The Evolution of Educational Metadata: From Standards to Application Profiles

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Abstract

A number of international efforts have been initiated during the past few years leading to the definition of educational metadata specifications for the commonly agreed description of educational resources. As more and more applications are implemented using educational metadata, it becomes obvious that it would be difficult for a single metadata model to accommodate the functional requirements of all applications. As a result, application profiles aim to facilitate the application-oriented implementation of educational metadata specifications. In this paper we discuss the issue of standardization vs. conversion and will present different existing specifications with the relative merits of each one, we will examine the fundamental techniques for the definition of application profiles and will focus on discussing interoperability issues in the case of application profiles. Finally, we will demonstrate the use of a tool which offers a graphical user interface for straightforward metadata authoring and at the same time has the necessary suppleness to easily incorporate new educational metadata specifications and/or application profiles.

1. Introduction

It is claimed that educational metadata can significantly enhance the effective description, search and retrieval of learning objects resulting in efficient organization of educational resources for technology supported instruction. As a result, a number of international efforts have been initiated during the past few years leading to the definition of educational metadata specifications for the commonly agreed description of educational resources [1, 2, 3, 4].

The basic function that underlies intercommunication between systems is the exchange of information. A major barrier limiting systems interoperability is the use of different specifications that define the structure of the exchanged information (standardization diversity). In case of educational metadata, the problem is that although a generally accepted standard does exist (IEEE Learning Object Metadata), many educational metadata management systems are still using other specifications (Dublin Core, Ariadne, GEM, etc.) or previous versions of the IEEE LOM standard (e.g. the Campus Alberta Repository of Educational Objects (CAREO) is using the IMS Metadata version 1.2.2.)

Furthermore, assuming that two systems use the same learning object metadata specification, interoperability cannot be ensured if this common model is described in different natural languages (internationalization problem). In CEN/ISSS Learning Technologies Workshop, the internationalization of a given specification is defined as the sum of processes whose purpose is to facilitate search, evaluation, reusability, and processing of learning objects within a multicultural and multilingual scenario. Internationalization leads to the existence of multiple translations of each specification, providing evidence that, two systems may not be able to interact even when they use the same learning object metadata specification [5].

In both cases, there are two possible ways to overcome the above mentioned problems: either the use of a commonly accepted international standard or a conversion between varying metadata models (either different specifications or same specification in different languages). The first option bares all the costs that are necessary to implement an international standard. Obviously standardization costs are proportional to the level of standardization. On the other hand, precise conversions between variations of specifications lead to significant system complexity and, thus, in comparatively high implementation costs [6, 7, 8, 9].

The first section of the presentation will discuss the issue of standardization vs. conversion and will present different existing specifications with the relative merits of each one.
As more and more applications are implemented using educational metadata, it becomes obvious that it would be difficult for a single metadata model to accommodate the functional requirements of all applications, especially in the case of communities who need to combine metadata specifications for simple resource discovery (Dublin Core), rights management (INDECS), multimedia (MPEG-7), educational (IEEE LOM) and museum (CIDOC CRM) content, to satisfy their application-specific requirements.

As a result, application profiles aim to facilitate the application-oriented implementation of educational metadata specifications by allowing the designers to ‘mix and match’ metadata schemas as appropriate [10, 11]. An application profile is an assemblage of metadata elements selected from one or more metadata schemas. The purpose of an application profile is to adapt or combine existing schemas into a package that is tailored to the functional requirements of a particular application, while retaining interoperability with the original base schemas.

Some examples of application profiles already published are the Le@rning Federation Application Profile, the Cancore Application Profile, the Celebrate Application Profile, the European Treasury Browser (ETB) Metadata Application Profile, the SCORM Metadata Application Profile, the UKLOMCore, the RDN/LTSN LOM application profile, the SingCore Application Profile and the Curriculum Online Application Profile.

It becomes obvious that, there is a need for software tools that go beyond educational metadata authoring to support design and development of application profiles [12]. The second section of the presentation will examine the fundamental techniques for the definition of application profiles and will present the benefits of using application profiles.

The problem of metadata interoperability becomes more complex in the case of application profiling. Many approaches have been proposed for improving interoperability between model-specific vocabularies, thesauri and ontologies in the context of information retrieval and exchange. These range from database schema integration, to the use of ontologies in organizing and integrating networked information systems to the merging of monolingual and multilingual thesauri. The third section of the presentation will focus on discussing the interoperability issues in the case of application profiles and examine how application profiles affect conformance with metadata specifications.

Finally, we will demonstrate the use of a tool which offers a graphical user interface for straightforward metadata authoring and at the same time has the necessary suppleness to easily incorporate new educational metadata specifications and/or application profiles.

References