


# Towards Higher Software Quality in Very Small Entities: ISO/IEC 29110 Software Basic Profile Mapping to Testing Standards

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## ABSTRACT

This paper focuses on software and systems process improvement in small companies, for which the ISO/IEC 29110 series systems and software lifecycle profiles for very small entities (VSEs) has been developed and started to be implemented worldwide. The ISO/IEC 29110 series consists of VSE profiles. The most implemented profile worldwide has been the software basic profile. Published experience gained from the pilot projects and software basic profile implementations showed that software quality and testing are not sufficiently covered. In order to improve the effects of the implementation of the ISO/IEC 29110 software basic profile and increase the quality of a developed software product, the aim of this research is to provide process mapping between the ISO/IEC 29110 software basic profile and selected test improvement approaches, particularly the ISO/IEC/IEEE 29119-2 and ISO/IEC 20246 testing standards, and TMMi. The results of the mapping are presented in the form of the mapping tables and the ArchiMate model.

## KEYWORDS

ArchiMate, ISO/IEC 29110, ISO/IEC 29119, Mapping, Software Basic Profile, Software Process Improvement, Standard, Test Process, TMMi, Very Small Entities

## INTRODUCTION

Taking into account the key role of software and systems in today's society, it is rather surprising their development process is not regarded as satisfactory (Standish Group, 2015). Software and Systems Process Improvement (SPI) being a technique to implement improvement activities to achieve better results within development represents a way of brightening such situation. A variety of models, industry-specific standards and methodologies have already been developed for assessment and improvement of software and system development processes. The use of these tools is motivated by the assumption that quality of a product is dependent on the process utilized for its development (Afzal, Alone, Glocksien, & Torkar, 2016). The current state of the art in SPI is presented in (Kuhrmann, Diebold, & Münch, 2016) together with the emerging topics, e.g., SPI for very small and medium-sized companies, and SPI in the context of lean and agile methods. Software and Systems Process Improvement in very small companies is subject of interest in a number of publications, e.g. (Pino, Pardo, García, & Piattini, 2010; Sulayman, Mendes, Urquhart, Riaz, & Tempero, 2014; Sulayman, Urquhart, Mendes, & Seidel, 2012). Other publications focus on the description and usage of the

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ISO/IEC 29110 series of systems and software engineering standards and guides aimed at improving life cycle processes in Very Small Entities (VSEs) recently developed and started to be implemented worldwide (Laporte, Munoz, Miranda, & O'Connor, 2018). Experience gained from the pilot projects of the ISO/IEC 29110 standard implementations has been published (Laporte & O'Connor, 2016; O'Connor, 2014; Paucar, Laporte, Arteaga, & Bruggmann, 2015) showing that the implementation has been predominantly successful, however with certain issues arising. One of these issues is an insufficient support for software quality assurance processes which have now become a mandatory part of software and systems development (Spinellis, 2017). The growing importance of software quality assurance processes has been confirmed both in practice (Kuhrmann, Garousi, Felderer, & Herkiloglu, 2017) and research (Garousi & Mäntylä, 2016). Moreover, several software test process improvement approaches have been developed to help organizations in assessing and improving their testing processes, where TMMi<sup>®</sup> has become the de-facto standard for software test process improvement around the globe. Furthermore, the ISO/IEC 29119 series focused on software testing has been published filling the gap of a traditionally poor coverage of testing within standards (Afzal et al., 2016).

The goal of this paper is to help VSEs that are implementing the ISO/IEC 29110 Software Basic Profile to improve their software test processes. The paper thus presents the results of a process mapping between the ISO/IEC 29110 Software Basic Profile and software testing standards. The outputs, i.e. mapping tables and ArchiMate model, can be used by very small entities in practice to achieve desired quality of software test processes.

The rest of the paper is organized as follows. First, the ISO/IEC 29110 series is briefly described followed by the introduction of the ISO/IEC 29119 series of testing standards and TMMi<sup>®</sup>. Then, the research methodology is explained. In the next section, the mapping of the ISO/IEC 29110 Software Basic Profile to test processes is described. Finally, concluding remarks are discussed.

## RESEARCH BACKGROUND

### ISO/IEC 29110 Series

As confirmed by several surveys (Anacleto et al., 2004; Laporte, Alexandre, & O'Connor, 2008) very small companies developing software mostly had not implemented any international standards or models like the ISO/IEC 12207 (SC7, 2008) or CMMI<sup>®</sup> before 2010, when the ISO/IEC 29110 standard came into existence. In order to help such companies to improve their software processes and to be recognized as entities that produce quality software, the ISO/IEC 29110 series for Very Small Entities (VSEs) was developed. The term "Very Small Entity" (VSE) means "an entity (enterprise, organization, department or project) that has up to 25 people" (SC7, 2016b). The ISO/IEC 29110 series consists of the VSE Profiles that enable VSEs to improve their processes in a clear and stepwise manner. In the field of software engineering, the "Generic" Profile Group was defined being applicable to a vast majority of VSEs that do not develop critical software. Within this group, four VSE Profiles were proposed, i.e. Entry, Basic, Intermediate, and Advanced. Firstly, the Software Basic Profile (SC7, 2011), intended for VSEs performing a single project with no special risks or situational factors, was developed and published. As a result of several Software Basic Profile implementation pilot projects that showed this Profile was still quite difficult to be implemented, the simplified Software Entry Profile (SC7, 2012) was developed. It is applicable for a small project (a six person-months effort) or start-up VSE. The Software Intermediate Profile (SC7, 2017b) is intended for a VSE which handles more than one project at a time, whereas the Software Advanced Profile (SC7, 2018b) is targeted at a VSE that wants to sustain and grow as an independent competitive software development business. Following the development of software engineering profiles, the profiles in the area of systems engineering have been developed. At present, the Systems Entry Profile (SC7, 2015b), the Systems Basic Profile (SC7, 2014) and the Systems Intermediate Profile (SC7, 2019) are

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