

## Chapter 2.10

# Semantic Competence Pull: A Semantics–Based Architecture for Filling Competency Gaps in Organizations

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### ABSTRACT

Despite its considerable growth and development during the last decades, the software industry has had to endure several significant problems and drawbacks which have undoubtedly had negative effects. One of these aspects is the lack of alignment between the curricula offered by Universities and other kinds of education and training centres and the professional profiles demanded by companies and organizations. This problem defines

the objective of this work: to provide a set of mechanisms and a solution to allow companies to define and express their competency gaps and, at the same time, allow education centres to analyse those gaps and define the training plans to meet those needs.

### INTRODUCTION

The software industry has become one of the main streams of development all around the world. In

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Spain, the information technology market generated a volume of 17,716 million € in 2006, which represents an increase of 7.8% with respect to the market volume in 2005 (MITC, 2007). The information services submarket experienced the highest rate of increase at 10.5%, representing 4 975 million €, and the software market sector volume was 1,600 million € (MITC, 2007). Traditionally, the information technology market demonstrated an insufficient number of practitioners due to the increasing demand for information technology professionals. Nowadays, demand continues to be relevant but it has experienced a deceleration accompanied by the appearance of market niches with unstable demand rates. Due to the scarce barriers to entry for practitioners (Joseph, 2005) work teams are formed by people from many different educational backgrounds and with diverse academic levels and training profiles (McConnell, 2003): bachelor and master graduates in Computer Science, graduates in other disciplines, licensed practitioners and undergraduate and unlicensed practitioners. During the 1990s, the demand for IT professionals exceeded the supply of qualified persons for several years (Koong, Liu & Liu, 2002). In 1999, there were 722,158 unfilled IT jobs in the United States. It was predicted that the shortage would grow to about 846,901 jobs by 2002 (Goodwin, 2000). While it is true that the economy has slowed down since the last quarter of 2000, many companies are still hiring persons with critical IT skills while other workers are being laid off (Armour, 2001; Gladwin, 2001).

Additionally, the software industry has been characterized by a problem that was first identified at the beginning of the 1970s (Brooks, 1987). This problem is the inability to finish and deliver software products within the established time schedule, and not being able to remain within the planned budget, and was referred to as the 'software crisis' (Nauer, 1969). Latter analyses of the problem and the related literature have confirmed the clear difficulty in building software (Brooks, 1987) and have redefined the crisis as

a breakdown or a chronic disease (Gibbs, 1994). Several key elements have been established to combat the effects of the crisis (Pressman, 2005): Project, Product, Development process and Personnel. Regarding the latter, human factors, considered by many authors as *Peopeware* (DeMarco, 1987), are proving as crucial aspects in the field of software development.

Boehm (1981) points out that subsequent to the size of the product, personnel factors have the most important influence on the total effort necessary for the development of a software project, and that personnel characteristics and human resources related activities constitute the most relevant source of opportunities for improving software development (Boehm, 2000). On the same issue, some other authors state that inadequate competence verification of software engineers is one of the principal problems when it comes to carrying out any software development project (McConnell, 2003).

In the information and communications technologies (ICT) field, software is a critical element. Failure rates associated with software projects are really high, and the personnel included in software development teams is one of the most decisive aspects for projects and their deficiencies (Pressman, 2005). The teams should be comprised of practitioners having heterogeneous education and experience (McConnell, 2003) and human resources management systems should be easily able to identify and assess the engineers' professional training with the objective of improving the workforce's competence level (Curtis, 2001).

## **Current Labour Market Situation**

This section presents both the current situation and the evolution of the labour market from the point of view of the demand for practitioners and their competency profiles. Historically, employment in the field of Information Technologies has been impacted by several crises such as the bankruptcy of *dotcom* companies, the delays in the adoption

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