On the Use of Semantic Technologies to Support Education, Mobility and Employability

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Abstract. The technological development that has taken place over recent years has affected the way that the Web is exploited by users. In fact, a user is no longer seen as a mere observer; instead, he or she actively takes part in the production of new knowledge, which is then made available to other users. In this scenario, which is characterized by ever-growing information, new approaches (e.g., based on semantic technologies) for processing large amounts of content must be developed. Other sectors, including education and learning, as well as job seeking and hiring activities, could benefit from the exploitation of tools that can be developed within the Semantic Web initiative. As a consequence of the use of semantic technologies, learners could find more efficient training paths that provide them with their missing areas of competence and training institutes could analyze and modify existing qualifications according to a market’s requirements, while companies could effectively identify the best candidates for a given job, not only within national boundaries but also worldwide. This study aims to present an overview of recent research in the field of semantic technologies applied to education and job-seeking contexts. Issues that are related to students’ and workers’ mobility, job seeking and hiring and the improvement of qualification offers will be analyzed and compared, by distinguishing three fields of research: knowledge base creation, the development of strategies for the integration of heterogeneous systems and the definition of inference rules, and the identification of methodologies for the visualization of qualification outcomes and curricula.

1 Introduction

Recent years have been characterized by a large change in the type of data that is stored and accessed on the Web. In fact, technological developments have transformed the Web from a pure information repository to a world where the contents are increasingly based on users’ preferences, and needs are generated and disseminated. From this perspective, the user is no longer seen as a mere observer;
instead, he or she also plays an actively part in the production of new knowledge, which is then made available to others users.

It is evident that this type of context requires new approaches to be developed, to effectively process a large amount of content. In fact, although for a long time the possibility for users to find information of interest strictly depended on their ability to properly use the available search engines, today the ever-growing amount of information gathered on the Web makes experience-based data processing extremely time-consuming; hence, new information mapping systems, e.g., systems that are based on semantic technologies, must be exploited.

From this viewpoint, the education and learning field could benefit from the exploitation of instruments that are created within the Semantic Web initiative. Solutions developed until now range from the use of semantic tools to support learning, such as the so-called Computer-Supported Collaborative Learning (CSCL) systems, to instruments that are devised to improve interactions among learners, to allow them to reduce the effort that is needed to complete a topic individually [Devedžić, 2005, Devedžić, 2006a], and to the exploitation of metadata to improve the e-learning experience, such as Learning management systems (LMSs), software packages developed to help trainers to foster quality in online courses and manage learning outcomes [Aydin and Tirkes, 2010].

However, despite the main focus of recent research on the use of instruments such as ontologies and taxonomies to improve the way teachers and learners approach education [Devedžić, 2006b, Bittencourt et al. 2008 and Anderson et al. 2004], issues that are related to the definition of occupational profiles, the construction of professional qualifications and the improvement of job seekers employability, from a lifelong learning viewpoint, should also be considered to be of primary importance.

In fact, even though in Europe, during recent years, several instruments to support mobility and employability were defined (e.g., EQF “European Qualification Framework” [EQF, 2008] and ECVET “European Credit System for Vocational Education and Training” [ECVET, 2009]), students and workers who decide to spend a working period abroad still encounter several difficulties in the recognition/validation of their qualifications, which can be mainly associated with information asymmetries among students, job seekers, employers and training centers. This asymmetry results from the fact that, usually for a student who decides to continue his/her study career abroad, it is difficult to find (within course descriptions) areas of competence that he/she needs to achieve or classes that he/she needs to attend to obtain a given qualification.

This difficulty arises from the heterogeneity of the qualifications structure and from the lack of well-established definitions. For example, two countries can show qualifications that are articulated in different ways, in which the contents could be described heterogeneously; moreover, qualification pillars (such as knowledge, areas of competence and skills) could assume different meanings in a specific national domain, with serious consequences to mutual understanding.