# The Evolution of the ISO/IEC 29110 Set of Standards and Guides

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## ABSTRACT

While the quality of products is a competitive advantage for very small software development organizations, the usage of Software and Systems Engineering standards amongst such very small organizations is extremely low. A key factor in the literature explaining this lack of quality standards adoption is the perception by small and very small organizations that such standards have been developed for large multi-national companies and not with small and very small organizations in mind. The ISO/IEC 29110 standard is unique amongst software and systems engineering standards, in that the working group (ISO/IEC JTC1/SC7 WG 24) mandated to develop a new standard approached industry to conduct a needs assessment and gather actual requirements for a new standard as part of the standards development process. This paper presents a historical perspective behind the development of the ISO/IEC 29110 systems and software engineering standard and its constituent components, including the rationale behind its development and the innovative design of implementation guides to assist very small companies in adopting the standards. Further this paper will present an overview of the various parts of the ISO/IEC 29110 family and briefly present the plans for the future evolution of this series of standards.

## KEYWORDS

ISO/IEC 29110, Profiles, Software Engineering, Software Process, Standards, Systems Engineering, Very Small Entities

## 1. INTRODUCTION

The purpose of this paper is to explain the rationale and justification for the development of a set of systems and software engineering process standards and guides developed specifically for very small entities and to chart the design and development of the ISO/IEC 29110 series of standards from the perspective of two of the standards authors. Very Small Entities (VSEs) are enterprises, organizations (e.g. public or non-profit), departments or projects having up to 25 people. In addition, this paper will present the outline of the standard and its associated deployment supports. Finally, this paper will present an overview of the global pilot implementation of ISO/IEC 29110.

The structure of this paper is as follows: Section 2 introduces background concepts and definitions such as the concept of Very Small Entities, Standards and their usage in small companies. Section 2 provides a high level historical summary of the evolution of the ISO/IEC 29110 standards from its initial inception to its current status. Section 4 will present the overall structure of the standard and the Management and Implementation Guides in particular. Section 5 will present a short discussion on the evolution of the standard to include Systems Engineering and section 6 presents a high-level summary the global efforts to implement the standard. Section 7 discussion standards and education, while section 8 discusses the future possible evolution of the standard.

## 2. BACKGROUND CONTEXT

Software development is a highly complex endeavor (Clarke et al., 2016) and for many small and very small software companies, implementing controls and structures to properly manage their software development activity is a major challenge (Larrucea et al., 2016). Administering software development in this way is usually achieved through the introduction of a software process. All software companies are not the same and vary according to factors including size, market sector, time in business, management style, product range and geographical location. For example, a software company operating in India may have a completely different set of operational problems when compared to a software company in Canada, Mexico or Ireland. Even within a single geographical area such as Ireland, the range of operational issues faced by a small local Irish-owned firm can be radically different to those affecting a multinational subsidiary. The fact that all companies are not the same raises important questions for those who develop software process and process improvement models. To be widely adopted by the software industry, any process or process improvement model should be capable of handling the differences in the operational contexts of the companies making up that industry. But process improvement models, though highly publicized and marketed, are far from being extensively deployed and their influence in the software industry therefore remains more at a theoretical than practical level (Coleman & O'Connor, 2008a).

In a time when software quality is a key to competitive advantage, the use of ISO/IEC systems and software engineering standards remains limited to a few of the most popular ones. Research shows that small and very small companies can find it difficult to relate ISO/IEC standards to their business needs and to justify the application of the standards to their business practices (Laporte et al., 2008) (O'Connor & Coleman, 2009). Most of these companies don't have the expertise or can't afford the resources - in number of employees, cost, and time - or see a net benefit in establishing software life-cycle processes. There is sometimes a disconnect between the short-term vision of the company, looking at what will keep it in business for another six months or so, and the long-term or mid-term benefits of gradually improving the ways the company can manage its software development and maintenance. A primary reason cited by many small software companies for this lack of adoption of software engineering standards, is the perception that they have been developed for large software companies and not with the small organization in mind (Coleman & O'Connor 2008b). To date the industrial reality is that Very Small Entities (VSEs) have limited ways to be recognized, by large organizations, as enterprises that produce quality software systems within budget and calendar in their domain and may therefore be cut off from some economic activities.

Accordingly, there is a need to help such organizations understand and use the concepts, processes and practices proposed in the ISO/IEC JTC1/SC7's international software engineering standards. The recently published ISO/IEC 29110 standard "Lifecycle profiles for Very Small Entities" (ISO, 2011a) is aimed at addressing the issues identified above and addresses the specific needs of VSEs.

### 2.1. Very Small Entities

The definition of "Small" and "Very Small" Entities is challengingly ambiguous, as there is no commonly accepted definition of the terms. For example, the participants of the 1995 Capability Maturity Model (CMM®) tailoring workshop (Ginsberg & Quinn, 1995) could not even agree on what "small" really meant. Subsequently in 1998 SEPG conference panel on the CMM and small projects (Hadden, 1998), small was defined as "3-4 months in duration with 5 or fewer staff." Johnson & Brodman (1998) define a small organization as "fewer than 50 software developers and a small project as fewer than 20 software developers." Another definition for VSE introduced by Laporte et al. (2006) as "any IT services, organizations and projects with between 1 and 25 employees."

To take a legalistic perspective the European Commission (2005) defines three levels of Small to Medium-sized Enterprise (SME) as being: Small to medium - "employ fewer than 250 persons and

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