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# Competence gaps in software personnel: A multi-organizational study

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ABSTRACT

Today, the innovation and quality of the software industry's products and services depend to a great extent on the knowledge, ability and talent applied by software engineers. At the same time, human aspects are recognized as one of the main problems associated with software development projects. More specifically, inefficiencies usually come from inadequate verification of software engineers' competences. Another issue is the lack of an established career for software engineers, which adds difficulties to evaluate competences. With these challenges in mind, this paper presents a study conducted in the software industry to test competence gaps among software practitioners, comparing the 360-degree feedback results and self-evaluations with that of standard competence levels. The results of this research may be very valuable to organizations immersed in software development projects.



## 1. Introduction

Despite advances in technology and major shifts in economy, human resources remain an organization's most valuable resource (Saraswathy, Thamaraiselvan, Senthilarasu, & Sivagnanasundaram, 2011). Personnel have been proved to be crucial in the software industry, since software engineering involves people collaborating to develop better software (Lanubile, Ebert, Prikladnicki, & Vizcaíno, 2010). Recently, Colomo-Palacios, Casado-Lumbreras, Tovar, and Soto-Acosta (2011), following the path described by DeMarco and Lister (1987), identified human resources management as one of the main issues in software development. In fact, one of the software industry concerns is related to the development of its human resources talent because the quality and innovation of its products and services depend to a great extent on the knowledge, ability and talent applied by software engineers through the software development process (Rivera-Ibarra, Rodríguez-Jacobo, & Serrano-Vargas, 2010). Therefore, information technology (IT) human resources are gaining importance in today's changing and more and more competitive environment (López-Fernández, Martín-Alcázar, & Romero-Fernández, 2010) and have become crucial for the software engineering process (Polančič, Heričko, & Pavlič, 2011).

In this scenario, management of people in software development projects is particularly critical (Liu, Chen, Chen, & Sheu, 2011) because human aspects are the source of the main problems associated with software development projects and there is abundant empirical evidence which confirms that (Hazzan & Hadar, 2008). Software development is recognized as a human centric and sociotechnical activity (Casado-Lumbreras, Colomo-Palacios, Soto-Acosta, & Misra, 2011) affected by personnel factors, which employs software practitioners who possess high levels of education, specific skills as well as the ability to apply skills to identify and solve problems (Ryan & O'Connor, 2009).

Individual differences have been identified as one of the paradigms for research analyzing human factors in software development (Curtis, 2002). These individual differences could rely, among other factors, on competences (Sharp, Baddoo, Beecham, Tracy, & Robinson, 2009; Turley & Bieman, 1995). Although software practitioners through their competences are the enablers of the Knowledge Society (Hernández-López, Colomo Palacios, García Crespo, & Soto-Acosta 2010), since they provide knowledge workers with the tool to perform their work, inadequate verification of software engineers' competences is usually one of the main problems within software development projects (McConnell, 2003). Studies in the literature (e.g. Levy-Leboyer, 1996; Martin & Staines, 1994) have introduced taxonomies which differentiate between technical and generic competences. However, although software engineers may lack technical competences, only a few studies in the literature (e.g. Colomo-Palacios, Fernandes, Soto-Acosta, & Sabbagh, 2011)

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