eduWeaver – A courseware tool

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The courseware design tool eduWeaver provides a learning object pool as well as the export functionality of already designed courses, which are linked to the course material. eduWeaver supports the export functionality using an XML interface, which allows the export of the modelled learning processes into a SCORM® or an IMS package in order to guarantee independence of learning management systems (LMS). By means of breaking down the learning processes into four levels of different granularity, the modelling of didactics within the learning processes and the reusability of courseware is possible.

Keywords Learning Objects, Courseware, -Design, -Modelling

1. Introduction

Courseware- and learning management systems (LMS) are developed in order to facilitate the design, implementation and spread of learning processes. Due to the growing number of e-learning applications in lessons and distance courses, the support by convenient in use courseware systems and LMS became necessary. Although ready-to-use computer-based trainings (CBT) and learning management systems for individual courses are available today, the design and creation of online courses is still a challenge for teachers. The problems faced by teachers are numerous in this context. Time-consuming creation of e-content because of complex authoring tools, impossibility of finding existing learning objects (LOs) that fit into the own course and the dependency on the used learning management system are some of these challenges teachers have to cope with.

Therefore, two Austrian universities and three Austrian polytechnics initiated a project called eduBITE in summer 2002. The project was funded by the Federal Ministry for Education, Science and Culture of Austria. The goals were to develop teaching materials, to build instruments and to establish a communication platform. Hereupon learning objects in the area of integrated business information technologies were built as well as the tool eduWeaver was developed. Ascribable to an increasing demand for courseware design tools, eduWeaver is used by several universities and schools now. The association AKIT (Akademische Lehr- und Lernplattform – academic teaching and learning platform) represents the communication platform where eduWeaver is being put to educational institutes' disposal.

eduWeaver accomplishes different components. On the one hand eduWeaver is a repository for learning objects (LOs). This means that developed LOs are recorded in a repository, which is part of the tool eduWeaver. The idea was to collect all reusable LOs and to use them again for other courses. The teacher himself adopts the role of the author of learning objects but by virtue of lack of time the teacher additionally has the possibility to reuse existing learning objects and this saves a high amount of time.

On the other hand the motivation for the development of eduWeaver was the necessity to structure learning scenarios for didactical purposes. Teachers now are able to design complete courses using four different course levels, which differ in their granularity. By using eduWeaver as a tool for modelling courses, teachers are not only able to map didactical learning scenarios but to reuse them again for other courses.

2. eduWeaver – openness to instructional design

eduWeaver is based on the meta-modelling platform ADVISOR® and was developed as a specific method of ADVISOR®. This has been realised through customising as is depicted in figure 1 (see [1] and [2]). ADVISOR® itself is an open meta-modelling platform and was developed by the BOC Information Technologies Consulting GmbH within an ESPRIT project of the European Union between 1998 and 2000 [9]. ADVISOR® additionally offers supportive features for the training and the learning of employees in an e-learning environment [3].
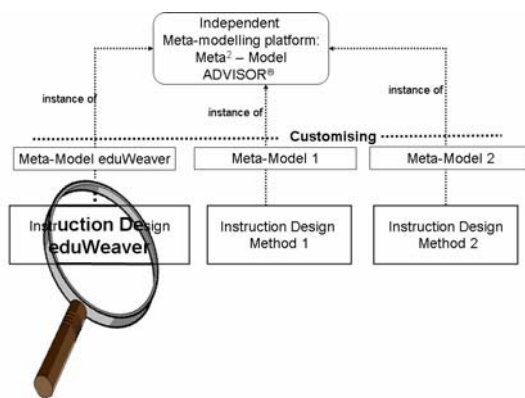
Fig. 1   ADVISOR® and the method eduWeaver

A meta^2–model consists of concepts that are used for definitions of meta-models. The user of a method constructs, according to the method, models. Afterwards the operator accomplishes analyses and simulations (which are algorithms and mechanisms) with his models [see 1]. ADVISOR® provides simulations of designed educational processes relating to times and costs. Due to this functionality the time and costs saving is measurable [2].

A meta-modelling platform supports different components like integration mechanisms, adaptibility, openness and flexibility [4]. Due to these requirements a meta-modelling platform can be considered as the basis of various modelling methods.

On the basis of the independence of the meta-modelling platform ADVISOR® the tool eduWeaver has been developed as a method of ADVISOR®. Therefore, the meta-model of eduWeaver emerged from the meta^2–model of ADVISOR®. The aim was to develop a tool that meets the special requirements of a courseware design tool, which is particularly used in the academic environment. Thus, eduWeaver has to demonstrate special usage scenarios that are defined as didactical learning scenarios. Through customisation the method eduWeaver has been developed. Advancements of the method eduWeaver can be achieved by modifications in the meta-model. Though the foundation for the latter process is the meta-modelling platform ADVISOR®, the platform ADVISOR® itself is not altered. Further developments regarding eduWeaver pertain without exception the tool eduWeaver.

3. eduWeaver – technical realisation

eduWeaver is a web-based tool and is available over ADOweb®. This service enables the access to the modelling method eduWeaver [9]. The underlying programming language of eduWeaver is Java.
The meta-data has been adapted to the Austrian meta-data-specification for e-learning resources.
The implementation of a user authorisation purposed the reusability of own and external learning objects and most notably the constraint of changing learning objects. Due to the user authorisation the operator is allowed to alter only own learning objects.
The export of designed courses and the connected e-learning resources is provided by an XML interface. This functionality supports the import of modelled courses into the majority of learning management systems as a result of the compilation of SCORM® and IMS packages.

4. eduWeaver – independence of e-learning platforms

The role of eduWeaver as a courseware tool is precisely defined. The tool eduWeaver is seen as a conjunction between e-learning platforms and their users, who are divided in two different groups: students and teachers. Both teachers and students have several advantages by using eduWeaver and an E-Learning Platform like interactivity, independence of place, reusability of learning objects etc. as can be seen in figure 2.
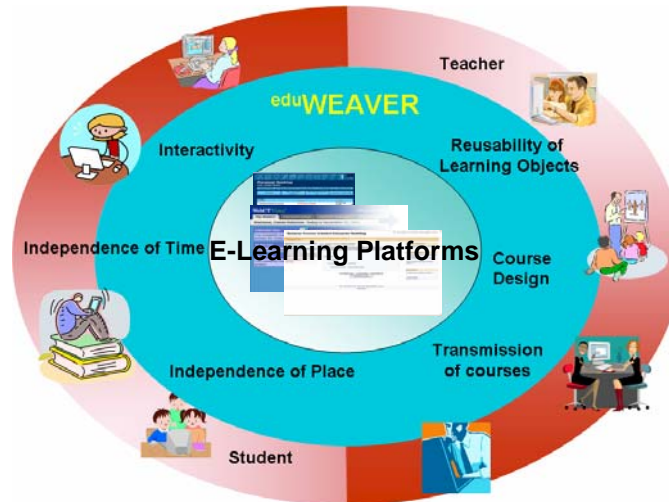
Fig. 2   The role of eduWeaver

The design of didactical models coupled with the creation of the own e-learning materials that can be resources like books, slides or lecture notes is the main advantage in the usage of eduWeaver. Simulations and optimisations of educational processes represent important features for the users of eduWeaver especially referring to time and costs of a teaching process.[5]

Furthermore, the support of the creation of reusable learning objects in eduWeaver is an essential functionality of the tool. Learning objects have to meet different requirements – accessibility, reusability and interoperability. Thus, learning objects have to be chased with the metadata to be recorded in a database, which is the learning object pool in eduWeaver. The reusability means that the LOs should be operable in different contexts and independence relating to interoperability is another important demand [6].

Independence is one important characteristic of eduWeaver. Due to the provision of independence of LMS by eduWeaver, problems, which arise when an LMS is changed, will not accrue. The possibility of exporting designed learning processes as SCORM® (Sharable Content Object Reference Model) or IMS (Instructional Management System) packages through an XML interface is offered by the tool eduWeaver. Due to this feature the autonomy of eduWeaver concerning learning management systems can be guaranteed.

5. eduWeaver – an application scenario

In order to construct didactical learning scenarios in an ideal way, eduWeaver provides four different modelling levels and offers a learning object pool.
The learning object pool contains numerous reusable learning objects. Therefore the physical learning material is recorded at the eduWeaver database and connected with the learning objects in the learning object pool.

The four levels of eduWeaver consist of the coursemap (level 1), the modules (level 2), the lessons (level 3) and learning objects (level 4) [7].
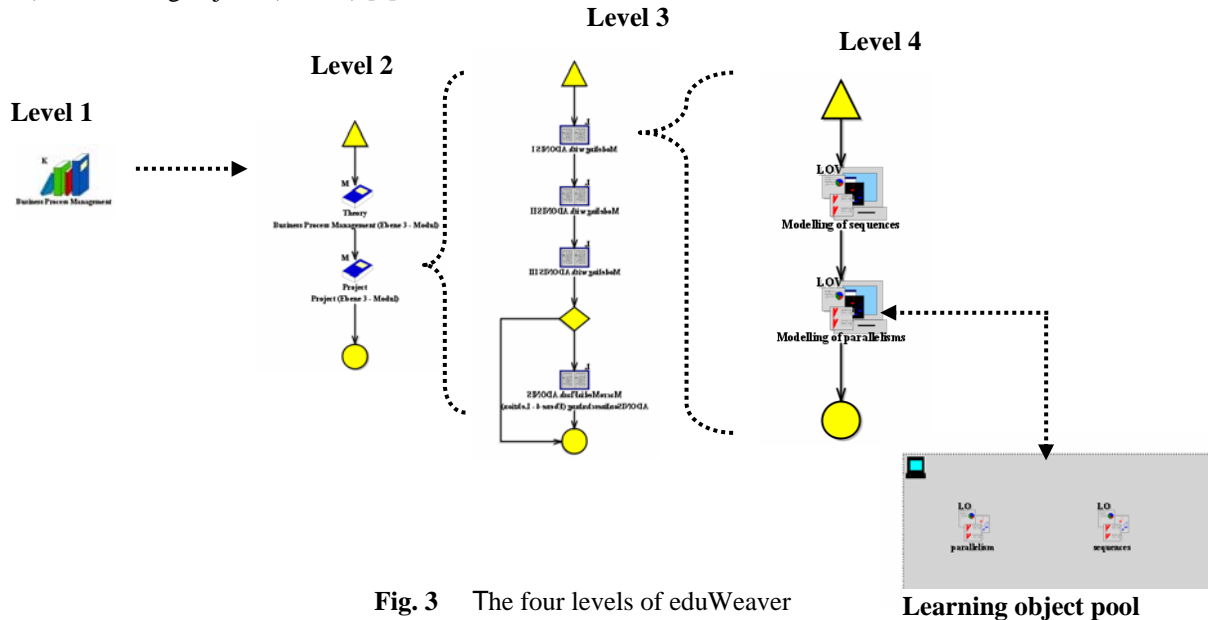

Fig. 3   The four levels of eduWeaver

Learning object pool

As is illustrated in figure 3 the four levels of eduWeaver are connected with each other by referencing from an object of one level to the next one. Thus a hierarchical order can be noticed.

In every level different didactic learning scenarios are modelled therefore the granularity differs in every level. Figure 3 shows how the sections reference to each other. Every modelled process begins with a triangle that is the symbol for the start of the process. The circle shows the end of each modelled process. Every level exhibits its own symbol representing modules (level 2), lessons (level 3) or learning objects (level 4). It has to be noted that level 1 just gives an overview of all available courses. Thus level 1 shows a map of independent courses. Every course is splitted into modules on level 2 and the learning process is depicted as a sequence or another alternative path. Each module represents a cohesive part of the learning and teaching process. In figure 3 the course "Business Process Management" consists of two modules which deal with the theory of the course and a project that comprises the practical part of the course. Every lesson in level 3 is assigned to the thematically coherent module and contains one lesson in presence teaching. Therefore the outcome of this is that every lesson consists of various learning objects. Depending on the required learning objects in a lesson the number of LOs varies. In figure 3 there are two LOs shown for the lesson "Modeling with ADONIS[®] I". The level of the learning objects shows the highest degree of granularity as the learning objects represent the smallest units within the modelling process. The learning objects in the last level are linked to the learning objects in the learning object pool. Thereby, the learning objects in level 3 are indirectly linked with the physical courseware. The LOs of the learning object pool, which represents the repository of eduWeaver, contains the learning resources.

Figure 3 illustrates the splitting of the learning and teaching process over 4 different levels. This way of course modelling allows the didactical processing of course models. The learning object pool is the fundament of all models in eduWeaver. The learning objects of the learning object pool represent the linkage between the models in eduWeaver and the physical resources. Thus, applicable learning objects have to be recorded in the pool of learning objects before the user begins to design the teaching process.

6. Conclusion and summary

This paper focused mainly on the tool eduWeaver. As a method of the independent meta-modelling platform ADVISOR® it was developed by means of customisation. eduWeaver represents a linkage between e-learning platforms and its users who are teachers and students. Both groups take advantage of the usage of eduWeaver. Interactivity, independence of time and place, reusability of learning objects and many other attributes within the learning and teaching process are provided by the usage of eduWeaver. Due to the arrangement of learning processes in hierarchically dependent levels, a didactical learning process can be modelled in an optimal way. Main features of eduWeaver are the independence of learning management systems and the reusability of LOs.

The tool eduWeaver is working and available through the internet page http://www.edubite.ac.at and the access is free for schools, universities and polytechnics. Though some schools and universities are using eduWeaver, enhancements are still accomplished.

The improvement of the user interface as well as the design of online courses and courseware, which will give users an introduction to eduWeaver will be the focus of future developments.
An attempt was made together with students to develop a resource model. The aim is to be able to model learning objects and to create learning objects, which show a high didactical quality. The development of this model still goes on.

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