EduBITE:

Developing an E-Learning Environment

for

Enterprise-Resource-Planning-Systems

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Abstract

This paper describes the development of an e-learning environment in the field of integrated business information systems. To generate e-content with a high rate of re-usability, the courseware tool eduWeaver was developed. With this tool the e-content for different courses can be generated from of a learning object's repository. So, the main target group for eduWeaver are lectorers in the field of ERP-related courses.

Furthermore, within the project "eduBITE" ERP-content will be developed: Starting with the central case-study "DeBITE", which describes a company using an Enterprise-Resource-Planning-System in the wood-industry, the project covers all important business processes and tasks of the departments involved.

With the outlined course-profile the results of the project will meet the increasing demand for education in the field of integrated business information systems.

Motivation

Enterprise Resource Planning Systems (ERP-Systems) supporting the enterprise business processes as an integrated business information system are often the backbone of the enterprise IT infrastructure. Although ERP-Systems mostly are sold as 'standard business solutions' and are based on process reference models they tend to be complex concerning their installation, customizing and maintenance. As a result there is a demand for ERP experts for this purposes on the market. Knowledge necessary to master the job of an ERP expert spans from knowledge on enterprise business processes and their interdependencies on knowledge of the detailed structure and functionality of an ERP-system, parameters and data structures concerning the modules of the ERP-System.

Therefore, there is a demand for education focusing understanding of integrated business processes in general on one hand and for ERP-specific detailed knowledge on the other hand as well as the correlation of these two aspects.

Knowledge of "Integrated Business Information Systems" is focused on in most computer science studies and manifold topics from conceptual business process modelling level to the implementation details using various ERP-Systems are dealt with. Also in Austria this knowledge is currently taught at several universities focusing different aspects. Learning takes place exclusively in form of face-to-face courses using individual teaching and learning materials (slides, books, scripts, exercises). Continuous case studies and also the close connection of use case studies to background knowledge necessary to understand the totality of discourse are rarely used until now. Overtaxing individual teachers time to prepare sophisticated (multimedia) course materials and the expenditure to stay up-to-date with actual software versions are the main reasons for this fact.

The development of highly re-usable e-content in the area of integrated business information systems can be seen as one step in solving this problem. Business knowledge with reference to business processes, their integration, data and organisation structures and ERP product specific knowledge have to be separated into different learning objects. The interaction between learning objects have to be as strong as possible, where as the interaction between learning objects has to be as as small as possible to keep the influence of new ERP-system versions small and isolated. Stored in a central repository indexed using standardized metadata learning objects re-integrated information systems can be re-used by different teachers in different learning scenarios (e.g. face to face courses, blended learning courses, virtual courses, case studies) with different focuses.

This paper presents eduBITE, a project with the objective to create highly re-usable e-content concerning integrated business information systems in general and ERP-Systems in special. Section two follows an overview on eduBITE and its objectives and architecture, section three presents the making of eduBITE according to an e-content life cycle model and section four the results and the next project steps are described. EduBITE is funded by the Austrian Federal Ministry for Education, Science and Culture (bm:bwk).

EduBITE

The development of e-content is expensive and very time consuming. In spite of these high production costs most materials are re-usable, but a very small extent only. Project results are often lost in obscurity. EduBITE demonstrates a collaborative approach of several Austrian universities to produce, configure and re-use multimedia contents in the field of Integrated Business Information Systems respectively ERP-systems. EduBITE focuses the following objectives:

- *To develop teaching materials*

  Topics relating to 'Integrated Business Information Systems' (IBSIS) such as conceptual business engineering, enterprise modeling, the support of business processes implementation or the customization of ERP- systems are prepared for multimedia use based on a case study enterprise (DeBITE). The produced learning modules focus on computer-science students as well as business-administration students. They cover a course in the field of integrated business information systems and will be evaluated over one semester in at least two courses at two different partner universities.

- *To develop Instruments:*

  EduWeaver is developed as a tool to support courseware-design, in order to categorize developed materials according to the IEEE international meta-data standards, to structure course scenarios and to enable re-use. The meta- indexed learning objects can thus be used to design specific lessons according to special target groups or certain learning processes. These items guarantee adaptation, enhancement and interoperability of the developed multimedia material.

- *To develop a Communication Platform:*

  The output of the project is aimed at to increase the re- use of available multimedia materials in the IBIS context. The association AKIT[1] will be the framework to obtain access to the multimedia materials and to improve and enhance them. Its members also constitute the market for the sustained use of the project products.

  The architecture of the e- learning environment produced by eduBITE consists of multimedia learning objects[2], which are organized in a repository. These objects can be configurated flexibly using a specific tool, eduWeaver, which enables the configuration of the de-

sired needs. A course can then be published and used in any learning management system understanding IMS standard, i.e. WebCT.

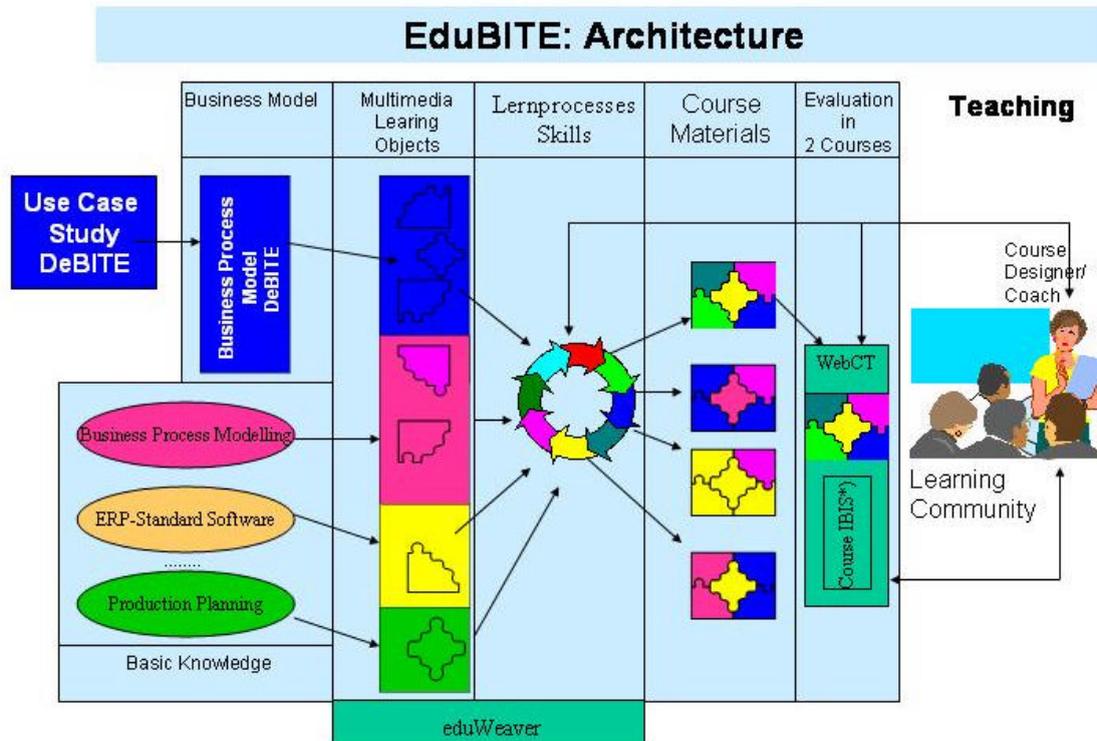Figure 1 shows a sketch concerning eduBITE architecture.

Figure 1: Architecture of the eduBITE e-learning environment

Making of EduBITE – the procedure-model

Courseware can be seen as a special kind of software. To guarantee high quality and re-usability of learning objects the application of an appropriate development process for e-content development is required. For eduBITE we chose to use the process model approach for courseware development of Klein/Stucky (2001) deviding the whole development process in four phases: Analysis, Design, Implementation, Use/Maintenance. Project Management and the development of the courseware design tool eduWeaver accompanied these items.

Analysis

During the analysis of e-content it has to become clear which learning method should be applied, who is in the target-group and what are the relevant contents. It was specified, that the target group consists of students in applied informatics as well as students in business administration and business engineers.Therefore, the following topics are to be dealt with in depth in EduBITE:

- The case study enterprise "DeBITE", a manufacturing company within the wood-industry
- Business Engineering and Enterprise Modeling
- Architecture of Business Information Systems
- The architecture of ERP Systems, including related topics such as customizing and integration
- Sales and Distribution
- Materials Management
- Production Planning
- Financial Management and Controlling

The ERP-content forming a learning objects' repository is mainly designed to be used either in blended-learning courses or for the use in synchroneous classroom-courses. Therefore, it consists of self-study objects as well as of case study elements, which lead to "tandem-learning" Iberer/Müller (2001) in supported groups.

There are two different approaches to the learning content: one is the example company "DeBITE" which is a company in the wood industry sector. This demo-company produces furniture and deals with furniture-accessories. In this case-study, students can look into the business processes resulting from the mentioned business scenario.

The business processes are modeled refering to the supply chain operations reference model (SCOR) by Stephens (2001), an open standard for modeling business processes. Even

if the ERP-content focuses mainly on processes inside *one* company, the structure of SCOR, which is based on a three-level concept, is open to a further detailing on additional levels (i.e. 4-6) - depending on the process- and information system detail and further development towards supply-chain-management.
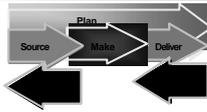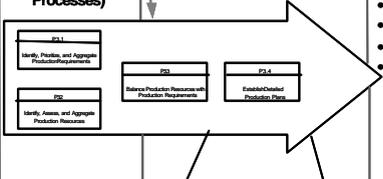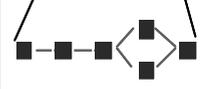
Level				
	#	Description	Schematic	Comments
Supply Chain Operations Reference model	1	Top Level (Process Types)	Plan / Source Make Deliver	Level 1 defines the scope and content for the Supply Chain Operations Reference model Here basis of competition performance targets are set
	2	Configuration Level (Process Categories)		A company's supply chain can be "configured-to-order" at Level 2 from approximately 24 core "process categories." Companies implement their operations strategy through their unique supply chain configuration.
	3	Process Element Level (Decompose Processes)	P3.1 Identify, Prioritize, and Aggregate Production Requirements / P3.2 Identify, Assess, and Aggregate Production Resources / P3.3 Balance Production Resources with Production Requirements / P3.4 Establish Detailed Production Plans	Level 3 defines a company's ability to compete successfully in its chosen markets and consists of: • Process element definitions • Process element information inputs and outputs • Process performance metrics • Best practices, where applicable • System capabilities required to support best practices • Companies "fine tune" their Operations Strategy at Level 3
Not in Scope	4	Implementation Level (Decompose Process Elements)	■—■—■—◇—■	Companies implement specific supply chain management practices at this level Level 4 defines practices to achieve competitive advantage and to adapt to changing business conditions

Figure 2: The level-concept of the supply-chain-reference-model

The SCOR-model also seems to be well suitable for didactical reasons: Students can "click" themselves into the details of a business process and can "drill-down" on the information-system-level.

For this case-study approach of the company "DeBITE", the business model of the demo-company was done with ADOLOG[3], a business modeling tool based on ADONIS, and the SCOR-model. For further detailing of the SCOR-reference-processes, it is planned to combine the "easy-to-understand" processes with more detailed Event-driven-process-chains (EPC) (Scheer 2002), which refer to ERP-Systems reference-models, like the SAP R/3 reference model (see figure 3).
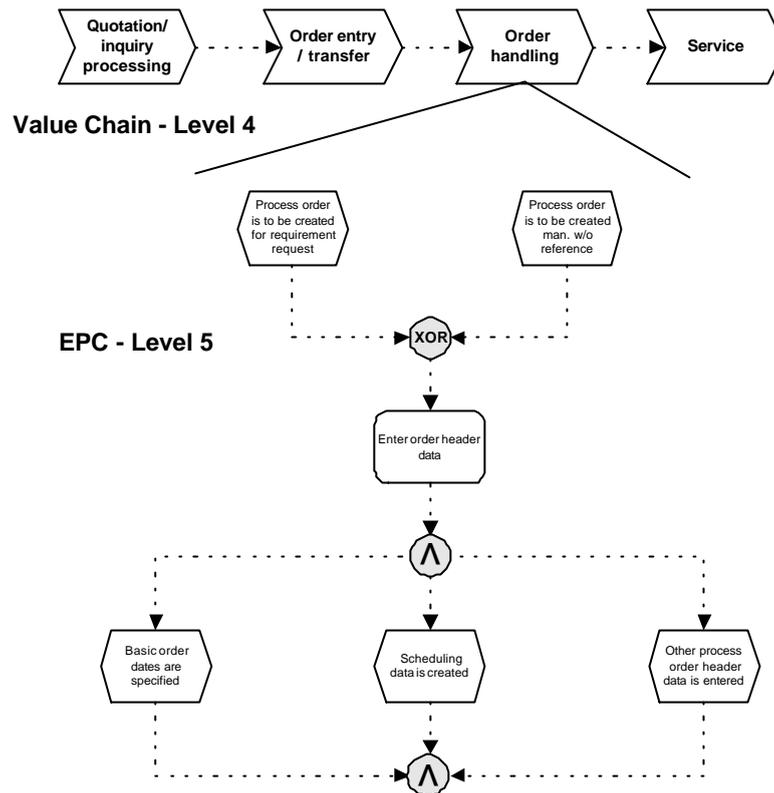
Figure 3: Example of the extension levels of the SCOR-model

The objectives of the case-study "demo-company" are primarily act to transfer the understanding of the integration between business processes and the function mode of an ERP-System. Secondly, the didactical scenario of a demo-company, which is multimedially supported, leads to an easier understanding and higher motivation while learning a complex subject. Furthermore, this approach in a practice-oriented way shows the interaction between people, working on different tasks in various departments along business processes. This holistic view supports the better understanding of the function mode of ERP-Systems, where functions, based on master-data, support the employee's tasks. Thus, as an additional benefit the case-study deepens the student's understanding of the way a company works.

The second approach made in the project described is more traditional: it starts with fundamentals of business modeling, the architecture of integrated information systems – based on a business administrative view and a technological view. To structure the content

mentioned the project-team defined in the analysis-phase various mind map diagrams, which

finally lead to the definition and structure of learning objects. Figure 4 shows as an example

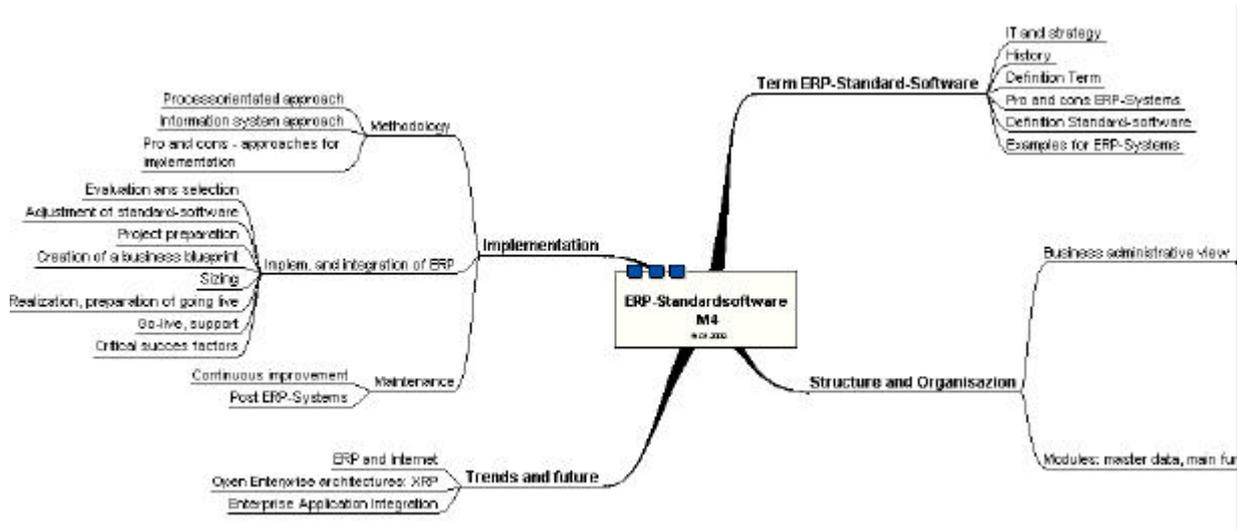the mind map of the project-module "fundamentals of ERP-systems".

Figure 4: Mind map of the project-module "Fundamentals on ERP-Systems"

Based on the modules concerning the fundamentals of ERP-Systems, the ERP-content

is function oriented structured: The various departments of a company, referring to the mod-

ules of an ERP-system, are the structure. Within the specific modules roles have to be de-

signed, reflecting the positions in a company. Moreover, related tasks along business proc-

esses, their interaction with other departments and their view on ERP-functionalities are de-

fined.

Design

During the design phase of eduBITE learning objects modularizing the content of in-

tegrated business information systems, which are analyzed during the analysis phase have to

be modelled as well as learning scenarios describing the whole course structure. This tasks

are supported in eduBITE by eduWeaver, a tool developed for this very special purpose sup-

porting also the re-usability of learning objects and course structures in a very high degree.

Figure 5 describes the understanding of learning objects and course structures in eduBITE in form of a simplified meta-model.
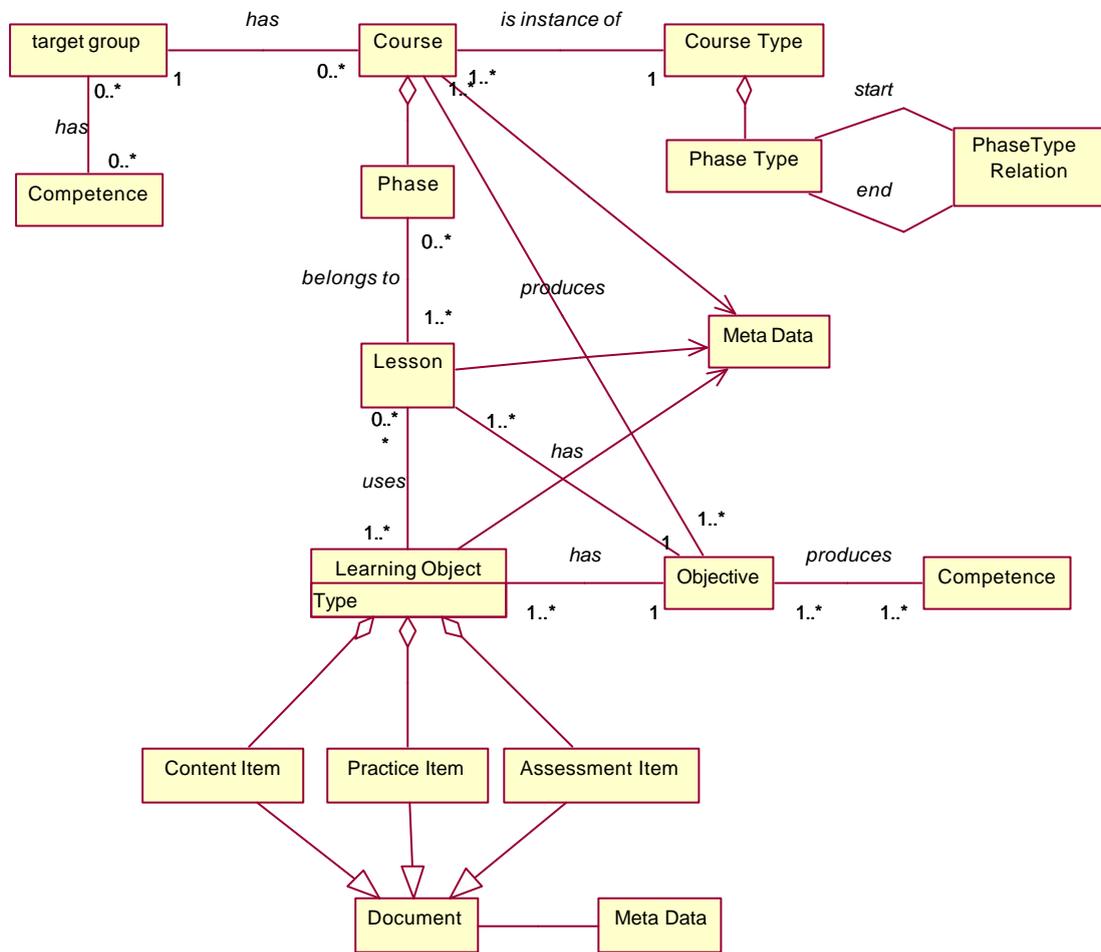

Figure 5: EduBITE Courseware Meta-modell

Learning objects are aggregates of documents describing contents, showing their applicability and testing the learner (content items, practice items, assessment items). Learning objects are supposed to have high integration and to be loosely linked. Learning objects have objectives producing competences for the learner. So, they also can be structured to lessons (for an example see figure 6) and lessons are aggregated to phases. A whole course is built out of various phases. The structure of best practice courses can be re-used in form of course types predefining special course patterns.
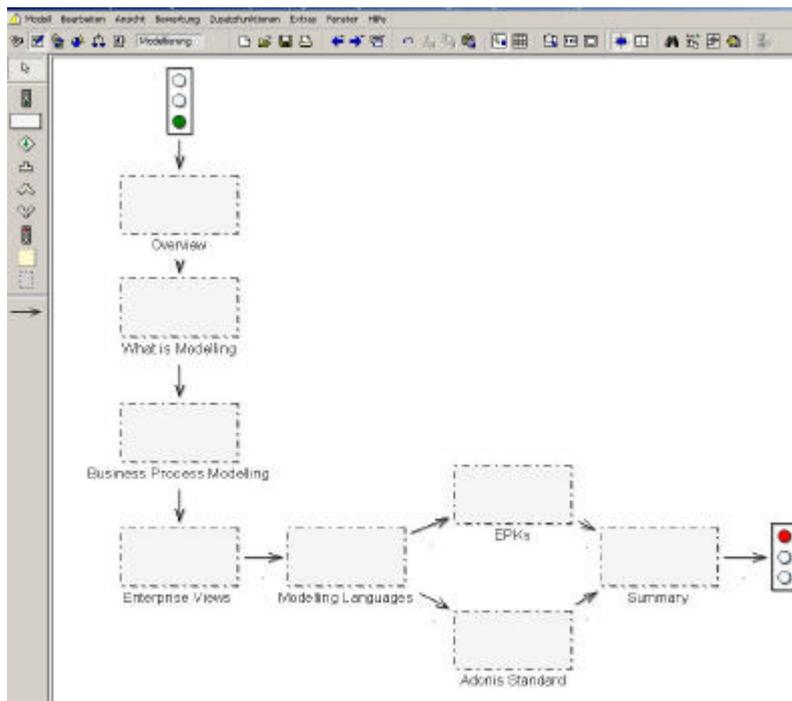
Figure 6: Learning Objects are grouped to a lesson

Implementation and Test

During the implementation phase of eduBITE those documents (e.g. texts, slides, videos, audios, animations) specified during the design phase are created by using different authoring-tools (e.g. Dreamweaver, Autorware, Word, Adobe Premiere). Sometimes also an adoption of existing documents for re-usee in this way makes sense. The quality of the documents has to be tested during this phase in form of project reviews. All documents are uploaded to the eduWeaver database which serves in this way in eduBITE not only as a courseware design tool but also as a powerful content repository.

To make course materials interoperable eduBITE foresees an XML export interface according to e-learning-standards (LOM). Via this interface it is, therefore, possible to automatically implement courses to a special learning management system. We use WebCT as learning platform in eduBITE.

Evaluation / Maintenance

During this phase two courses using the same learning objects within different learning structures are evaluated in two different universities. During this phase didacticians, specialized on e-learning support the technicians coaching the two courses to be evaluated. In this way evaluation and quality test are made by the student's directly. According to the learner's feedback some adoptions are still possible during this phase.

Results

EduBITE is an attempt to produce highly reusable learning objects to be used in different integrated business information system learning scenarios. To do this in a e-content development process framework supported by a computer aided e-content engineering tool, to evaluate the outputs professionally and to rollout the experiences and products in Austria.

The project started in autumn 2002 and has a runtime of 2 years. Until now analysis phase was completed and documented in a content specification handbook. Design of learning objects has been started. A prototype of eduWeaver is available to support design work. Design of learning objects is supposed to be finished in June 2003. Implementation of the specified documents is planned for summer 2003. The first learning scenario that will be designed based on these learning objects will be to support a face-to-face course that will be evaluated in spring 2004. Experiences of this evaluation process will result in learning object enhancements being evaluated again in a blended learning scenario in autumn 2004. These experiences will also be rolled out together with the developed learning objectives and learning scenarios in form of a central eduWeaver repository as a project result in autumn 2004. As future work in this area we plan to do investigations of analysis and simulation potentials of course scenarios in dependence of learner skills and knowledge based automatic configuration of course scenarios.

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[1] AKIT stands for Academic Platform for IT-Learning, see http://www.akit.ac.at

[2] The Learning objects are designed according to standards, like LOM,

http://ltsc.ieee.org/wg12/; IMS, http://www.imsproject.org/; SCORM,

http://www.adlnet.org/index.cfm?fuseaction=scormabt

[3] ADOLOG and ADONIS are products of BOC GmbH, http://www.boc-eu.com/