An Open and Service-Oriented Architecture to Support the Automation of Learning Scenarios

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ABSTRACT

The specifications of automated learning scenarios can lead to advantages for virtual learning environments and important benefits for organizations, although research in this e-learning area has not addressed this issue. To achieve this goal, one requirement is to have an infrastructure able to support the execution of specifications of learning scenarios. This paper presents an open service-oriented architecture based on the Open Services Interface Definition (OSID) specifications proposed by the Open Knowledge Initiative (OKI) and other normative specifications. The architecture is used as a technological infrastructure in a virtual learning environment with more than 40,000 students enrolled and has been tested as the infrastructure of a tool to automate specifications of learning scenarios. A case study has been used to test the suitability of the architecture and describe such a tool for the future.

Keywords: Automation, Learning Scenarios, OKI OSID Interfaces, SOA Architecture, Web Services

INTRODUCTION

Research in e-learning technology with respect to the concept of reusable learning objects and their standardization has evolved in recent years, however, research on the learning scenario concept and its automation has not been so successful.

The automation of the specifications of business processes has been very successful in the Business Process Management (BPM) area and has brought about important benefits.
for enterprises and organizations. In a similar way, the automation of specifications of learning processes could provide important advantages to the e-learning area and those organizations that focus its activity on the LMS. Some of these advantages are: 1) the establishment of a valid set of primitive learning scenarios for any organization, 2) the creation of a catalogue of learning scenarios and the possibility to customize them according to an organization’s features, procedures and rules, 3) the possible certification of learning processes that permits the implementation of learning scenarios as the first step to future standardization, 4) the optimization and innovation resulting from a deeper knowledge of learning scenarios and finally, 5) the taking on of a given role by the LMS could free a participant of those tasks that can be mechanized, thus providing time for carrying out others of a more added-value nature.

The IMS Learning Design (LD, 2003) specification provides recommendations about the learning process design and some tools related to the execution of learning scenarios, which have been developed to test the IMS LD specification. The RELOAD editor (JISC, 2006) to author learning designs in IMS LD format, the CooperCore Design Engine (Vogten, 2004; Vogten & Martens, 2005) to automate the scenario of the delivery of learning activities and finally, the LAMS (LAMS Foundation, 2005) to provide teachers with an intuitive visual authoring environment to create sequences of learning activities. In addition, there are other tools like the TELOS editor (Technologies Copigraph Inc., n.d.) to validate and design learning scenarios using an ontology-driven and service-oriented architecture. However, there is a lack of tools that facilitate the specification and posterior execution of automated learning scenarios does not exist.

In fact, learning scenarios may be executed by: 1) using a LMS and 2) programming the learning scenarios from scratch. Since using a LMS may constrain the possibilities of learning scenarios, which will have to be written using the rules of the LMS instead of the rules of the organization, we believe the second option is more interesting. Hence, a framework to support the LMS specifications is needed.

The goal of this paper is facilitating the specification and execution of learning scenarios by means an open-source framework that permits interoperability among specifications and its reusability in the distributed learning environment. Thus, the proposal of this paper is to present an architecture that is able to support a tool capable of automating teachers’ tasks that usually occur in a learning environment from its specifications, and not only those related to the learning process design. The technological infrastructure proposed matches with the results of the Campus Project (Open University of Catalonia, 2006) of the Open University of Catalonia (UOC). The UOC is a pioneer virtual university in Spain with more than 43,000 students enrolled during the academic course 2008-2009. The Campus Project has the aim of evolving the e-Learning Platform created 10 years ago according to an open and service-oriented approach. Nowadays, the presented architecture is being effectively used in the virtual Campus of the UOC.

This paper is composed of six sections, dealing with: the introduction and motivations of this work, the concept of a learning scenario, the requirements of the infrastructure to support the automation of specifications of learning scenarios, the proposal of our architecture, a case study that illustrates the feasibility of the automation of a learning scenario using the proposed architecture and, the conclusions and future work.

Learning Scenarios

The learning scenario concept used by IMS LD is that given by Fowler in (Fowler, 2000): “A scenario is a sequence of steps describing interactions between the user and the system (...)” in reference to the kind of scenarios considered which are related to the learning process design only.

From the point of view of computer science engineering, a learning scenario is a flexible tool for the system’s design that has no single
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