Sharing and Adaptation of Educational Documents in E-Learning

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***Abstract*—Few documents can be reused among the huge number of the educational documents on the web. The exponential increase of these documents makes it almost impossible to search for relevant documents.**

In addition to this, e-learning is designed for public users who have different levels of knowledge and varied skills so they should be given a content that sees to their needs.

This work is about adapting the content of learning with learners preferences, and give the teachers the ability to reuse a given content.

***Index Terms*—Teaching document, distance learning, metadata, Semantic Web.**

I. INTRODUCTION

Most e-Learning applications are accessible via the web and they include varied educational resources that are increasing exponentially. This leads us to searching for relevant documents. These applications share the same relevance searching problems with the web.

Few documents can be reused among the huge number of the educational documents on the web, finding and selecting a text segment, graphic resources or exercises... from a document for the goal of reusing it in another or in a new document is almost difficult.

E- Learning is designed for public users who have different levels of knowledge and varied skills. They don't know that the content of the document they have is adapted to their needs.

II. E-LEARNING

The European commission defined "E-learning ", in2000, as "the use of new multimedia technologies and the internet to improve the learning quality by making it easy for users to access to resources and services as remote trade collaboration".

In this section we will present the actors of an e-Learning resources used by each actor. We are interested in teaching resources are saying essentially exploited by teachers and learners.

A. Actorsof an e-learning

For an e-Learning main actors are the learners, teachers, administrative staff and technicians [9]. According to the tasks performed by these actors, they use different resources. For example, a technician will need access to documents to manage computers; a secretary will need access to records of registrations while some resources can be used by these different actors [9].

In this article we focus on the educational resources used by teachers and learners.

B. Educational objects

We are interested in documents known as teaching that are created for the learning use only, among the huge number of documents available on the web. Producing these kinds of documents requires significant time and budget at the same time it can be recouped only id it's reused all across the wide web. Therefore, it's crucial to structure and index.

Curriculum materials become learning objects: a digital entity used in learning environments with the following properties.

- Autonomy: Each learning object used separately from the other
- Reusability: Elementary learning objects can be used in different contexts and for many purposes.
- Aggregation: Learning objects can be grouped and regrouped in order to form other learning objects.
- Indexing: each learningobjects has a description be retrievable easily.
- In addition: a given learning object should lead to an adequate learning.
- No superfluous: it must be limited to relevant learning objects if we're in need of just one fraction of required objects.
- At the right time: we can find the learning objects in time relying on the indexation.
- Custom: the ability of customization of courses across an organization or each person or user.

III. THE SEMANTIC WEB

"The semantic web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation" [7].

In this section we present the Semantic Web technologies and the needs expressed for the use thereof.

A. Why the semantic web?

The creation of the web was in the early 90s in order to facilitate the access and sharing an important volume data on the internet. HTML formed the most important solution for documents formats on line [12].

Nowadays, the web contains a huge number of documents, but there is no way to control the content: the current web doesn't offer any services in this sense so the

user wastes his time in consulting web pages to find what they need.

Because of this problem, the W3C (World Wide Web consortium) introduced the semantic web as a solution for the improvement of the web to finally offer the users relevant information. This made the web resources understandable by human and machines. The W3C has begun to build new performance tools and languages. XML, RDF, OWL which Figure 1 exposes the layers of the latter.

Using XML, we could separate content from the presentation, RDF made it easy for us to describe the web resources and finally the OWL offered the opportunity to make arguments.

B. The metadata

Tim Berners-Lee said. « Metadata is information about web resources (or other) understandable by humans and processable by software » [12].

The importance of this information is that it is treatable by a software in an automatic way .to ensure that metadata is useable for online resources access, it is mandatory to have a standard for the resource and both the producers and users use the same repository. In addition, this standard must be able to withstand the possible developments and extensions to accommodate future needs. The Dublin Core was the best-known standard for indexing digital documents. It also includes information such as "author", "title", etc…

LOM (Learning Object Metadata) is one of the indexing standards of learning objects and it is built on the top of Dublin Core, it also supplies it by adding specific extensions to pedagogy fields [12].

LOM specifies the syntax and semantics of the educational and defines the required attributes in oder to better describe the learning objects.

The current version of the LOM defines nine categories with a total of 78 items describing a learning object:

- General: resource description across as an identifier, title, keywords, etc.. ;
- Life Cycle: description of features on the history of the resource, its life cycle and so on. ;
- Meta-Metadata: description of the learning resource itself as id, contribution, language ... ;
- Technique: Set the techniques such as data type, format, size, etc.. ;
- Pedagogy: Teaching characteristics;
- Fees: Costs, copyright, description ... ;
- Relationship: characteristics expressing the links to other resources such as type (nature of the relationship);
- Annotation: Comments on the educational use of the resource: Author, date, description;
- Classification: characteristics of the resource described by entries in classification systems (purpose, classification references, path ...).

IV. THE SEMANTIC WEB CONTRIBUTION IN E-LEARNING DOMAIN

There are an infinite number of documents and services on the internet that are accessible to users, but the majority of these documents and services have a unique organization, presentation and content that satisfy many users but not all of them.

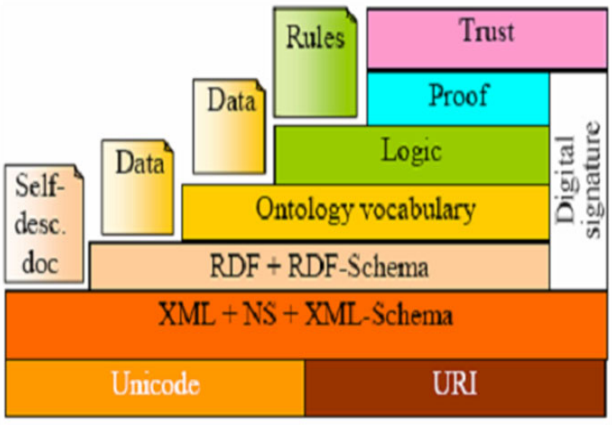

Figure 1. Layers of the semantic web.

Figure 2. Dublin Core elements.

The same problem exists as for the e-learning system; our duty is to adapt the instructional content to users' requirements and make it reusable by teachers and so that the teachers can build another one.

The E-learning that can grow quickly and benefit from the semantic web solution is among the services that are found on the web.

A. The research and reuse.

The formation of educational materials deposits is a great challenge for the well being and the success of any E-learning project. This implies new teaching materials requirements. In the first place, we believe we should allow these materials to be reused in different contexts by different users. This multi-purpose operating documents means that they can be reconfigured for each of these contexts. This reconfiguration is then passed through an adaptation phase [14].

We propose the construction of a warehouse of educational materials which will be composed of two parts:

- The database will store all the learning objects filtered;
- All LOM descriptors and semantic descriptors resulting from the indexing phase.

The LOM and the semantic descriptors will allow us to easily find a learning object stored. So our warehouse will have the architecture depicted in figure 3.

The two phases of insertion of a learning object are:

- A filtering phase: filtering of relevant educational materials based on a rules engine.
- An annotation phase: it is associated with semantic annotations and descriptors LOM each learning object.

The first purpose of the educational materials repository is that the added documents can be reusable: documents are to be reused in many contexts other than the first contexts if these documents have been made available on the web. The reuse of a document then implies a further formal context for another use. The repository is to enable people to use the added documents in various ways and contexts. We are going to discuss the operating multi-purpose [14].

B. Adaptation

The information fund on the current web are presented in the same manner for all users that is to say the current web doesn't take the needs and interests of these users into consideration or even whether they are really interested in the same information. The web must provide relevant information based on feedback from users for better understanding and proper management of web resources.

For better adaptation, the system must:

- Know the users: their needs, their interests, and what they want and they don't want.
- Present the diagram of the source: the system must help the user search a simple way in large amounts of resources.

The adaptation in the semantic web can be applied in both fields.

- The adaptive virtual documents: these documents are composed of a set of fragment information and a typesetting system semantic for the selection, assembly and organization of these fragments according to the specifications and goals of learners in the adaptation of the aspect of document users.
- The adaptive hypermedia: we are interested in the adaptation of the hypermedia in our approach; we rely on the notion of a grain of knowledge obtained by the semantic decompositions of learning resources and adaptive multi-agent systems technology.

V. CONCLUSION

The Semantic Web proposes solutions, many of which are interesting in the field of e-Learning.

The learning context would also be more precisely defined by ontologies of field.The structure of learning objects can be understood by machines if it refers to ontologies. Based on these ontologies, the reuse of learning objects and their customizations are presented as a direct Contribution of the Semantic Web.

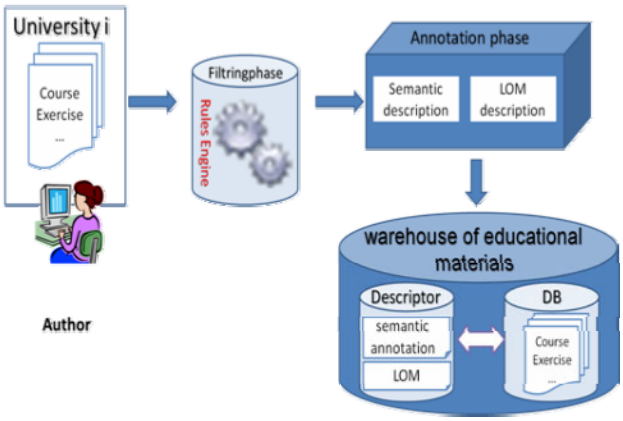

Figure 3. Modeling a warehouse of learning objects.

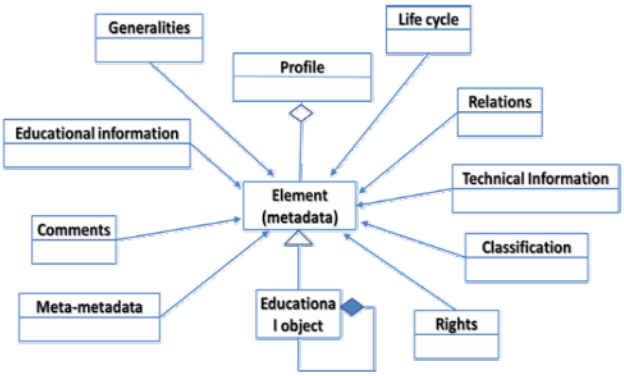

Figure 4. Description of a learning object by LOM.

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