Converting learning content to learning objects (LO) and atomic LO's
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CONVERTING LEARNING CONTENT TO LEARNING OBJECTS (LO) AND ATOMIC LO'S

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ABSTRACT

Our learning content can be structured as learning objects (LO) and as atomic learning objects (ALO). For both of them a set of metadata has been defined. The metadata follows the international standards on learning content. As a result the interoperability of the learning objects in different learning systems is being guaranteed. We are converting the digital learning content into LO's. A learning object is seen as a composition or a scenario model of a set of blocks. The blocks, presenting the smaller learning content parts, are composed of the learning content (full text doc) and of a set of added ALO's, being small learning content elements. The blocks function as the nodes in a content tree. The full content of a block will be decomposed into atomic learning objects. Depending on the chosen scenario model, some scenario specific ALO's will be added and the LO will be created. The course modules and courses will be built by selecting and tracking some LO's. This course module or course itself is a LO too, inheriting the metadata of the composed LO's.

KEYWORDS

Learning Content, Learning Objects, Atomic learning objects, EDUMAP, e-learning scenario model

1. INTRODUCTION: LEARNING OBJECTS AND ATOMIC LEARNING OBJECTS.

A learning object (LO) is an independent content component that can function as the learning content of a course module. It can be defined as any digital content resource that supports learning, that can be re-used and that can be delivered on demand across the network, be it large or small. Examples of those larger reusable digital resources include entire web pages that combine text, images and other media to deliver course modules.
A course module is a scenario of a number of blocks representing learning content parts.
The learning process being the reading of the content on this level is defined as a sequence of a number of steps, each being the reading of content parts in a block.
A learning object is such a composition or a scenario model of a set of blocks. The blocks, presenting the smaller learning content parts, are composed of the learning content (full text doc) and of a set of added atomic LO's, being small learning content elements (short text documents, figures, digital images or photos, live data feeds, live or pre-recorded video or audio snippets, animations, some questions and answers, some tests, some mouse-over animations, and smaller web-delivered applications).
The architecture of the block (the way all atomic objects have been used) and the composition of the blocks to create a course module (learning object) will be based on a chosen e-learning concept, taking into account the characteristics of the learner with special focus on the personal learning styles of the learner.

The learning objects and the atomic learning objects will be stored and managed in a LOMS (learning object management system).

By defining those learning objects as independent components, by following the international standards and by managing them in a learning object management system (LOMS), the re-usability of the learning objects and the interoperability is guaranteed, and so is the opportunity of potential implementation in different learning management systems (LMS).

2. CONVERTING A COURSE INTO AN E-LEARNING PRESENTATION

2.1. Learning content decomposition and tree structured content parts or BLOCKS

Figure 1: decomposition of content document

We are all very familiar with the structure of a book in chapters. A course is similar with a book. A chapter contains many blocks, being smaller content parts.

If the chapter can really be split into more individual content topics, or which can be learned as individual topics, than the learning content is split into two or more independent content units, put together in a sequence. So the learner will learn them as one logical content module. Each unit is composed of a set (one or more) of blocks, corresponding to some smaller content parts, being structured as a relational tree.

The learning content is split into a set of full text documents each linked with a block in this structure. The relation between a block and another block of lower level (a sub block) is defined as: "can be explained as" or "consists of" or other explaining expressions.
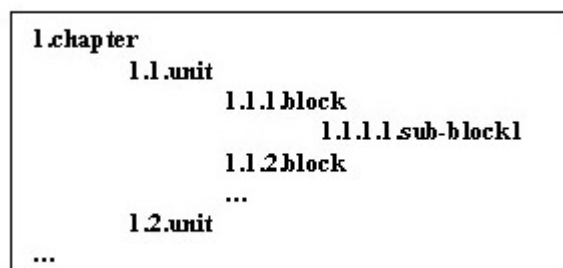

Figure 2: three structure of content blocks

Example of a decomposition of a text document

Figure 3: learning content document

Hoofdstuk1: Internet als info en communicatie kanaal van het bedrijfsleven

I.De toegang tot bedrijfsrelevante informatie

0. Inleiding

Wanneer men op zoek is naar bedrijfsrelevante informatie, is het internet een uiterst geschikt middel. Het internet kan namelijk gezien worden als een bibliotheek van allerhande informatie van heel de wereld over de meest uiteenlopende onderwerpen. De kunst is enkel, in dit ongestructureerde geheel van data de juiste en relevante informatie te vinden die men zoekt.

1. Zoekmachines

Elke internetsite heeft een uniek adres. Men weet echter vaak niet op welk adres men de nodige informatie kan vinden, het is dus nu juist de kunst dit adres te vinden. De gemakkelijkste manier is door gebruik te maken van allerhande zoekrobotten. Zij zorgen namelijk voor een snelle en makkelijke navigatie over het Web door het simpelweg intypen van sleutelwoorden, waarna de zoekrobot sites waar het kernwoord in voorkomt gaat opzoeken. Vervolgens bekomt men een lijst van adressen waar het vermelde trefwoord in voorkomt. Een voorbeeld van een bekende zoekrobot is Yahoo.

Hierbij is ook interessant te vermelden dat je op de volgende sites terecht kan voor het adres van de internetsite van een bedrijf of voor het telefoonnummer en het adres ervan:
http://www.infobel.be
http://yellow.advalvas.be/
http://www.digikids.be/dk_NL/SITES_FORUMS/THEMASITES/BEDRIJVEN/A.htm
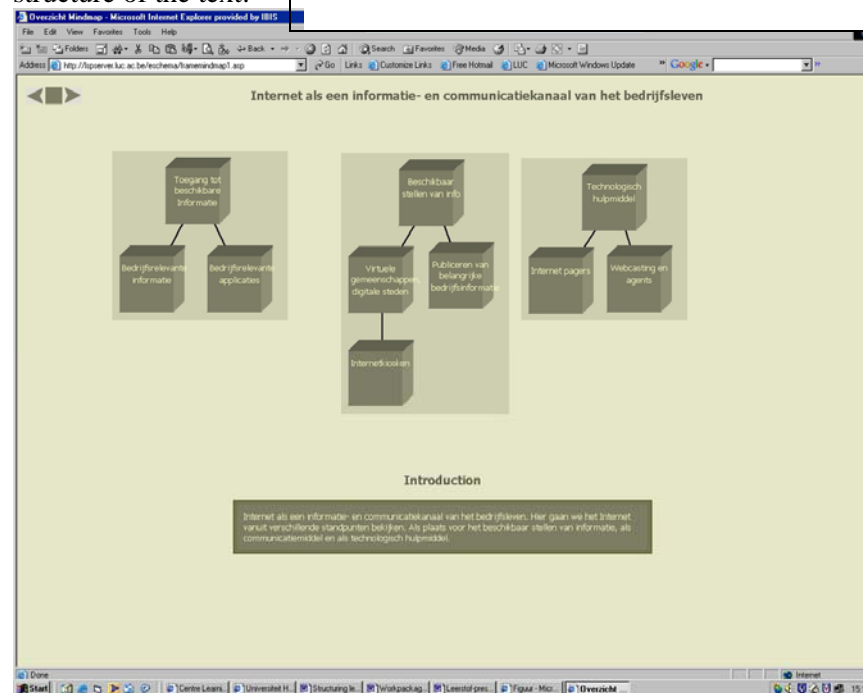
The content tree structure of the text:

Figure 4: three structure of content blocks

2.2. Decomposition of the blocks into the ALO's.

The content linked with a block is a part of the original text, it is a full text document, including figures, Q&A, test questions, hypertext links, …being all the atomic learning objects (ALO).

This full text document will be decomposed into ALO's, namely figures, Q&, … all being the presentation elements.
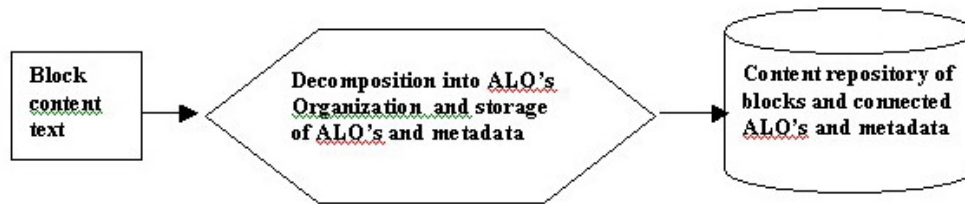

Figure 5: a block content text decomposed into ALO's

2.3. Process of LO creation as a composition of blocks in a scenario model

We can create different compositions or scenario models of the set of blocks to present the learning content to the learner as an e-learning course module. The blocks are the building blocks and linked with them are the basic atomic learning objects.
Not only the blocks are presented in a different composition, the blocks themselves differ in architecture by using the atomic learning objects on a different way.

Following the traditional "web-pages e-learning "concept, we can built a tree structured html scenario model. We can bring together the full text docs of all blocks and put them in the pre-defined tree structure. On this time the block, being a html page must be designed using the presentation of the full text and the other atomic elements, being figures, hypertext links, Q&A, keywords, audio fragments, … can be linked with it following the design of the scenario model.
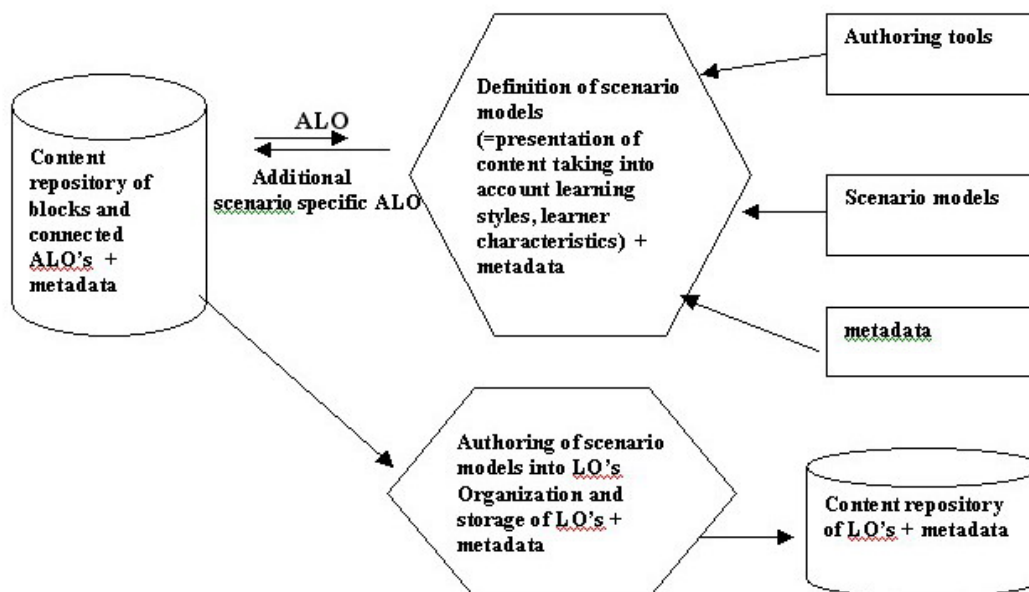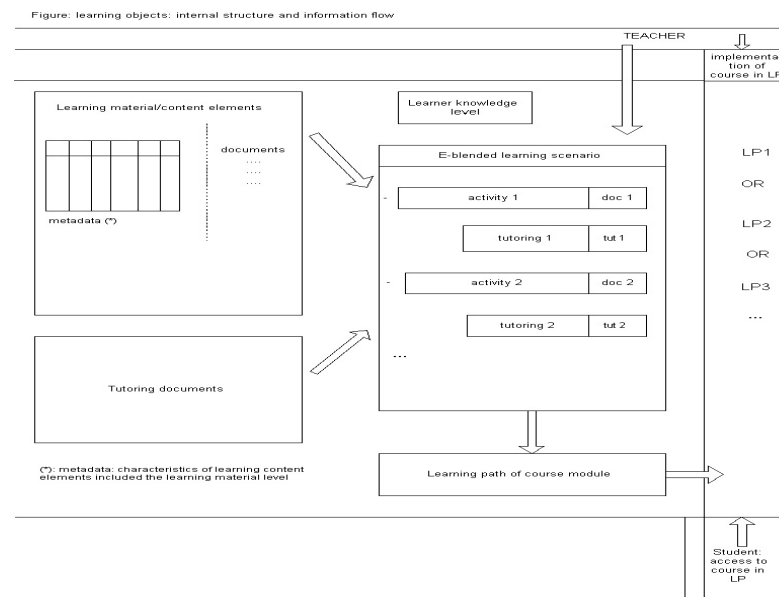

Figure 6: process of LO creation

Figure 7: internal structure of LO and information flow

Following the e-MINDMAP concept, we can build an EDUMAP scenario model.
We can organize the blocks in a graphical way in units and in EDUMAPS.   Relevant atomic objects are the full text, the short text, figures, video's, ….
The datamodel is very similar to this of the previous scenario model.

2.4. Process of course module creation by packaging the LO's.

Figure 8: process of course module creation

The course module or the course consists of one or more chapters. Each chapter can be converted in one or more LO's. The course can be built by packaging some LO's, fitting the characteristics of the learner.

3. COURSE MODULES OR COURSES PRESENTED IN A CHOSEN PRESENTATION SCENARIO.

More and different scenarios can be built upon the same decomposition of the learning content. Dependent on the type of scenario model, a set of presentation components or atomic learning objects, will be defined and are brought together into a scenario model design. The learning objects (LO) structure corresponding to a scenario model, has to be defined and the corresponding relational data model has to be customised.

Some of the presentation components are common to different scenarios and can be re-used. Others are very specific for the scenario to which they belong.
The structure of the Learning Object database has been set up to contain all kind of presentation components required to build e-learning courses following several scenario models.
We can create different compositions or scenario models of the set of blocks to present the learning content to the learner as an e-learning course module. The blocks are the building blocks and the basic atomic learning objects are linked with them.
Not only the blocks are presented in a different composition, the blocks themselves differ in architecture by using the atomic learning objects on a different way.

3.1. e-MINDMAP scenario.

The e-EDUMAP is so telling the story in a graphical way and in a sequence of steps. The blocks are composed of some atomic learning-elements, being the short text or audio document, the full text, some additional text or graphical presentations, or pictures, some questions and answers, some tests, some mouse-over animations, … . The most challenging characteristic of the e-MINDMAP is the visual way of structuring the content. Animation can be built in too. The learner will be supported by this way to understand and to print in memory the structured content with the underlying relations between the content blocks.
An example of a course module following the e-MINDMAP concept:
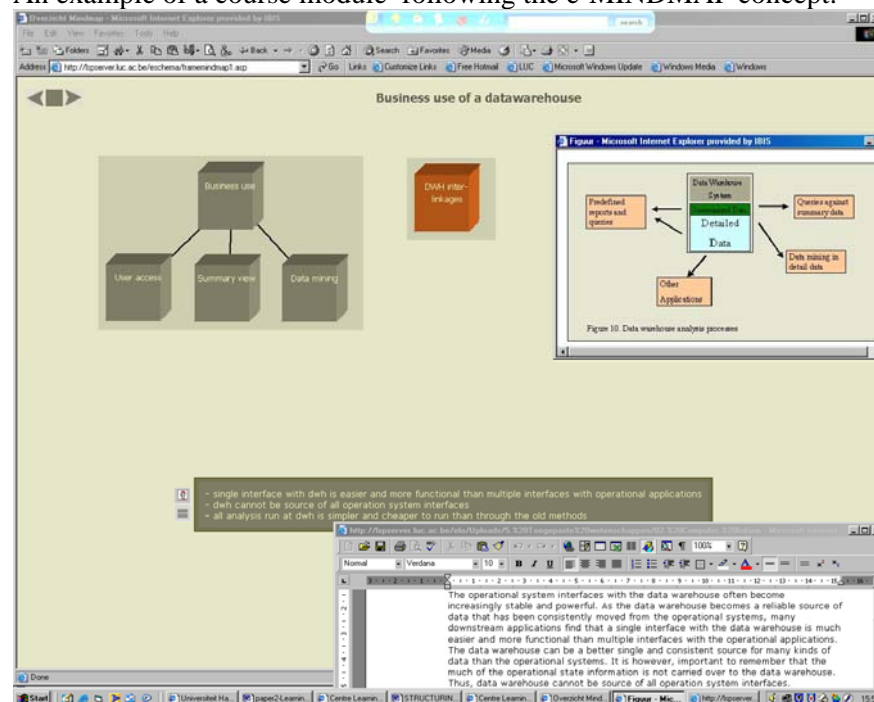
Another example of the same concept, commercialised as EDUMAPS by EPYC. (www.epyc.be)
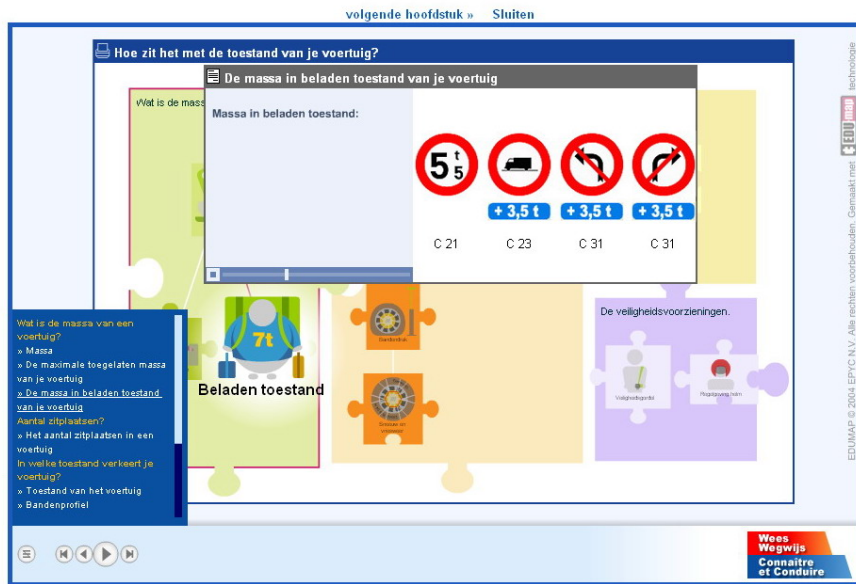
3.2. Tree structured interactive internet pages.

We can build a tree structured html scenario model. We can bring together the full text docs of all blocks and put them in the pre-defined tree structure. On this time the block, being a html page must be designed using the presentation of the full text and the other atomic elements, being figures, hypertext links, Q&A, keywords, audio fragments, … can be linked with it following the design of the scenario model.
In this concept the focus is not the creation of the "visual overview" structure. But now it is possible to built in more interaction and a rich presentation layer.

CONCLUSION

In this paper we are reporting about our methodology for converting the content of traditional courses into LO's. We have already available our LOMS supporting all activities, included in

the creation and management of e-learning courses composed of those LO's. The metadata is already there. Till to now our course authoring system for selecting and packaging the LO's is still not based on them. But we do expect that all LMS in the future will have the built in opportunity of selecting and packaging of LO's .

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