Chapter 2
A Semantic Framework for Cloud Learning Environments

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ABSTRACT
Cloud Learning Environments (CLEs) are gradually gaining ground over traditional Learning Management Systems (LMS) by facilitating the lone or collaborative study of user-chosen blends of content and courses from heterogeneous sources, including Open Educational Resources (OER). This chapter describes the use of ontologies for modelling various aspects of the learning process within such an environment. In particular, the author considers a semantic knowledge base as the core of the learning environment, facilitating learners in finding educational services on the cloud. He describes how different stakeholder clusters are involved in the creation and maintenance of this knowledge base, through collaborative ontology management techniques. Finally, the chapter defines the mechanisms for the evolution of this knowledge base and the constant updating of the associated cloud learning services.

INTRODUCTION

Web 2.0 offers new opportunities for e-learning, through the provision of open and reusable tools and services. Learners are enabled to assemble their Personal Learning Environment (PLE) by aggregating Web 2.0 resources in order to reach their learning goals. In addition, the cloud offers an abundant amount of services for building adaptive and customisable Cloud Learning Environments (CLEs).

Nevertheless, the wide range of the offered cloud learning services makes finding the suitable ones for achieving a particular learning goal, quite challenging. Learners are in dire need for support in constructing their learning environment according to their needs and preferences. The absence of semantic descriptions of the available learning services on the cloud hinders this task, thus preventing access to potentially useful Web 2.0 resources.
Our work is targeting the adaptivity and personalization of PLEs and CLEs, in terms of content and navigation, as well as the entire learning environment and its functionalities (Mikroyannidis, Lefrere, & Scott, 2010a, 2010b). In particular, we propose the use of ontologies to model the key elements of the CLE and its learning services. Our semantic knowledge base aims at facilitating learners in finding and aggregating educational services on the cloud.

The proposed knowledge base allows us to match similar learner profiles with each other through ontology mappings, as well as discover connections between learner profiles and learning resources. In this way, recommendations can be offered to a learner about potential ‘study-buddies’, with whom the learner shares common competencies and learning goals. The learner can also receive recommendations about learning resources for targeting a particular learning goal.

We perceive a semantically enhanced CLE as the evolution of the present LMS-based approaches. This evolution aims at providing learners with personalised services on the cloud that will support them in reaching their learning goals and will allow them to assume complete control over their learning (Mikroyannidis, 2011).

BACKGROUND

Learning Management Systems have dominated e-learning for several years. They have been widely used by academic institutions for delivering their distance learning programmes, as well as for supporting their students outside the classroom. They have also been established in the business sector as the mainstream platform for delivering training services to employees. A Learning Management System (LMS) is an online software application offering facilities for student registration, enrolment into courses, delivery of learning materials to students, student assessment and progress monitoring. Popular examples of LMS used by the academic as well as the business world include Blackboard, Moodle, and CLIX.

However, the advent of Web 2.0 has altered the landscape in e-learning. Learners nowadays have access to a variety of learning tools and services on the web. These tools and services are usually provided by different vendors and in many cases are open and free. Repositories like Wikipedia, YouTube, SlideShare and iTunes U offer access to a wide range of learning materials for free. Augmenting and configuring the diverse and distributed Web 2.0 tools and services in order to address the needs and preferences of individual learners is a significant challenge for modern online learning environments.

The transition from the traditional e-learning approach of LMS to Web 2.0 e-learning solutions bears significant benefits for learners. It puts emphasis to their needs and preferences, providing them with a wider choice of learning resources to choose from. The European project ROLE (Responsive Open Learning Environments) is exploring this transition within a variety of learning contexts and test-beds. One of the these test-beds is provided by the Open University and concerns the transition from formal learning, where courses are exclusively prepared and delivered by educators, towards informal learning, where the learner is in control of the whole learning process. This transition is being implemented within the Open University test-bed as a transition from the LMS towards the Personal Learning Environment (Mikroyannidis, 2011).

The Personal Learning Environment (PLE) is a facility for an individual to access, aggregate, configure and manipulate digital artefacts of their ongoing learning experiences. The PLE follows a learner-centric approach, allowing the use of lightweight services and tools that belong to and are controlled by individual learners. Rather than integrating different services into a centralised system, the PLE provides the learner with a va-