

Chapter 3.9

SWELS: A Semantic Web System Supporting E-Learning

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ABSTRACT

This chapter presents a prototypal e-learning system based on the Semantic Web paradigm, called SWELS (Semantic Web E-Learning System). The chapter starts by introducing e-learning as an efficient and just-in-time tool supporting the learning processes. Then a brief description of the evolution of distance learning technologies will be provided, starting from first generation e-learning systems through the current Virtual Learning Environments and Managed Learning Environments, by underling the main differences between them and the need to introduce standards for e-learning with which to manage and overcome problems related to learning content personalization and updating. Furthermore, some limits of the traditional approaches and technologies for e-learning will be provided, by proposing the Semantic Web as an efficient and effective tool for implementing new generation e-Learning systems. In the last section of the chapter,

the SWELS system is proposed by describing the methodology adopted for organizing and modeling its knowledge base, by illustrating its main functionalities, and by providing the design of the tool followed by the implementation choices. Finally, future developments of SWELS will be presented, together with some remarks regarding the benefits for the final user in using such system.

INTRODUCTION

In a context of rapid environmental and technological change, characterized by an increasing obsolescence of knowledge, organizations need to accelerate the renewal and to increase the effectiveness of their managerial competences. Such continuous change is a determinant of continuous learning processes that calls for the capacity to organize at all levels of the organization new working processes that have to be more knowledge intensive, multidisciplinary, and collaborative.

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This requires a profound rethinking of the processes supporting the design, development, and delivery of learning (McCrea et al., 2000) in a way that the learning process becomes more effective, just-in-time, and customized.

As a consequence, learning should not be a passive activity which is only done when people are in the educational institutions without knowing how the knowledge is used in the real world. It should be a continuous and active process performed under a specified goal and situation where the knowledge is really needed. Moreover, as huge amount of knowledge becomes available through Internet in the information society, it becomes possible for people to access the knowledge they need when necessary. In such a circumstance, the most important thing about having a lot of knowledge is to know how to find the knowledge, to be ready to understand and master the new knowledge, and to create knowledge for future use to close the loop of knowledge production and consumption. For these reasons, the goal of education and learning should be augmented to include training of learning capability and creativity of the learners (Mizoguchi, 2000).

Such considerations are some prominent drivers of the e-learning. Since e-learning applications are accessible from anywhere at any time, ICT-based learning environment has been gaining increasing attention from the research community.

In this context, the recently emerged (VLE) Virtual Learning Environments revealed themselves very effective from the pedagogical point of view, especially if they are compared with the previous (CBT) Computer Based Training and (WBT) Web Based Training systems.

However, VLE did not completely solve the problems related to the organization and navigation of the learning materials. Indeed, most of the current Web-based learning solutions show some limits in accessing the right knowledge, as well as in the learning pattern navigation process (given that they do not allow a complete and multi-

dimensional vision of the knowledge available, therefore users are obliged to follow the learning modules according to a linear path designed for a generic learner). In addition, there is the need to optimize the processes related to learning resource organization and aggregation, and the subsequent access and reuse of such resources with respect to a not scheduled learner profile.

Our focus here is on the creation of a Web-based learning environment that enables fast, just-in-time and relevant learning. Indeed, current Web-based solutions do not meet the above mentioned requirements, and some pitfalls are for example information overload, lack of accurate information, and content that is not machine-understandable.

These limits suggest the application of Semantic Web technologies (Barnes-Lee, 2000) to e-learning as means for implementing new generation e-learning systems. The Semantic Web technologies support the innovation process in a learning environment, exploiting the opportunity to create and manage data that are *machine understandable* and not *only machine readable* (Secundo et al., 2004).

An effective way to apply the Semantic Web approach to e-learning could be the use of the ontology backbone, which allows the *ontology-based* description of the learning materials (knowledge base), adding small semantic annotations to each learning object created (Nejdl, 2001). By using an ontology-based approach, learning resources can be easily organized into customized learning patterns and delivered on demand to the learner, according to her/his profile and knowledge needs.

Moreover, such an approach allows to virtuously combine the content description process with the content navigation one: content description to easily identify the learning resources required to achieve the desired learning goals; content navigation to minimize the required time for accessing the learning resources by adopt-

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