INTRODUCTION

Despite promoting initiatives to support development of lecturers’ pedagogical skills and competences, including ICT knowledge for developing, editing and choosing learning environments and learning materials, e-learning literature recognises that there has been lack of familiarity with learning theories and a gap in didactic expertise leading to inability to manage different learning strategies depending on the context and to poor integration of learning theories in learning designs (McNaught 2003). The focus from pedagogical point of view...
is to find new ways to support teachers and enable them to exploit the ‘constructivist’ potential of digital technologies for learning, incorporating elements of discussion, collaboration, and user-generated content in their learning designs. These general requirements align at the high-level with the semantic web vision of resource creation, sharing and re-use (Mizoguchi & Bourdeau, 2000).

The term “Learning Design” has been in use only in recent years; the earliest work in the field can be traced back to “instructivist” approaches, e.g. (Merrill & Twitchell, 1994). The development of interest in “Learning Design” as a focus of research began with this recognition that the constructivist pedagogical theories did not easily transfer to the practice of teaching (Jonassen, 1994). The dependence on the context in which learning takes place required an approach to teaching based on design principles rather than pre-defined instructional sequences (Oliver et al., 2002).

In our view, next generation Learning Design (LD) tools have similar design requirements as intelligent applications that create, share and re-use services through the use of metadata or more formal models, such as ontologies and are dynamic in nature.

The design of modern intelligent applications draws from the use a knowledge-base (e.g. ontologies) as a core element to enable “intelligence” in the system. There are many types of technology areas that are both emerging and driving knowledge-base intelligent applications, such as the Semantic Web, Semantic GRID, pervasive computing, ubiquitous computing, context-aware computing and so on (Mizoguchi & Bourdeau, 2000; Waterson & Preece, 1999; Delgado et al., 2005; Biletisky & Ranganathan, 2008; Flahive et al. 2009). Leveraging the Semantic web developments and exploiting the observation that ontological models can form the domain grounding for context-aware applications this chapter provides the design of a framework for supporting next generation LD tools that provide adaptive and personalised experiences.

This chapter is organised as follows. An overview of LD tools is provided. The rational and the design of a Learning Design Support Environment (LDSE) that adopts a knowledge engineering approach to support LD adaptation and cohesion between learning design theory and practice is discussed. Following this, an adaptation framework for LD is described. Finally, the implementation is outlined, an overview of the results from an initial user study and evaluation is provided with some conclusions.

**OVERVIEW OF CURRENT TOOLS FOR LEARNING DESIGN**

There is considerable work on developing various languages, formalisms and tools for LD. We have identified four distinct approaches to learning design tools: standards-oriented, generic form-based, theory-based, and knowledge-based. A selected set of tools are summarised in Table 1 to illustrate these approaches.

There has been a great deal of research to uncover the way learning designers practice, from design creation to delivery. The result of this work, e.g. Masterman (2009), helps to understand how on a day-to-day basis the learning designer goes about creating, modifying, sharing and using their products of design, and the many tools available for supporting learning design. The findings reveal some resistance in using current tools and the gaps within the field. Even the very idea of underpinning a tool with theory encounters resistance from user groups.

The employment of different theories may offer the learning designer a better mapping of their cognitive approach to tool usage. We assume that most learning designers make use of theory,
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