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Chapter XII

The Role of Metadata in E-Learning Systems

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Abstract

The fast development of technologies requires specialised and complex skills that need to be renewed frequently. Thus the role of continuing education and lifelong learning is becoming even more important. E-learning adapts well to continued education, as it can be done in parallel to other work. This in turn sets new requirements for universities: they have to build e-learning infrastructures and course material has to be in digital form. Moreover, the e-learning systems should be designed in a way that they provide easy access to courses and course material. A cornerstone of easy access is the metadata attached to courses and other relevant elements. However, the mere metadata itself is not very useful without the ontology that gives the semantics for the metadata. In this chapter, we will give an overview of the role of metadata and ontologies in e-learning systems. We will also consider the standards of educational metadata and consider the utilization of metadata and ontologies in three e-learning systems.

Introduction

The idea of e-learning offers several interesting advantages for both the universities as course providers and for the students. The main advantage for universities is the possibility of surviving the competition for students by offering courses in their special areas of competence, research, and expertise via the Internet. Students are interested on e-learning as it provides flexible ways to combine work and studying. Thus, e-learning can be defined as an information technology-enabled and supported form of distance learning in which the traditional restrictions of classroom learning have disappeared (Liu, Chan, Hung, & Lee, 2002). Moreover, a virtual university can enhance organizational learning and bring competitive advantages by continuously developing the skills and knowledge of employees (Teare, Davies, & Sandelands, 1999).

Current e-learning systems have been developed at different times; they are based on a variety of technologies; and they may provide very heterogeneous functionalities and user interfaces. However, the learner should be able to access all the virtual universities in a similar way or, more ideally, there should be a global e-learning portal through which a learner could access every virtual university as simply as accessing one. In order to achieve this goal, the e-learning system should support the following functions:

- hide the heterogeneity of various e-learning systems, and
- provide advanced querying and searching features.

The support of these functions requires appropriate technologies, but the technology can only be utilized if learning objects' standardized metadata descriptions and ontologies are commonly used.

In this chapter, we will restrict ourselves to the meaning of metadata and ontologies in the context of e-learning systems. First, we consider different approaches for representing the content and searching learning objects. In particular, we want to emphasize the significance of the type of services the system supports, and thereby motivate the need for advanced searching and querying functions. Then, we give an overview of ontologies and explain why and which kinds of ontologies are required in e-learning systems. Also, the notions of metadata and educational metadata as well as their standardization issues are discussed. The LOM standard is analysed in most detail, as is the most powerful and most widely used metadata standard for educational information systems. Then, three metadata based e-learning systems, namely, the ARIADNE Knowledge Pool-system, the CUBER-system and the ONES-system, are introduced. These systems support metadata-based searching of learning objects, but they have essential differences in the methods they use and the services they provide. Next, we discuss the dynamicity of ontologies. In particular, we consider how the dynamicity of ontologies affects learning objects' metadata descriptions and what kinds of problems it causes for metadata based searching. A solution for the problem is also proposed. Finally, the future trends of metadata and learning object ontologies is discussed.