# Helping SMEs to Better Develop Software: Experience Report and Challenges Ahead

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## ABSTRACT

Small and medium-sized enterprises (SMEs) play a key role in the worldwide economy and are increasingly dependent on software as part of their products/services or to support their operation (e.g. e-commerce, smart manufacturing). Over the past 15 years, as a research and technology transfer centre, CETIC has been busy helping Belgian SMEs to increase their maturity in software development. We have also contributed specific methods and tools for the SME target, including the OWPL framework and now the ISO29110 standard. This talk aims at sharing what we learned from different types of SMEs (from startups to grownups, both IT and non IT) about common problems gathered in a long term survey. We then focus on key issues like requirements, technical debt, test/release and (agile/lean) project management. Finally, we share our thoughts on new challenges ahead raised by the ever increasing connectivity like cybersecurity and privacy regulation (GDPR).

## CCS CONCEPTS

• **Social and professional topics** → **Quality assurance**; **Technology audits**; • **Software and its engineering** → **Software creation and management**; **Software development methods**;

## KEYWORDS

Software Development Practices, Software Process Improvement, Small and Medium Enterprise, ISO29110, Industry Report, Case Studies

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## 1 SME CONTEXT

Small and medium-sized enterprises (SMEs) are the main drivers in many economies worldwide, including in European countries where SMEs hire two thirds of the people and generate 58% of the total value added [12].


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Software is becoming pervasive in every business, many non-IT companies have seen their products and services evolving to become interconnected. This also impacts SMEs which, for example, must offer a digital presence through an e-commerce shop or even develop new digital assets (apps or connected hardware) to support their business. However, developing software is challenging for SMEs, especially to ensure the quality, time, and budget constraints. SMEs differ from larger organizations because of their limited, often less specialized, resources. However, they are more flexible, also more directly focused on the innovation and value production. They also show a lower adherence to standards [7].

In this context, the purpose of our talk is to share our practitioner experience in helping SMEs to address the software development problems given their specificities. Our talk heavily relies on our experience in auditing and coaching several dozens of Belgian SMEs over the past 15 years as this is one of the main missions of CETIC as a research and technology transfer centre [2]. This involves both IT startups and grownups, with a focus on the first category. Indeed, as depicted in Figure 1, startups evolve through key phases and their ability to correctly manage their software development has to be carefully monitored when going out of incubation stage. For this purpose, we have developed a lot of connections with structures incubating such startups [4, 16].

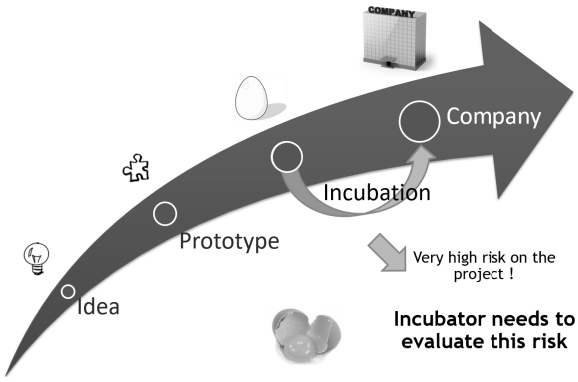


**Figure 1: Typical SME Evolution Phases**

Over our first year of practice, we realized that standards much more lightweight than SPICE or CMMI were required. We initially engaged in the process of developing a local software process improvement framework for SMEs called OWPL [1]. As other organisations over the world had engaged in a similar process, we joined our forces to produce an international standard all together: the ISO29110 standard targeting Very Small Entities (i.e. up to 25

people) [3, 8]. This need for specialized frameworks for SMEs is still present as it accounts for the majority of the contributions found in the recent literature (approx. 38%). Furthermore, there is also a growing interest in success factors to help companies in conducting Software Process Improvement (SPI) and in adapting agile principles and practices for SPI [9].

## 2 TALK OVERVIEW

As a starting point, our talk will give a large overview of the current state of practice and highlight most common problems faced by SMEs developing software. This part is based on a survey carried out in Belgium in the course of 2015 [11]. As it heavily relies on the ISO29110 standard, its main characteristics will be introduced with a focus on the basic profile (as depicted in Figure 2) before detailing the survey results. A comparative look will also be devoted into other surveys targeting SMEs and larger scale surveys like CHAOS [15], Gartner [6], Sauer & Cuthbertson [14].

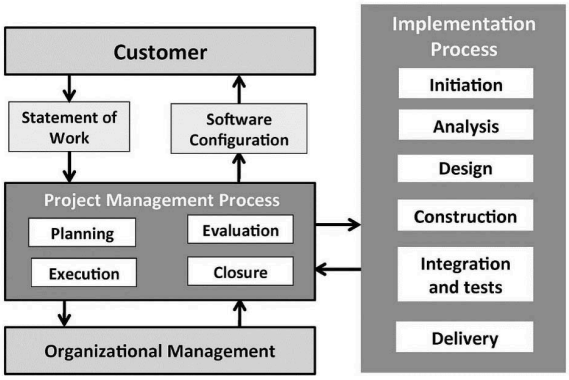


**Figure 2: ISO29110 Software Basic Profiles Processes [10]**

The talk will then explore more specific issues in the light of the ISO29110 standard. Key take-aways will be formulated based on typical recommendations done to SMEs. This will typically cover:

- *requirements management*: help with identifying and structuring requirements (techniques, templates, tools) including using agile techniques, e.g. identifying and structuring user stories as depicted in Figure 3.
- *technical debt management*: help to identify the debt (micro-process audit, code analysis) and how to manage it, e.g. using an Agile approach. The case of IT startups can also be analysed in more details [13].
- *test/release management*, especially with the aim to reduce the post-delivery corrective iteration steps.
- *project management and development process* with a focus on the use of agile and lean principles

Finally, back to the big picture, we stress the fact that SMEs are quite aware of their maturity level and are willing to improve. However, they need the right methods and tools that fit their organisation and resources availability. We also share some thoughts about the challenges ahead related to the fast technological evolution and the increasing level of connectivity. This results in new threats like cybersecurity or the need to address new regulation

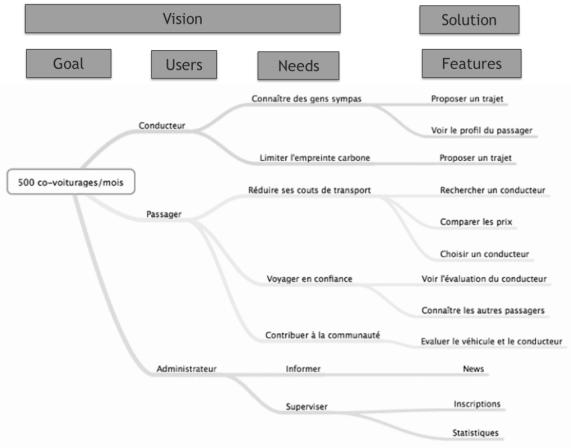


**Figure 3: Using User Stories for Gathering Requirements**

constraints like the European General Data Protection Regulation (GDPR) [5].

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