learning Space	TeleTOP	WebCT	Other
1	+				
2	+	+	+	+	With web browser through DU developed search engine
3	+	?	?	?	
4					learning objects in LearnExact to be played by any compliant
5	+				
6					in principle every Electronic Learning Environment
7	+				N@TSchool (http://www.threeships.com)
8					eBusinessLab / use of LEX is still part of research

### Section 2. Pedagogical approach and learning scenario in the course

Q1: Please make a rank for the most valuable and used pedagogical approaches (from 1 to 8):

		Respondents							
	1	2	3	4	5	6	7	8	
Collaborative learning		5	2		5	4	3	7	3
Communities of practice		6	3		6	6	7	8	7
Problem-based learning	4	2	5	Х	4	2	2	1	2
Project-based learning		1	6		3	8	5	2	5
Experiential learning	3	7	7		7	5	4	3	6
Skills-based learning	2	3	8		2	1	6	6	4
Task-oriented learning	1	8	1	Х	1	3	1	4	1
Discovery learning		4	4		8	7	8	5	8

Comment (which approaches will be used):

1	We do not use al the approaches in the course
2	The approach is competence based. Students work in teams on as authentic as possible projects
3	Task-oriented in combination with traditional learning approach, namely reading a chapter about the
	theory followed with some assignments
4	The course will be based on Math problems to be solved. Based on the score of solving these
	problems, students are pointed onwards to remediation materials
5	Taks oriented learning
6	The reading skill is the main focus of the course, sub skills are trained according to the results achieved
	on the test, i.e. the test should give an indication of the components the student_should work on, others
	he may be able to skip. There is some collaborative learning involved through a bulletin board that is
	supposed to function as a forum for discussion, mutual advice and problem-solving
7	1 to 6 of the list above will be used
8	

Q2: Specify what pedagogical approach will be used in the course and to what extend (put the percent from 1 to 100 next to the applied pedagogical approach)  $\$ 

	Learning by listening	Learning by exploring	Learning by doing	Learning by social interaction
1	80		10	10
2	5	30	35	30

3		10	70	20
4	10	20 (learning by reading	20	20
		+30%)		
5	10	20	60	10
6	5	10	70	15
7	10	30	40	20
8			100	

Q3: What learning events should be included into the course and in what sequence?

						Resp	spondents				
	1	2	3	4	5	6	7	8			
Gain attention			1		1		+	+			
Inform learners of objectives		1	2	1	2	1	not in LO's will be added later in the course	+			
Stimulate recall of prior learning					3		+	+			
Present the content		2	4	3	4	2	+	+			
Present tasks		3		2	5	3	+	+			
Provide learning guidance			3	ongoing	6	4	+	adaptive			
Elicit performance (practice)			5	same with 2	7		+	+			
Communication with peers		4	7	ongoing		6	not in LO's will be added later in the course	Depends on granularity of task			
Communication with instructor		5	8	ongoing	8	5	not in LO's will be added later in the course	Depends on granularity of task			
Collaboration		6	7		9	6	not in LO's will be added later in the course	ELO task			
Presentation of student's work					10	7	not in LO's will be added later in the course	ELO task			
Provide feedback		7	6	4	11	8	+	No, for teachers model answers can be used			
Instructor assesses performance		8		1	12	9	not in LO's will be added later in the course	Teacher model answers			
Peer assessment						11	not in LO's will be added later in the course	ELO task			
Self-assessment			9		13	10	+	ELO task			
Enhance retention							+	ELO task			
Other							Some of these learning events may be present in the course in Blackboard or N@Tschool, but will not be in de LO's made with LeX				

Q4: What learning strategies are supposed to be used in the intended course?

	Traditional	Problem	Participating in	Skills	Task	Collaboration	Other
	lecturing	solving	Project	development	implementation		
1							
2		+	+				
3	Blended lea	arning; stud	ents work mainly a	alone through the a	content, which is	+	See
	a combinat	tion of tradi		left			
			some assigni	ments)			

4				+			
5		+			+		
6		+		+	+	+	
7	+	+	+		+	+	
8		+	+	+		+	

### Section 3. Technologies supporting course delivery

Q5: What is the aim of using computer technologies in intended course?

	support activities	face-to-face	class	support distance learning	support blended learning
1		+			
2					+
3				+	+
4		+			+
5		+		+	+
6		+		+	+
7		+		+	+
8					+

Q6: What are the objectives of using electronic learning environment (ELO) in intended course?

		Respondents								
	1	2	3	4	5	6	7	8		
store, manage and deliver learning materials	*	*	*	*	*	*	*	Not clea r yet		
provide communication between students and instructors	*	*	*		*	*	*			
provide collaboration among students		*				*	*			
train particular skills	*	*	*	*	*	*				
schedule and manage the learning process			*	*	*	*				
test and grade students				*	*	*				
control and guide students			*			*	*			
monitor students' performance			*			*	*			

Q7: Please make a rank for the most used functionalities of ELO (from 1 to 6):

		Respondents							Total
	1	2	3	4	5	6	7	8	
Course content delivery	1	1	1	3	1	2	1	1 ELO Questions are not relevant, only tasks are developed, that will run within a ELO	1
Assignment delivery and grading	2	6	6	2	4	5	5		5
Communication	3	3	3	3	2	6	2		3
Collaboration	5	2	4	4	6	4	3		4
Simulation	6	5	6	6	5	3	4		6
Testing and examining	4	4	2	1	3	1	6		2

Q8: What technologies and functionalities of the ELO will be used to support the pedagogical approach?

	Respondents							
	1	2	3	4	5	6	7	8
Course content delivery								
Presentation of content	*	*	*	*	*	*	*	
Adaptive learning content				*	*	*		
delivery depending on								

student's characteristics								
Archive for course	*	*		*	*	*		
materials, such as								
presentations, documents,								
etc								
URL links	*				*	*		
Virtual laboratory								
Simulations	*				*		*	
Role-play game								
Content sharing/Reuse	*				*	*	*	
	Cours	se orga	anizatio	on				
News delivery and	*	*	*	*	*	*	*	
notification								
Calendar	*	*	*		*	*		
Roster				*	*	*	*	
Study guide	*		*	*	*	*	*	
0	Commu	nicatio	n func	tions				
Email exchange	*		*	*	*	*	*	
Discussion forums	*	*	*		*	*	*	
Real-time chat			*			*		
Video services			*		*	*		
	Collab	oration	function	ons				
File exchange		*	*		*	*	*	
Whiteboard			*		*		*	
Group work		*			*	*	*	
Application sharing						*		
Asse	ssmen	t and s	tudent	trackir	ng			
Student portfolios					*	*	*	
Assignment delivery and	*				*	*	*	
grading								
Online test	*	*		*	*	*	*	
Self-assessment	*		*	*	*	*	*	

Comment: (3) assessment: collect tracking data (content self-assessment) en evaluate them with the personal student planning

### Section 4. Goal of using templates

Q9: Do you need the support of templates while creating the content? Q10: Did you use templates before?

	Q9: Need the sup	port of templates	Q10: Already used templates			
	Yes	No	Yes	No		
1		+	+			
2	+		+			
3	+			first time of content developing		
4	+		+			
5	+		+			
6	+		+			
7	+		+			
8	+			+		

Q11: Please make a rank of the most strong expectations from using templates (from 1 to 6)

	Respondents							
	1	2	3	4	5	6	7	8
They will reduce time and effort invested into content development	1	6	1	4	6	6	1	1
They will provide ready-made models and structures of the courses that will enable making instructional design without deep knowledge in this field	5	2	2	5	5	5	5	0

They will relate to pedagogical approaches that will enable to use certain pedagogies in the course without thinking how to structure activities	2	2	3	3	4	4	4	3
They will provide efficient layout of information on the screen	4	6	6	6	2	3	3	2
They will provide good-looking interface	3	6	5	7	1	2	2	4
It will be rather easier to use templates than standard features of the LCMS	6	5	4	2	3	1	6	0

Comment: (4) the most important: They will facilitate re/use and sharing of materials between institutions

Q12: What is the goal of using templates from your point of view?

	Respondents							
	1	2	3	4	5	6	7	8
To lead a content developer in the process of content creation by offering hints, structures and flow of activities within course		*	*	*		*	*	*
To provide content developer with separate templates which reflect specific learning activities. The content developer will need to utilize them in appropriate way to meet his own pedagogical approach.			*		*	*	*	
To support content developer in implementing pedagogical models by providing proposed solutions for particular pedagogical approaches.			*	*		*	*	
Other	reduce time effort							

#### Section 5. Desired architecture and interface of templates and intended course

Q13: If templates have a branched architecture how many levels of granularity would you like to see in order to operate with template easily and effective?

1	??
2	3
3	4
4	2-3
5	3
6	
7	3-4
8	Depends on presented overview

Q14: What kind of support would you like to have in using templates?

	User guide how to use template	Tool tips	Right mouse button menu	Graphical icons reflecting functionality	Other
1	+				
2	+	+	+	+	+
3	+	+			Technical support for develop and adapt the templates
4	+				training days and workshops
5	+	+	+	+	
6	+	+	+	+	
7	+		+		
8	+		+		

### Q15: What should templates provide for content developers?

	Layout of elements comprising course	Set of learning activities available to use within pedagogical approach	Sequence for possible course structuring	Other
1		+	+	
2	+			
3	+	+	+	set of different possible pages and functionalities to form a custom made course
4	+	+		
5	+	+	+	
6	+	+	+	
7	+	+		
8	+	+	+	

### Q16: What are the main elements which should be present in each course?

	Service functions	Delivering content	Navigation	Table of content
1				
2	+		+	+
3	+	+	+	+ indicator of present page in table of content
4				
5		+	+	
6	+	+	+	+
7	+	+	+	+
8		+	+	+

### Q17: What kind of service functions should be presented in the course?

	Glossary	Help	Print	Log off
1				
2	+	+	+	
3				
4				
5	+	+		
6	+	+	+	+
7	+	+	+	
8			+	

### Q18: What sections need to be included into course information to inform learners of objectives?

	Respondents							
	1	2	3	4	5	6	7	8
Instructor			+			+		
Learning objectives		+	+	+	+	+	+	+
Prerequisites		+	+		+	+	+	+
Competences		+		+	+	+		+
Content (learning materials)		+	+		+	+	+	
Assessment		+	+		+	+	+	
Organization			+		+	+	+	+

Q19: The learning content might include:

	Audio	Video	Animation	Pictures	Text	Combinations
1	+	+	+	+	+	+
2	+	+	+	+	+	+
3			powerpoint	+	+	+
4						+
5	+	+	+	+	+	+
6	+	+	+	+	+	+
7	+	+	+	+	+	+
8				+	+	

### Q20: What type of material will be used?

	тхт	HTML	SWF	JPG, JPEG, GIF	MP3	PDF	PPT	WMP	AVI	VRML	Other
1	+	+	+	+		+	+	+	+		
2	+	+		+		+	+		+		
3	+	+		+		+	+				
4	+	+	+	+	+	+	+	+	+	+	
5	+	+		+	+	+	+	+			
6	+	+	+	+	+	+	+				wmv, wma, mpeg1- 4
7	+	+	+	+	+	+		+	+		Quickti me, java
8	+			+		+	+	1			

Q21: What output format would you like to get?

	HTML	QTI	SCORM	IMS packages	Word documents	SWF	Other
1	+	+	+	+		+	
2	+			+			
3			+				
4			+				
5			+				
6	+		+		+		
7	+	+	+	+			
8							eBusinessLab

Q22: Practical exercises should be presented in the form of:

	Games	Role-play games	Simulations	Other
1				all if possible
2	+	+	+	+
3	+			
4	+	+	+	
5	+	+	+	
6	+	+	+	
7			+	
8				tasks

Q23: What kind of questions should be provided by templates?

	Multiple choice	Open question	Selection or pointing elements	Matching terms and definitions	Other
1	+	+	+	+	all mentioned
2	+	+	+	+	
3	+	+			
4	+	+		+	depending on linked in tools Question Mark, Maple TA
5	+	+	+	+	
6	+	+	+	+	gap filling, drag and drop, likert scale, multiople answers, ranking
7	+	+	+	+	+
8					Task based approach

# Appendix 3

### **Design of Problem-Based Learning template**

### Theory and models used

The description of PBL pedagogy from IMS LD Best practice and implementation guide.

Narrative: For any given problem-based learning activity, students are assigned to teams and presented with a problem description, objectives, document and presentation requirements, an outline of associated topics, and evaluation rubrics. Students are then assigned a number of discrete learning tasks which address all areas of the overall problem. These tasks include participation in discussion activities, access to subject matter experts, reviewing online content and resources, and online quizzing. Once students have completed all of the discrete tasks, students are evaluated by delivering their problem solution in the form of an in-class presentation and a response document, together with discussion activity participation, selfand peer-assessment, and online low-stakes quizzes.

Main Success Scenario:

- 1. Student logs onto system.
- 2. System identifies student and presents problem description.
- 3. System directs students to problem resources.
- 4. Students divide problem responsibilities. Is this to say that students self-assign to various discrete tasks? Also, is there an assumption that between Steps 4 and 5, the students actually complete said tasks?
- 5. Students assemble parts to answer problem definition for response document and presentation.
- 6. Students consult with instructor regarding outstanding issues.
- Students submit document and give presentation.
- Feedback and evaluation from instructor, experts, and peers.
- 9. Students complete low-stakes quizzes.

#### Extensions:

4a. Students complete weekly discussion activities.



### Relation between learning scenario and template

The table below presents steps in template reflecting instructional design of PBL approach and correlation with learning scenario from IMS LD BPIG.

	Main Success Scenario (IMS LD BPIG)	Steps in template
4.	Student logs onto system.	Step 1. Home page This template page enables creation of cover page of the module and introductory information about the module
5.	System identifies student and presents problem description.	Step 2. Problem description This template page is responsible for presentation of problem statement
6.	System directs students to problem resources.	Step 3. Links to resources This template page allows to list resources by adding links to relevant literature or attachment documents
7.	Students divide problem responsibilities. Is this to say that students self-assign to various discrete tasks? Also, is there an assumption that between Steps 4 and 5, the students actually complete said tasks? (4a extension) Students complete weekly discussion activities.	Step 4. Tasks This template page reflects assigning tasks that includes description of tasks that need to be done and their order
8.	Students assemble parts to answer problem definition for response document and presentation.	Step 5. Forming problem solution This template page refers students to appropriate areas where they can upload files and share knowledge, as well as discuss solution or consult with instructor (5a) Workspace is an area where all students can locate their documents and share knowledge (URL to workspace). (5b) This process is supported by discussion (URL to discussion)
9.	Students consult with instructor regarding outstanding issues.	Step 5c. Consultation Consultation with instructor (e-mail)
10.	Students submit document and give presentation.	Step 6. Submission This template page directs students to the area where they can submit problem solution Step 7. Presentation This template page directs students to the area where they can submit presentation
11.	Feedback and evaluation from instructor, experts, and peers.	Step 8. Feedback This template page directs students to the area where they can receive feedback from instructor and peers
12.	Students complete low-stakes quizzes.	Step 9. Examination This template page allows to create examination test to assess students

### Description of template

Template item	Description
Step 1. Home page	<ul> <li>This template item enables to create:</li> <li>3) title page of the module – input of title of the module (and other information, e.g. author, year, organization, slogan, etc.)</li> <li>4) introductory information about the module - this section contains a number of links to different sub-sections which provide detailed description of goals and learning objectives of the PBL module, instructional method, requirements, etc.: <ul> <li>instructor - this section provides information about instructor. Personal data include: name, faculty, e-mail</li> <li>objectives – learning objectives of module</li> <li>prerequisites - this section provides a list of prerequisites that a student has to have before staring this module: knowledge, skills, completed courses</li> <li>competences - this section explains which competences a student should obtain after finishing this module</li> <li>content - here is a list of literature used in this module (text description of literature resources)</li> <li>assessment - this section explains what the system of grading is, how the learning activities are assessed and how the final grade is calculated</li> </ul> </li> </ul>

	<ul> <li>organization - this section presents a description of organization of the module</li> </ul>
Step 2. Problem	Presentation of content including formats:
description	Text
	Text with Audio
	Text with Video
	Text with Multimedia
	Text with Image
	Other combinations
Step 3. Links to	Several kinds of recourses include:
resources	Attached document + description
	<ul> <li>Link to the material within the course + description</li> </ul>
	URL + description
Step 4. Tasks	Assigning tasks include description of tasks that need to be carried out and their order
	(text description + links to tasks). Tasks are the following:
	<ul> <li>participation in discussion activities (URL discussion)</li> </ul>
	<ul> <li>access to subject matter experts (e-mail)</li> </ul>
	<ul> <li>reviewing online content and resources (URL resources)</li> </ul>
	online quizzing (QTI)
Step 5. Forming	(5a) Workspace is an area where all students can locate their documents and share
problem solution	knowledge (URL to workspace).
	(5b) This process is supported by discussion (URL to discussion)
	(5c) Consultation with instructor (e-mail)
Step 6. Submission	Submission area where students put final problem solution (URL)
Step 7. Presentation	Submission area where students put final presentation (URL)
Step 8. Feedback	Discussion area (URL to discussion)
Step 9. Examination	Small test (QTI)

# Appendix 4

### **Design of Collaborative Learning template**

### Theory and models used

The description of Collaborative learning pedagogy from IMS LD Best practice and implementation guide.

Narrative: Instructional model has students placed in small groups of 2-5 members, in which each member has a role. These roles are associated with an activity, based on a set of resources, one of which is a form that is used to record each student's role-artifact. These role artifacts are then aggregated into a group artifact. The group discusses the group artifact and then submits it as a record of their best group work. The system aggregates the artifacts as they are submitted, analyzes the data therein, and displays the results in a way that is meaningful to the teacher. As the evidence accumulates, the teacher may initiate a class discussion, send one or more of the artifacts back for correction or clarification, or move a group on to another activity, with the same or rotated roles.

Main Success Scenario:

- 1. The instructor uses the system to place the learners into groups.
- 2. The instructor uses the system to assign roles to individual learners.
- 3. The System notifies the instructor when all learners are successfully logged on, are in a group, and are aware of their role.
- 4. The Teacher sends an activity, as well as the associated role-forms, to each group.
- 5. The learners fulfill their roles by completing their forms and submitting the results as role-artifacts.
- 6. The System accumulates the role-artifacts until the group artifact is complete. When the group artifact is complete, the System makes the completed artifact available to the group members.
- 7. The group members discuss the group artifact, make changes if desired, and then submit the final artifact.
- 8. The System accumulates the group artifacts as they are submitted, analyzes the results, and displays the results in a way that is meaningful to the instructor.

Extensions:

- 1a. The instructor may assign a time limit for the activity, view alternate activities, check that all students present are logged in, etc.
- 4a. Each group may get the same or different activities.
- 5a. The system may make the state of the role-artifacts of each learner available for the instructor to view.
- 6a. The system may make the state of each group-artifact available for the instructor to view.
- 8a. The groups may vote to submit the form, or the form may be submitted as is, after a timelimit set by the instructor.
- 8b. The instructor may return a group form for correction or clarification. Forms returned to groups are removed from the aggregate and are not used in the analysis.

### Learning scenario in Collaborative learning approach



### Relation between learning scenario and template

The table below presents steps in template reflecting instructional design of Collaborative approach and correlation with learning scenario from IMS LD BPIG.

	Main Success Scenario (IMS LD BPIG)	Steps in template
1.	Student logs onto system.	Step 1. Home page This template page enables creation of cover page of the module and introductory information about the module
2.	The instructor uses the system to place the learners into groups.	Step 2. Dividing students into groups This template page provides facilities to divide students into the groups, specify and describe groups
3.	The instructor uses the system to assign roles to individual learners.	Step 3. Assigning roles This template page enables to assign roles to different students and describe these roles
4.	The System notifies the instructor when all learners are successfully logged on, are in a group, and are aware of their role.	Step 3a. Conformation Students sent an e-mail to instructor that they are aware and agree about group division and their group- mates. Maybe other LMS's feature is responsible for this.
5.	The Teacher sends an activity, as well as the associated role-forms, to each group.	Step 4. Assigning tasks This template page enables to assign tasks to different students and describe these tasks
6.	The learners fulfill their roles by completing their forms and submitting the results as role-artifacts	Step 5. Submission of individual works This template provides area for submission of work or link to the area within LMS where a student can upload the work.
7.	The System accumulates the role-artifacts until the group artifact is complete. When the group artifact is complete, the System makes the completed artifact available to the group members.	Step 6. Forming solution This template page allows to fill in the appropriate sections with the information about where, when and how students can communicate and collaborate to form a general solution. The sections are: communication, collaboration, consultation.
8.	The group members discuss the group artifact, make changes if desired, and then submit the final artifact	Step 7. Submission of final group work This template page directs students to the area where they can submit group work
9.	The System accumulates the group artifacts as they are submitted, analyzes the results, and displays the results in a way that is meaningful to the instructor	Step 8. Feedback This template page directs students to the area where they can receive feedback from instructor and peers

### Description of template

Template item	Description
Step 1. Home page	<ul> <li>This template item enables to create:</li> <li>5) title page of the module – input of title of the module (and other information, e.g. author, year, organization, slogan, etc.)</li> <li>6) introductory information about the module - this section contains a number of links to different sub-sections which provide detailed description of goals and learning objectives of the Collaborative learning module, instructional method, requirements, etc.:</li> <li>instructor - this section provides information about instructor. Personal data include: name, faculty, e-mail</li> <li>objectives – learning objectives of module</li> <li>prerequisites - this section provides a list of prerequisites that a student has to</li> </ul>
	<ul> <li>have before staring this module: knowledge, skills, completed courses</li> <li>competences - this section explains which competences a student should obtain after finishing this module</li> <li>content - here is a list of literature used in this module (text description of literature resources)</li> <li>assessment - this section explains what the system of grading is, how the learning activities are assessed, and how the final grade is calculated</li> <li>organization - this section presents a description of organization of the module</li> </ul>
Step 2. Dividing	Dividing is presented in the form of customizable table that contains information:
students into groups	<ul> <li>Name of the group</li> <li>People involved</li> <li>Description of the group</li> </ul>
	• Other (for example area for submission final version of assignment) In order to continue a learner needs to select the name of the group (link in the table). Then he will see more detailed description of the group assignment, and different options to collaborate within group work, including description of individual roles and tasks of each group member, as well as options to support and guide students in the
---	---
	implementing of their tasks.
Step 3. Assigning	This template item fills in a customizable table with roles:
roles	Name of the role
	Responsible person
	Description of the role
	Other
Step 4. Assigning	This template item fills in a customizable table with tasks:
tasks	<ul> <li>List of tasks related to the role or person</li> </ul>
	Deadline
	Description of tasks
	Other (for example area for submission final version of individual task)
Step 5. Submission of individual works	In the table containing tasks descriptions (step 4) might be an option for submission assignment. However in this case in the description of task there should be clear stated that after implementing the work the document should be uploaded into this area and it will be visible for all team members (but it depends on the support by LMS of this feature)
Step 6. Forming	Templates fill in 3 sections: communication, collaboration, consultation with the following
solution	information:
	<ul> <li>description of where and how solution can be generated by means of special tools.</li> </ul>
	<ul> <li>links (URL) to appropriate areas where these collaborative activities are carried out</li> </ul>
Step 7. Submission of	Link (URL) to submission area where students put final group work
final group work	
Step 8. Feedback	Link (URL) to discussion area or other special area where students can get feedback

## *Appendix 5* QUESTIONNAIRE. Usability testing of TBL approach template

Dear Sir/Madam,

The aim of this questionnaire is to explore user satisfaction with utilizing TBL approach template, as well as measure the effectiveness of the template. The purpose of the questionnaire is to answer the following questions:

- 1. Does the template meet the expectations and requirements of content developers?
- 2. How efficient and easy in operation is the template?
- 3. How good is the content developed by means of template?

The questionnaire is divided in 3 parts:

- 1. Background information about general knowledge of learning objects, task-based learning pedagogy,
  - and experience in content development and working with learn eXact software.
- 2. Evaluation of content developed by means of TBL approach template
- 3. Evaluation of TBL approach template

Please tick the most appropriate box(es) with an X and fill in blanked spaces.

Thank you in advance!

### 1. Background information

Name		
Do you know pri	nciples of task-based lea	arning pedagogical approach?
Yes	No	
Do you use task	-based learning pedago	gical approach in your courses?
Yes	No	
If yes then how I	ong have you used it? (I	Experience)
Do you have exp	perience of creating cont	tent for your course?
Yes	No	
If yes then how r	many courses have you	created?
Are you familiar	with learn eXact's autho	ring tool?
Yes	No	
Have you ever u	sed learn eXact to creat	e content of the course?
Yes	No	
If yes then how r	many courses have you	created?
Do you know the	e concept of Reusable L	earning Object (RLO)?
Yes	No	
Have you ever a	pproached the creation	of course content from an RLO point of view?

Yes No

### 2. Evaluation of content developed by means of TBL approach template

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Effectiveness as teaching-learning tool				1	1
The tool provides media-rich presentation of material					
The form of material presentation motivates and stimulates the interest					
The tool improves ability of teacher to teach the material					
The tool improves ability of learner to study the material					
The tool provides reusability of content in many context					
Compliance with TBL pedagogical approach					
The tool embraces all main characteristics of the TBL					
The tool supports delivery of content based on the TBL scenario					
The tool enables explicit description of task					
The tool enables efficient presentation of task					
The tool facilitates implementation of task					
Structure of learning content presentation	-	-			
The structure of content presentation is logically and didactically correct					
The structure of content presentation is clear and efficient					
The 'task description' element is useful					
The 'task definition and example' element is useful					
The 'task implementation activities' element is useful					
The 'report requirements' element is useful					
The 'submission conditions' element is useful					
The 'presentation conditions' element is useful					
The 'feedback' element is useful					
The 'analysis' element is useful					
The 'practice' element is useful					
The 'test' element is useful					
Interface of learning content presentation					
The labels, buttons, menus, text, and general layout of the interface are consistent and visually distinct					
The style of page presentation is attractive					
The style of page presentation facilitates the perception of information					
The tool provides appropriate flexibility in navigating and browsing the content					
The tool provides enough interactivity with content					
Ease of use					
It is easy to access the needed piece of content					
The course requires a lot of documentation, technical support, and/or instruction to successfully use it					
Additional remarks and comments about the strue	cture and pres	entation of the	content		

### 3. Evaluation of TBL approach template

1. What is your impression of a TBL approach template?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Effectiveness				1	
The template is doing what it should do					
The template allows to carry out work efficiently					
Efficiency					
Template provides enough support to carry out activities					
Once user have learned how to use a template they can sustain a high level of productivity					
Template enables user to save time while developing content					
Template enables user to save effort while developing content					
Template provides wide facilities for implementation the needed task with minimal set of operations					
The template is flexible to use					
Utility					
The template provides appropriate set of functions that enable users to carry out their tasks in the way they want to do them					
Learnability					
It is easy to get started using template to perform core tasks					
It doesn't take long time to get started using template to perform core tasks					
It is easy to learn the range of operations to perform a wider set of tasks					
It doesn't take long time to learn the range of operations to perform a wider set of tasks					
Memorability	-				-
The interface of template helps user remember how to carry out tasks					
Errors					
User makes many errors during implementation of task					
The user can easily recover from the errors					
Satisfaction					
It is pleasant to use the design of template					
It is pleasant to use the structure of template					
Consistency					
All titles within the structure of the template are consistent					
All elements within the structure of the template are consistent					
All functionalities of elements within the structure of the template are consistent					

2. Did you have problems with understanding the goal or functionality of elements in the template structure? If yes then answer questions 3 otherwise skip this question. No

Yes

3. Which element(s) did cause misunderstanding or difficulties with understanding? And what kind of problems did they cause? (Mark the appropriate box(es) with X)

Elements	Not clear							
of the TBL approach template	Goal of element	Functionali ty (didactical meaning	Title of element	Structure of sub- elements	Way of filling in	Input data format	Output result	Other
TBL approach								
User Guide								
Title of the Module								
Homepage								
Title of the Homepage								
Image								
Subtitle								
Text (Slogan/Citation)								
Information about the module								
Instructors								
Objectives of the module								
Prerequisites								
Competences to be achieved								
Content of the module								
Assessment principles								
Organization of the module								
TBL Model								
Step 1. Task description								
Step 2. Task definition and example								
Step 3. Task implementation activities								
Step 4. Report requirements								
Step 5. Submission conditions								
Step 6. Presentation conditions								
Step 7. Feedback								
Step 8. Analysis								
Step 9. Practice								
Step 10. Test								
Summary								
Examination								
Help page								
Logo top left								

4. What element(s) do you think should be excluded from the structure?

5. What element(s) do you think are missing and can be included into the structure?

- How can you characterize interaction design of the template? Satisfactory Enjoyable Entertaining Helpful Motivating Aesthetically pleasant Supportive of creativity Rewarding Emotionally fulfilling Other \_\_\_\_\_\_
- 7. How can you characterize use of the template? Satisfactory Enjoyable Entertaining Helpful Motivating Aesthetically pleasant Supportive of creativity Rewarding Emotionally fulfilling Other

### **Final remarks**

If you wish you can add any additional information:

Thank you for completing the questionnaire!

# Appendix 6

## Results of usability testing of TBL approach template

## 1. Background information

Question	Yes	No
Do you know principles of task-based learning pedagogical approach?	+++	++
Do you use task-based learning pedagogical approach in your courses?	++	+++
Do you have experience of creating content for your course?	+++++	
Are you familiar with learn eXact's authoring tool?		+++++
Have you ever used learn eXact to create content of the course?		+++++
Do you know the concept of Reusable Learning Object (RLO)?	+++++	
Have you ever approached the creation of course content from an RLO point of view?	+++	++

## 2. Evaluation of content developed by means of TBL approach template

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Effectiveness as teaching-learning tool	j			1	
The tool provides media-rich presentation of material				++++	+
The form of material presentation motivates and stimulates the interest		+	++	++	
The tool improves ability of teacher to teach the material		+	++	++	
The tool improves ability of learner to study the material			+++	++	
The tool provides reusability of content in many context			++	++	+
Compliance with TBL pedagogical approach	1	T	n		1
The tool embraces all main characteristics of the TBL		+		+	+++
The tool supports delivery of content based on the TBL scenario				+++	++
The tool enables explicit description of task				+++	++
The tool enables efficient presentation of task			+	++++	
The tool facilitates implementation of task				+++++	
Structure of learning content presentation					
The structure of content presentation is logically and didactically correct			+	++++	
The structure of content presentation is clear and efficient			++	+	++
The 'task description' element is useful			+	+++	+
The 'task definition and example' element is useful			+	+++	+
The 'task implementation activities' element is useful			+	++++	
The 'report requirements' element is useful			+	+++	+
The 'submission conditions' element is useful			+	++++	
The 'presentation conditions' element is useful			+	++++	
The 'feedback' element is useful			+	+++	+
The 'analysis' element is useful			++	+++	
The 'practice' element is useful			++	+++	
The 'test' element is useful			++	+++	
Interface of learning content presentation					
The labels, buttons, menus, text, and general layout of the interface are consistent and visually distinct				++++	+
The style of page presentation is attractive		+	++++		
The style of page presentation facilitates the		+	++	++	
perception of information					
The tool provides appropriate flexibility in navigating and browsing the content			+	++	++
The tool provides enough interactivity with content		+	++	++	
Ease of use			-		
It is easy to access the needed piece of content			+	++	++
The course requires a lot of documentation, technical support, and/or instruction to successfully use it		+++++			

## 3. Evaluation of TBL approach template

	Strongly	Disagree	Neutral	Agree	Strongly
Effectiveness	ulbugiee				ugice
The template is doing what it should do				+++	++
The template allows to carry out work			+	+	++
efficiently					
Efficiency				1	
Template provides enough support to carry				+++	++
out activities					
Once user have learned how to use a			+	+++	+
template they can sustain a high level of					
productivity					
Template enables user to save time while		+		+++	+
developing content					•
Template enables user to save effort while		+		****	
developing content		'			
Tomplato providos wido facilitios for			<b></b>	<b>*</b> *	
implementation the needed task with minimal					
set of operations					
The template is flexible to use				++++	+
				1111	
The templete provides appropriate set of					
functions that enable uppropriate set of			++	+++	
tunctions that enable users to carry out their					
lasks in the way they want to do them					
Learnability					
It is easy to get started using template to			+	+++	+
perform core tasks					
It doesn't take long time to get started using				+++++	
template to perform core tasks					
It is easy to learn the range of operations to			+	++++	
perform a wider set of tasks					
It doesn't take long time to learn the range of			++	+++	
operations to perform a wider set of tasks					
Memorability					
The interface of template helps user			+	++	++
remember how to carry out tasks					
Errors				1	1
User makes many errors during		+	++++		
implementation of task					
The user can easily recover from the errors			+	++++	
Satisfaction					
It is pleasant to use the design of template		+	++	++	
It is pleasant to use the structure of template		+		++++	
Consistency					
All titles within the structure of the template			+	+++	+
are consistent					
All elements within the structure of the				++++	+
template are consistent					
All functionalities of elements within the			+	++++	
structure of the template are consistent					

Elements				Not cle	ar			
of the TBL approach template	Goal of element	Functionali ty (didactical meaning	Title of element	Structure of sub- elements	Way of filling in	Input data format	Output result	Other
TBL approach								
User Guide								
Title of the Module								
Homepage		+						
Title of the Homepage								

Elements	Not clear							
of the	Goal of	Functionali	Title of	Structure	Way of	Input	Output	Other
TBL approach template	element	رdidactical	element	elements	ning in	format	result	
		meaning						
Image								
Subtitle								
Text (Slogan/Citation)								
Information about the module								
Instructors								
Objectives of the module								
Prerequisites								
Competences to be achieved								
Content of the module					+	+		
Assessment principles								
Organization of the module								
TBL Model								
Step 1. Task description								
Step 2. Task definition and						+	+	
example								
Step 3. Task implementation activities	+	+						
Step 4. Report requirements			+					
Step 5. Submission conditions								
Step 6. Presentation conditions	+	+						
Step 7. Feedback								
Step 8. Analysis	++	+++	++					
Step 9. Practice	+	+	+	+				
Step 10. Test					+			
Summary								
Examination	+							
Help page								
Logo top left	+	+						

How can you characterize interaction design of the template?	
Satisfactory	+++
Enjoyable	
Entertaining	
Helpful	++++
Motivating	
Aesthetically pleasant	
Supportive of creativity	+
Rewarding	
Emotionally fulfilling	

How can you characterize use of the template?	
Satisfactory	+++
Enjoyable	
Entertaining	
Helpful	++++
Motivating	++
Aesthetically pleasant	
Supportive of creativity	+
Rewarding	+
Emotionally fulfilling	