Chapter VIII
The MOT+Visual Language for Knowledge-Based Instructional Design

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ABSTRACT

This chapter states and explains that a learning design is the result of a knowledge engineering process where knowledge and competencies, learning design, media and delivery models are constructed in an integrated framework. Consequently, we present our MOT+ general graphical language and editor that help construct structured interrelated visual models. The MOT+LD editor is the newly added specialization of this editor for learning designs, producing IMS-LD compliant Units of Learning. The MOT+OWL editor is another specialization of the general visual language for knowledge and competency models based on the OWL specification. We situate both models within our taxonomy of knowledge models respectively as a multi-actor collaborative process and a domain theory. The association between these "content" models and learning design components is seen as the essential task in an instructional design methodology, to guide the construction of high quality learning environments.

INTRODUCTION

Building high quality learning designs is a very important and demanding task. It is also a difficult task that we started to address already a decade ago by progressively building an instructional engineering method (Paquette et al., 1994, 2005a; Paquette, 2003), a delivery system (Paquette et al., 2005b) and a graphical knowledge modeling editor (Paquette, 1996, 2002).

In this on-going work and for the present discussion, the point of view is taken that a learning design is the result of a knowledge engineering process, where knowledge and competencies, learning design, media and delivery models are constructed in an integrated framework. In the first section of this chapter, we present the MISA[1] instructional design method based on these four models and their relationships to each other. The second section presents the MOT (modeling with object types) visual language and the specialized editing tools that have been used in numerous applications. We summarize the theoretical basis of the language, its syntax and semantic. Moreover examples within the MISA instructional design method will be presented.

The third and fourth sections address the standardization issues and how the MOT+ software is adapted to provide visual aid to designers building knowledge and/or pedagogical models. The third section focuses on the learning design models, the IMS-LD specification and the specialized MOT+LD editor that helps designers build IMS-LD compliant and interoperable units of learning. The fourth section presents the ontology web language (OWL) and the specialized MOT+OWL visual editor. We use it to represent domain knowledge models and target competency that can be used to plan, support staff roles and evaluate the quality of learning designs. In the fifth section we discuss the association between LD models and OWL models to support what we believe is the central task for knowledge-based instructional design aiming to support learning environments within the Semantic Web.

Finally, the concluding section will summarize the properties of representation languages that we have found most useful while designing and using the various specializations of the MOT+ software through its evolution from a general knowledge modeling tool to a standardized tool at the heart of the instructional design methodology.

INSTRUCTIONAL DESIGN BASED ON VISUAL MODELING

In this section, we present a synthesis of the MISA 4.0 instructional engineering method main components and concepts. A knowledge modeling approach using the MOT editor was used to define the instructional engineering method itself, its concepts, processes and principles. And thus, this method can also be seen as a visual modeling application.

This R&D initiative, started in 1992, has led to the MISA 4.0 version (Paquette, 2001a, 2002a) and to its support tool, called ADISA[2] (Paquette et al., 2001). The editor MOT+ is embedded in the ADISA system and accessible through a Web browser from workstations linked to the Internet. It can also be used without ADISA together with forms provided by the MISA documentation. Since 2001, the method has been adapted to the huge standardization work that has occurred in the e-learning sector; we will address this aspect in later sections of this chapter.

Overview of the Method

The MISA learning engineering process produces specifications of learning environment grouped in documents called documentation elements (DE). Table 1 presents these DEs.

Each DE results from tasks distributed into six phases. Within phase 2, 3, 4 and 6, these DE can also be viewed according to four axes or dimensions of an e-learning environment: knowledge, pedagogy, media and delivery. Presently, MISA 4.0 comprises 35 basic sub-tasks, each producing one DE, numbered, as shown in table 1, from 100 to 640. The first digit denotes the phase, the second, the axis, and the third, the sequence number within the axis. A DE is either a visual model, identified in bold italic in table 1, or a text-based form describing guidelines for a model or properties of objects in the model.

MISA proposes a a problem solving approach in 6 phases. Each MISA phase is subdivided into a number of steps where parts of a learning environment or system are constructed. These phases are sequential, but spiral, with frequent returns to modify the result or previous tasks:

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