

# A Content Modeling Approach as Basis for the Support of the Overall Content Creation Process

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## Abstract

*The conception and production of new e-learning content in a corporate environment is expensive and time-consuming. In this paper we propose a content modeling approach as part of an authoring management platform. This platform aims to make the cooperative process of conception and production of e-learning content faster, easier to manage and equips knowledge domain experts with a tool, which does not demand for media and didactic experience.*

## 1. Introduction and motivation

The conception and production of e-learning content is expensive and time-consuming. This applies especially in a corporate environment where knowledge domain experts, authors, media producers, and project managers participate in the process. The involvement of many participants increases the effort in coordination and communication, especially in the exchange of documents and annotations.

Existing authoring tools in the e-learning area focus on the production of media-based content by supporting media producers. On the other hand, there are solutions for the management and exchange of media objects like content management systems and repositories. These tools have to be combined with editors for the description of concepts and storyboards as well as specialized tools for project management manually. A comprehensive system enabling all participants to cooperate and execute their tasks is still missing.

In the EXPLAIN project [1] a web-based Authoring Management Platform was designed that supports the

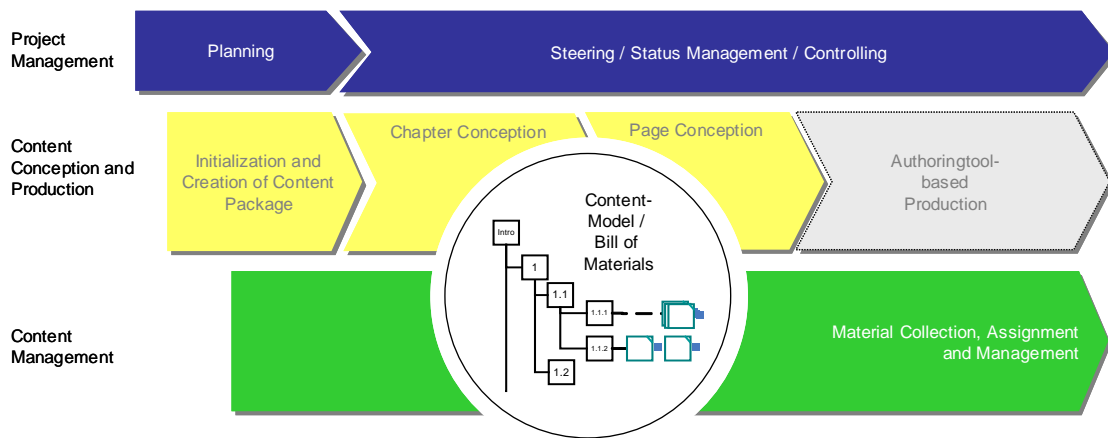
process of creation of e-learning content on the whole and allows the integration of existing authoring tools. The content model represents the central element in the overall process. It results from an initial project plan, it is created during the conception and it is an integral part of the storyboard and the basis for the production phase. The content model can be compared with a bill of materials used in product design and development as well as in production planning and control in an industrial context [2].

## 2. Authoring Management Platform

The Authoring Management Platform is mainly composed of three processes.

A content creation process has many aspects that have to be taken into account. In addition to the production of media and their combination into a learning object, it consists of the conception, material and resource management and project management. Our goal is to make this complex cooperative process faster and easier to manage, and to allow knowledge domain experts (called "experts") to take responsibilities for many steps of the process by guidance through the process steps and context sensitive tips. Therefore in the EXPLAIN project an Authoring Management Platform, which handles all these issues, was designed. Figure 1 shows the platform's process-map.

The project management encompasses the control of costs and time, administration of milestones for the content-creation process and management of responsibilities. Additionally it handles the collaboration of the users of the platform. The creation of reports regarding deadline violations, financial overviews or material or personal statistics is included here as well as a notification system sending messages to users automatically, if certain events are triggered.



**Figure 1: Process map of the platform**

Within the content conception process the modeling for the e-learning content to be produced is done. The platform provides an easy to use structuring tool, which allows the modeling of content in distinct steps. First the logical structuring is done – chapter conception, followed by the physical modeling – page conception. The last step includes referencing already available media objects and writing texts or concept descriptions for the modeled pages. If media objects are not available at the point of conception a replacement, called material-notice, that describes the desired media-object is referenced, until the object is available in the proper format. The whole conception process is guided by the platform in terms of didactical issues. For the production, the content model is transferred to an external authoring tool, where the learning object can be produced before it is exported to a standardized format like SCORM.

The content management component of the platform comprehends classical issues of content management. It provides a central data store, where the material can be stored and versioned. Redundancy of data and access conflicts are prevented, which in particular is fundamental for the collaboration to work. In this regard, the Authoring Management Platform also manages the access to the material by assigning different rights to different user-roles. In addition to that the content management component supports the referencing and assignment of materials and handles the metadata and status information of the material.

For all these three components of the platform, the content model is the central aspect. To harmonize the collaboration of the different components, the content model respectively the content modeling language (CML) has to fulfill certain requirements.

Because of the project management being driven almost completely by status, a CML has to support the storing and querying of status information regarding time and financial issues, responsibilities and process status. Furthermore the propagation of such values via the hierarchy of the content model has to be adjustable.

Time values, e.g., have to be propagated in a different way than costs.

The chapter and page conception implies a CML that allows hierarchical structuring without generating too much overhead in structure and implementation. The didactical information gained from the user has to be stored with the content model, too.

Regarding the content management, the CML should enable the platform to handle the above-mentioned content management issues. This can be done by providing special status information. Additionally the CML should support the consistent handling of references, especially the handling of material notices which may be of a different format than the objects they describe.

### 3. Our approach

In taking a closer look to related research works in this area, existing modeling languages seem not to fit in our scenario of use. Two different types of modeling languages can be distinguished: the usage of the first group (TeachML [3], LMML [3] and <ML><sup>3</sup> [4]) is restricted only to modeling and structuring the content without explicitly and necessarily expressing the whole life cycle of contents, especially in a cooperative scenario. The second group (Palo and OUNL-EML [3]), while being abstract, generic and constructivist oriented, does not meet all the requirements of our project. That is why we decided to design an own CML, which is described in this chapter with respect to each of the Authoring Management Platform's processes.

#### 3.1 Content conception and production

The platform's content conception process demands a content model with a concise structure, which can be modeled by an expert easily. The underlying modeling language should support this. We decided to make use of the book paradigm, because it is intuitive and

understandable for experts and thus can be modeled easily. Therefore we get a hierarchical structure of lessons which represents the logical structure. Lessons can be either chapters, if they are part of the highest level in the hierarchy, or sub-chapters otherwise. Lessons consist of pages, page groups or more subordinated lessons. The recursion of lessons is theoretically endless, but should not exceed a reasonable threshold. The pages and page groups represent the physical structure of the e-learning content. If at time of conception the exact number of pages in a lesson is known, a page is used, otherwise a page group is modeled.

### 3.2 Project management

For our approach we identified the information that needs to be stored to trigger the events that account for the project management. The process status determines the progress of the current process step. Values could be like "in work", "under review" or "review finished". The cost parameters are needed to control the preserving of a given budget and to create financial reports. They include planned and actual costs. Cost parameters are propagated over the content hierarchy additively, i.e. to get the cost of a lesson all respective costs of inferior lessons, pages, page groups and materials are added. The time parameters are handled similarly. They include deadline as well as start and finish dates of the different process steps. In contrast to the costs, the times are not added. To get the deadline of a superior lesson, the earliest time could be taken, for example. The responsibilities determine whom to notify, if special events, like a finished review or a deadline violation occurs. Annotations may be attributes of content objects like lessons and pages or references to external documents.

### 3.3 Content management

The content management process is manifold and makes high demands on the content model and thus the modeling language used. The main challenge here is, besides the classical content management issues, the referencing and representation of materials. Although a simple reference to the ID of the desired material may be sufficient, the material still has to carry enough information for the platform to handle issues like cross format referencing or versioning. Here the format depicts the actual media format of the actual object, e.g. text for a textual material notice that describes an image that has to be produced. Whereas the type means the target type of the material to include,

"image" in the given example. Versioning information encompasses references to previous and following versions along with the corresponding identifiers, while the access status can be set to prevent access conflicts.

## 4. Conclusion and future work

In this paper we proposed a content modeling approach as basis for an Authoring Management Platform. It supports the production process of e-learning content on the whole, including project management, content modeling as well as resource and material management. Thus it contributes to a greater effectiveness and efficiency of the production of new e-learning material. The major work in the future will be the implementation of the platform and hence the implementation and application of our approach. The implementation will also provide the opportunity to give an objective judgment of the quality and capabilities of our approach. The extension of the modeling language by means of didactical issues is another aspect to consider in the future.

## Acknowledgments

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