Work in Progress: Semantic Metadata for Learning Objects Evaluation

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Abstract - The amount of information available in different means and media has created opportunities in all knowledge domains. In the last five years, this development has occurred with more intensity in the Web, where the amount of information has been growing exponentially. In this context, learning objects are available in repositories on the Web with different objectives, contexts, granularities, and educational values. This presents a wide range of options to the user. Due mainly to the amount of options available and the lack of qualification standards, it is difficult use keywords to select learning objects that will maximize the learning process in a particular context. A proposal to improve the learning objects selection process is proposed that uses a metadata structure and ontologies using XML and RDF schema technologies that considers qualitative criteria for learning objects. This structure will optimize the web search process and maximize the reusability of learning objects.

Index Terms – Learning Objects, Metadata, Ontology.

PROPOSAL

The Web has introduced changes related to the expansion of the processing capacity, to the establishment of differentiated combinations and the flexibility of distribution of the information [2]. In the education domain, there is a need to create and implement materials that bring together media elements to amplify the processes for selecting educational material and facilitate learning. In addition, it is necessary to establish structures that simultaneously consider the educational specificities of different contexts.

Creating educational materials requires resources related to instructional design and involves educational theories for development of didactic strategies to promote and to specify requirements for learning experiences. In this direction, the planning involves the analysis of the necessary material and outcomes for learning. In addition, it requires development processes, implementation, evaluation and maintenance of the educational materials [9]. The adoption of the methodology described in this paper and the development of technological resources for labeling learning objects are necessary. Considering this, the present work proposes to establish evaluation parameters to configure metadata for ontologies to improve the semantic knowledge for learning objects.

The metadata definition describes any type of resource that can be understandable by machines. The transfer of the metadata concept to the learning object sphere, consequently, can be considered the information catalogue. This allows the professors, or whoever is using the catalogue, to search the learning object repository (LOR) and allows verification that the learning object meets the person’s requirements.

The current information that is available in metadata, however, is not enough to determine the quality and efficiency of a learning object in a specific context. For this reason, the metadata must be formally structured and organized for maximizing the search process. To support specification of these notations, web semantics tools can be used to express meaning. Among these tools, it is possible to detach languages as XML (Extensible Markup Language), RDF (Resource Description Framework) and OWL (Ontology Web Language).

Some reference models to learning objects were created to attach information that makes them compatible with any Content Learning Management System (CLMS). With metadata, it is possible to increase efficient resources to interoperability, portability, reusability, identification, indexation, integration, management and recovery of information. In this direction, some standards like IEEE-LOM (Learning Object Metadata) [7], ARIADNE [1], IMS [6] and Dublin Core [3] have been adopted by institutions to describe semantic data. Different metadata, however, can be used to specify necessary information without a definition of a formal semantic. Consequently, these standards address the interoperability question, but they do not solve the incompatibility of different metadata standards. These standards are concerned with the classification of learning objects from a producer point of view without considering the user context that must support different combinations of variables. Because of that, one solution is to add an ontology mediation layer to hold elements about educational design and background information related to learning objects.

The compatibility problem can be solved through development of ontologies for each knowledge domain that establishes the interoperability between learning objects. According to Guarino [5], the ontology object constitutes an abstract model to represent concepts of a specific domain in an objective and clear way. Gruber [4] complements the ontology definition that emphasizes that the ontology must be formal to be understood by computers and shared between groups.

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Guaranteeing that an ontology is constructed with quality requires describing the concepts and relationships of a domain formally, describing the essential knowledge to the domain, and defining a vocabulary that prevents ambiguous interpretations. In the educational domain, establishing an ontology should permit personalization of the learning experience according to learning styles and designs that can be expressed by an RDF schema.

Furthermore, for the creation of an adequate ontology and all the necessary formalism for sharing knowledge domain, it is necessary to have languages that represent the semantics of the information and make it possible to exchange heterogeneous data between environments. OWL, the W3C and RDF schema-developed language, can represent ontologies and metadata. OWL adds vocabulary for describing properties and classes: among others, relations between classes, cardinality, equality, richer typing of properties, characteristics of properties, and enumerated classes [11]. The elaboration of this vocabulary also includes the instructional design elements to make relations among concepts by considering different heuristics and methods that involve the analysis of educational necessities and the systematic plan of learning material [9].

For the learning object to increase the amount of pertinent information to support the learning process, it is necessary to establish criteria to make qualification possible. In this sense, each organization classifies the learning object using methods that change significantly among them; however, this lack of standards in the evaluation hinders the process of selection of learning objects. This way, if the teacher does not have information of the potential educational merits of the object and in which context this is maximized, it may be used in inadequate situations, harming the quality of the learning process.

To support the process and to maximize the reusability of the learning objects, the definition of a qualitative method annotated semantically in a metadata can be used. In this context, a learning object evaluation standard, which is based on a qualification context under the teaching focus [12], can be linked to mathematical indices. These can be written down semantically in the metadata, split in two different concepts (intrinsic and extrinsic properties), to demonstrate the potentiality of the object without in a specific context.

To allow this structure, this work proposes the creation of a metadata using the next framework. In the initial part of this metadata, the identification of the learning object will be formalized using the Dublin Core Standard [3]. With this standard, it is possible to include information of the learning object through the controlled vocabulary and allowing other applications to access this information through the sharing of vocabularies of Dublin Core. The second part contains information regarding intrinsic evaluation of the learning object. This will be made using a language of semantic demarcation, where all of the evaluated items can be documented through the checklist proposed by Silva and Mustaro [12].

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For this framework, an ontology will be used that will allow the sharing and the interoperability of learning objects. To elaborate, the educational ontology has adapted the pedagogic dimensions model of Leidig [8]. This proposal explicitly states the set of relations and patterns that are usually associated with didactic concepts. In this work, the dimensions established to constitute the semantic metadata for learning evaluation are: instructional design dimension, competence dimension, medium dimension, rhetoric dimension, interactivity dimension, and usability dimension.

For the construction of the ontology, this work will use Protégé, an extensible, platform-independent environment for creating and editing ontologies [10] and knowledge bases to capture the dimensions described previously. An objective of this proposal is to refine the selection of the objects in agreement with the combination of different parameters in the education ontology. This approach also intends to collaborate with the institution to determine the evaluation parameters that can be used by professors when they select learning objects to design a course. Research directed to define semantic metadata for learning objects evaluation should be collaborate to address the reusability of learning objects and maximization of their potentiality in educational situations.

Further work will involve more complex representation of learning object evaluation by semantic metadata.

REFERENCES


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