

# Software Project Managers under the Team Software Process: A Study of Competences Based on Literature

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## ABSTRACT

*Despite the clear relevance of the Information and Communications Technologies (ICT) market in world economics and the evident lack of success of software projects, organizations devote little effort to the development and maturity of the software project manager profession. This work analyzes the figure of project manager from the perspective of the Team Software Process (TSP), and it considers the required skills, attitudes and knowledge for a software development project. The basis for the study is the analysis of relevant references from the literature for their subsequent categorization into different competency concepts. The results of the analysis are compared with the contributions which the Guide to the SWEBOOK® and the PMBOK® Guide models provide of the profiles of the project manager. The results indicate that the literature relating to the Team Software Process is focused on the definitions of skills and attitudes, and to a lesser extent on knowledge components. The lack of the definition of the components which comprise competency constitutes a challenge for software development organizations that use TSP, whose project managers should confront the task with full capacities, and without the help of established and recognized competencies. The current work attempts to establish the competencies for project managers identified in the literature, in the environment of the use of TSP for software development, using a study based on content analysis.*

*Keywords: Competence, Project Manager, Software Project Management, Team Leader, Team Software Process*

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## INTRODUCTION

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

world. In Europe, the ICT market represented 5.74% of the GDP in 2007, and the expected growth for 2008 is 2.9% (EITO, 2007).

Software project management is a relatively recent discipline that emerged during the second half of the 20th century (Kwak, 2005),

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although most software projects are more concerned with aspects of technology rather than management (de Amescua et al., 2004). The task of managing a software project can be an extremely complex one, drawing on many personal, team and organizational resources (Rose, Pedersen, Hosbond, & Kræmmergaard, 2007). In this scenario, some authors (E.g. Turner & Müller, 2005; Munns & Bjeirmi, 1996) have indicated that the influence of competencies on the success of projects has not been successfully explored, while other authors (E.g. Pinto & Kharbanda, 1995; Skulmoski, Hartman, & DeMaere, 2000; Jiang, 2002; Crawford, 2005) have identified the competencies of project managers applying the competency concept, that is, they have identified the competencies which fundamentally make project managers competent and successful.

In software development projects, 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 et al., 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 ICT field, software is a critical element. Failure rates associated with software projects are extremely high, and the personnel included in software development teams is one of the most decisive aspects for projects and their deficiencies (McConnell, 2003). 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, Hefley, & Miller, 2001). This improvement is one of the key elements of profession models as stated in

the 'skills development' component by Ford & Gibbs (1996) and McConnell (2003).

In software engineering, development work is a team activity, and the effectiveness of this teamwork represents a crucial factor for the quality and the success of the entire project (Humphrey, 2006a). Based on this premise, TSP (Team Software Process) originated, aligned with the principles provided by CMM (Capability Maturity Model) and PSP (Personal Software Process), TSP. The main objective of TSP is to provide the fundamental mechanisms so that a development team is able to establish a development process and a plan to define how the work is to be carried out (Humphrey, 2000b). The relevance of TSP is supported by both its integration into the quality framework provided by the SEI (Software Engineering Institute) and the benefits reported by several organizations after its adoption in terms of quality and productivity of engineering teams' improvement (Humphrey, 2000b). For example, *Teradyne* saved 228 engineering hours for every 1000 LOC (lines of code) and reduced the repair costs about 4.5 times the cost of producing the programs in the first place (Humphrey, 2000b).

Given, on the one hand, the importance of software currently in the global economy, and on the other hand, the impact of the maturity initiatives for the software process, from the point of view of the individual (PSP), as well as the development group (TSP), or the organization (CMM), the manager figure of a project in a TSP environment results to be a key element for the process. This article proposes the current study within this scenario, aiming to elucidate whether the TSP literature adequately represents the competencies of these professionals in their distinct environments: skills, attitudes and knowledge.

The remainder of the article is organized as follows. The next section defines the competence paradigm, as well as its components and principal implications. This is followed by the description of the role of the team leader in TSP. The literature regards this role to be similar to that of the software project manager. Sub-

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