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Implementing ISO/IEC 29110 to Reinforce Four Very Small Entities of Mexico under an agile approach

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Very Small Entities (VSEs) of software development have had a significant demand and economic impact in recent years, because most of them are the software producer for medium and big companies in order to satisfice the growing demand of software. In this context, it is important to ensure that they produce quality software to successfully meet the market needs. This task relies on having the knowledge and the experience to implement proven practices, which are contained in quality models and standards, to be able to develop quality software, while increasing their productivity and keeping or reducing their costs. In this article a description of the implementation of the Basic profile of the ISO/IEC 29110 in Mexico, specifically at Zacatecas State is presented. This implementation was done as a strategy to increase the competitiveness of them. The article includes both, the strategy established to deploy the knowledge and the method followed to implement the ISO/IEC 29110 in four VSEs that uses Scrum methodology as agile approach. The results show that the implementation of ISO/IEC 29110 was easy and with a high acceptance due to the benefits detected in the reinforcement of the VSEs' processes without changing the way they work and solving their problems.

1. Introduction

Today, most of Small and Medium Enterprises (SMEs) prefers agile approaches to produce software in an effort to meet the schedule requested by the market [1], and VSEs are not the exception because most of them are using agile approaches too. Unfortunately, do not having the adequate knowledge regarding the correct implementation of an agile approaches, as well as, in the use of software engineering proven practices, contributes to inefficiencies in the development of software such as quality, cost and time.

It is well known that to implement proven practices (provided in quality models and standards) in real environments of VSEs is not an easy task so that it represents a considerable challenge. A common barrier arises because of they do not have the knowledge and the experience to implement proven practices, which are contained in quality models and standards.

The above-mentioned situation is more evident in VSEs. A VSE can be an enterprise, an organization, a department or project having up to 25 people. This type of organizations must work harder in order to survive and grow, so that the time and effort they can spend in the implementation of tasks for improving their operation and processes is the minimum [2][3].

The issues mentioned above highlight the need to reinforce VSEs software development process in order to enable them to develop quality products. Moreover, because many VSEs are producing and/or maintaining the software for bigger organizations [2].

In an effort to provide a standard adapted to the VSEs environment, ISO and IEC, which are standards organizations, provide the ISO/IEC 29110 standard series, as solution for the implementation of proven practices in VSEs [4].

ISO/IEC 29110 has becoming a high adopted standard in Mexico, it is one of the Quality Standards recognized by the government and the industry [5]. Besides, since 2013 until 2018, Mexico reported 35 of a total of 42 VSEs certified in this standard [6].

This article aims to describe the implementation of ISO/IEC 29110 in four VSEs from a state of Mexico, specifically Zacatecas, in which were detected benefits in the reinforcement of their project management and software implementation processes without changing the way they work and solving their problems the used to have in those processes. It is important to mention that this article is an extend article of an article published in [7], which has been updated to shows in more detail the benefits and the issues that VSEs solved with the implementation of ISO/IEC 29110. Besides, a description of the Basic profile of ISO/IEC 29110 is added as well as the strategy implemented in Zacatecas for the deployment of the ISO/IEC 29110 was included.

The article is structured as follows: after the introduction, section 2 shows an introduction of agile approaches; section 3 shows ISO/IEC 29110 is presented, giving more detail of the Basic profile; section 4 shows other research works of other countries that describes the results of implement ISO/IEC 29110; section 5 provides the strategy developed in the implementation of the ISO/IEC 29110 standard at Zacatecas Region; section 6 present the implementation of ISO/IEC 29110 in four VSEs from Mexico;

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and finally, section 7 shows a discussion, conclusions and the next work in this research.

2. Agile Approaches

The agile or lightweight methods are characterized by short, iterative development cycles, performed by self-organizing teams. This teams work with techniques such as simpler designs, code refactoring, test-development, frequent customer involvement. A feature of this type methods is that they emphasize on providing demonstrable working products in a development cycle [8].

The agile alliance defines "Agile" as the ability that an organization has in order to create and respond to changes so that it is able to have success in uncertain and turbulent environment [9].

Agile methods aim to meet the next goals: (1) to develop software faster, (2) to develop software in an incrementally way and (3) to develop software focused on increasing the satisfaction of the customer. To achieve these goals, they provide a conceptual framework of practices and principles [9]. Besides, they aim to achieve a close collaboration between a self-organized development team and the customers.

Based on the agile values and the agile manifesto, agile methods establish how to develop software using practices such as: iterative development, delivery simply working software frequently and early [1, 8, 9].

Many agile methods have been arising, the most popular are: Rapid Application Development (RAD); eXtreme Programming (XP), Scrum and Feature-Driven Development (FDD) [10].

Due to the VSEs of this article uses Scrum to develop software, we consider important to give and overview of this methodology.

Scrum provides a framework in which various processes and techniques can be implemented, so that it is possible to have a continuous improvement on the product, the team and the working environment [11]

Scrum empowered self-organized teams to divide their work into short and concentrated work in 1-4 weeks cycles named "Sprint" in which they should build working software according to the customer needs [11].

Scrum has six events (project vision meeting, sprint planning, sprint, daily scrum, sprint review and sprint retrospective) and four main roles (customer, product owner, scrum master and the development team) [11].
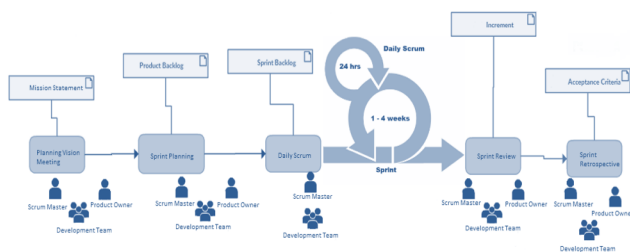
Figure 1 shows a typical scrum process representation.

Figure 1. Scrum Process [12]

3. ISO/IEC 29110

ISO/IEC 29110 Systems and Software Engineering Series was developed as a solution to help VSEs to face challenges such as improving productivity and quality with minimum costs. This standard was developed by the ISO WG24 [5].

The ISO/IEC 29110 series was designed for helping the VSEs in the development of not critical systems (composed of hardware and software components) or software. This series of software standards and management and engineering guides aims to improve VSEs software development process through the implementation of proven practices that could be easily implemented within a VSEs and are focused on obtain benefits in product quality, delivery time and costs of production.

The features that characterized the ISO/IEC 29110 series for software are [5]:

- It has a Generic Profile Group that has a four-stage roadmap, called profiles, which should be selected by a VSEs according to their goals: (1) *Entry Profile* should be selected if the VSE works on small projects such as six person-month effort and start-ups; (2) *Basic Profile* should be selected if the VSE develops a single application by a work team. It is the unique profile in which a VSE can be certified; (3) *Intermediate Profile* should be selected if the VSE develops more than one project in parallel with more than one work team; and (4) *Advanced Profile* should be selected if the VSE wants to grow and maintain as an independent competitive system and/or software development business.
- It has two processes: the project management process and the software implementation process.
- It works in VSEs using any development approach, methodology or tool.
- It provides a set of process elements such as objective, activities, task, roles and work products.

Table 1 lists the number of processes, tasks, work products and roles of each profile of the ISO 29110 4-stage software engineering roadmap. It is important to highlight that a "conditional process" is a process that may be mandatory under some specified conditions, may be optional under other specified conditions, and may be out of scope or not applicable under other specified conditions; these are to be observed if the specified conditions apply.

Table 1. Processes, tasks, work products and roles of the 4 Software Profiles of ISO/IEC 29110.

Element	Entry	Basic	Intermediate	Advanced
Number of processes	2	2	3 + 1 conditional	3 + 2 conditional
Number of Tasks	40	67	107 (+ 8 conditional)	123 (+ 23 conditional)
Number of Work Products	14	22	39 (+ 3 conditional)	42 (+ 7 conditional)
Number of Roles	3	7	8 (+ 1 conditional)	8 (+ 1 conditional)

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3.1. Overview of the ISO/IEC 29110 Basic Profile

Since the software Basic profile was used, the authors present an overview of its structure.

The software Basic profile of ISO/IEC 29110 is divided into two processes, as illustrated in Figure 2: the project management (PM) process, and a software implementation (SI) process. Each process is composed of a few activities and tasks, and the documents to be produced. As illustrated in Figure 1, the customer's statement of work (SOW) is used to initiate the PM process. The project plan is used to guide the execution of the software requirements analysis, software architectural and detailed design, software construction, software integration and test, and product delivery activities. Verification, validation, and test tasks are included in the SI process. The PM process closure activity delivers the software configuration (that is, a set of software products) and then obtains the customer's acceptance to formalize the end of the project.
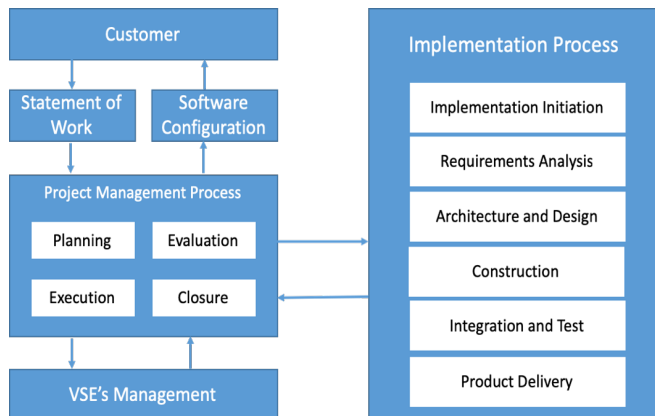

Figure 2. Processes and activities of the ISO/IEC 29110 software Basic profile [13]

4. Related Works

Successful implementations in many countries of the ISO/IEC 29110 have been published, since it has been adopted, as a national standard. This section presents a set of success cases.

Claude and O'Connor in [14] reported seven success cases implementing ISO/IEC 29110 in different countries: (1) an IT start-up from Peru, where the utilization of the Basic profile, using an agile approach, guided the start-up throughout all development phases. The start-up had a percentage of rework of 18% similar to organizations with a maturity level 2 of the software CMM. The start-up developed a high-quality application and obtained a formal certification to ISO/IEC 29110; (2) a small IT team of 6 developers of a large Canadian financial institution, with over 3,000 IT employees, used the Scrum methodology and ISO/IEC 29110 to develop a tool for the 80 traders of the cash management department. The new process enables de VSE reducing the number of incidents classified as major, when the tool for the traders were put in production. The new agile process improved the management of priorities of the traders, improved the quality of change requests and decreased the

numbers of defects in the software tools; (3) A 10-person team, of the IT division of a 2,000 IT people division of a large utility provider, developed a web application for the management of properties of the provider. The 1,500-hour project, using a Scrum approach was developed with only 9.6% of rework.

O'Connor and Laporte in [15] reported a pilot project of the implementation of ISO/IEC 29110 in France of a VSE of 13 people (2 software engineers), which building and selling counting systems that collects data about the private and public sites frequency.

Díaz, et al., in [16] reported the implementation of ISO/IEC 29110 in two VSEs software development companies in Perú. At the end of the pilot project, both VSEs had a higher compliance to the ISO/IEC 29110. They improve their organizational culture regarding the use of proven practices, because since their introduction, activities were adapted day to day. Besides, they report an improvement in schedules, which were managed better through timetables as well as an improvement in the schedules monitoring that was carried out using indicators.

Table 2 provides a better overview of the type of organizations, projects and number of people involve in the implementation of ISO/IEC 29110 with very good results.

Table 2. VSEs that have implemented the Basic profile of ISO/IEC 29110 with good results.

Type of Organization	Project	# persons
IT start-up from Peru [14]	Web platform for Insurance project	Increase from 4 to 23
IT start-up with location in Canada and Tunisia [14]	Smart city project	20 (18 in Tunisia)
A development team in an IT start-up from Canada [14]	Web application for collaborate, share and plan trips	Increase from 2 to 15
A software team in a large Canadian financial institution's IT division [14]	Tools for traders	6
A software development team in a Large Canadian Automotive domain [14]	Embedded software to control power trains	14
IT Division of a Large Canadian transportation enterprise [14]	Web apps	11
A division of large American engineering company [14]	Redefine and improve its project management process for their small-scale and medium-scale projects	Depending on the project type: Small:1 Medium: >1 Large: Many
VSE from France [15]	Counting systems about the frequenting of natural spaces and public sites	14
VSE of Peru that offers solution to different domains (e.g. commercial,	Embedded software	8

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retail, health, mining and engineering and Education) [16]		
VSE of Peru 2 [16]	Ad-hoc solutions for iPhone, iPad, android and windows phone	8

All of these VSEs have implemented the ISO/IEC 29110 and obtained very good results, the benefits identified in most of them are: such as reduce rework, access to new customers, increase quality, improve their processes among others.

It is important to mention that in a previous work of the authors of this article [17], there were listed eleven VSEs that have implemented ISO/IEC 29110, but they are not included in this section because the article presents just a summary of the VSEs. Besides, nine of them are the same as the included in [14] and the four from Mexico, are described briefly and they will be analyzed in detail in this article.

5. Strategy to deploy the ISO/IEC 29110 in the Zacatecas Region

According to [6], Mexico is the country that has more VSEs certified in ISO/IEC 29110 in Latin America. According to the report of certified VSEs published from NYCE (*Normalización y Certificación Electrónica*), the Mexican Certification Body, Mexico reports 35 of 42 VSEs certified in Latin America. However, the case studies of them have not been published.

To deploy the ISO/IEC 29110 at Zacatecas, an eight-step strategy was established. The strategy is illustrated in Figure 3 and then described.

Figure. 3 Eight-phase strategy to deploy the ISO/IEC 29110 at Zacatecas

1. *Analyze the environment*: this analysis aims to know the real environment of the software development organizations in Zacatecas. To perform this analysis a set of software development organizations were interviewed focused on size, business goals, experience with models/standards.
2. *Obtain the government commitment*: the first step is focused on obtaining the commitment of the government, because it is a key element toward the

be able to deploy the ISO/IEC 29110 at Zacatecas. The commitment consists on helping VSEs since the beginning until getting the certification.

3. *Communicate the pilot project to the stakeholders*: as second step it was necessary to present the project to the VSEs in order to explain them project goals, strategies of monitoring and control, duration time and indicators. This presentation allows VSEs decide to be integrated in the pilot project.
4. *Train the VSEs*: the third step consists on providing the training to VSEs on the ISO/IEC 29110 standard, e.g. the performance of workshops and specific courses.
5. *Establish the ISO/IEC 29110 committee*: as fourth step a committee was established. The committee aims to monitoring and control the activities performed during all pilot project, so that, if necessary, it should take corrective actions.
6. *Perform work sessions with VSEs of the pilot project*: during this step the five-step method was carried out for reinforcing the VSEs through implementing the ISO/IEC 29110. This method is briefly described in section 6.2.
7. *Monitor the meetings*: the ISO/IEC 29110 certification process is composed of three phases: gap analysis, pre-auditory and auditory. The monitoring meetings were performed after each phase of the certification process in order to provide feedback to VSEs regarding the non-conformities detected by auditors.
8. *Disseminate of the success cases*: once the VSE got the ISO/IEC 29110 certification it was necessary to find the ways to promote the success cases of VSE certification e.g. conference, acknowledgments, publications.

6. Implementation of the Basic profile of ISO/IEC 29110 to reinforce VSEs

This section describes the implementation of the ISO/IEC 29110 in four VSEs of Zacatecas. All of them using the Scrum methodology, and were certified in ISO/IEC 29110 by NYCE as result of the implementation of the standard.

6.1. Initial issues identified in the four VSEs

The implementation of the ISO/IEC 29110 starts with an identification of gaps or issues the four VSEs have in their development processes. As mentioned before all the VSEs carry out Scrum as base methodology for performing their projects. To have a better understand of them about why to use ISO/IEC 29110 to reinforce their software development process, the identified issues were classified based on the processes provided by ISO/IEC 29110 as next listed [7]:

a) Project Management (PM) process issues: the PM process contains 4 activities to manage a project (planning, execution, assessment and control, and closure). Related to the PM process there were found a total of 10 issues, next the issues are listed by activity:

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o *Project planning issues*: (PM1) lack of a practice to receive a document describing the software product to be developed from the customer; (PM2) lack of the development of a project plan that includes needs regarding the resources and training to carry out the project.

o *Project plan execution issues*: (PM3) lack of practices for registering the results of reviews carried out to discuss about the projects' progress; (PM4) lack of a practice for registering the planned versus actual values of the project.

o *Project assessment and control issues:* (PM5) lack of practices to analyze change requests; (PM6) lack of registration of agreements of performed meetings; (PM7) lack of practices for monitoring the applied corrective actions to manage deviations; (PM8) lack of practices to use baselines; (PM9) lack of evidence of perform configuration management; and (PM10) lack of perform software quality assurance.

o *Project closure issues*: (PM11) lack of a practice to obtain the customer acceptance.

b) Software implementation (SI) process issues: the IS process contains six activities to develop software (software implementation initiation, software requirement analysis, software component identification, software construction, software integration and test, and software delivery). Related to the IS process there were found a total of 8 issues, next the issues are listed by activity:

o *Software implementation initiation issues*: (SI1) lack of practices to review the project plan with team members to achieve a common understanding and commitment regarding the project.

o *Software requirements analysis issues*: (SI2) lack of practices to register changes in requirements.

o *Software architecture and design issues*: (SI3) lack of practices to develop a software design as well as the architectural design.

o *Software construction issues*: (SI4) lack of practices to document unit tests applied to software components.

o *Software integration and test issues*: (SI5) lack of the evidence of the test procedures executed; (SI6) lack of registration of test results; and (SI7) lack of production of results of verification and validation.

o *Product delivery issues*: (SI8) lack of practices to deliver the product as well as to obtain the customer acceptance.

6.2. Method performed to implement the ISO/IEC 29110 to reinforce the VSEs

To implement the ISO/IEC 29110 in VSEs a five-step method was developed, this method is illustrated in Figure 4 and the described [7].
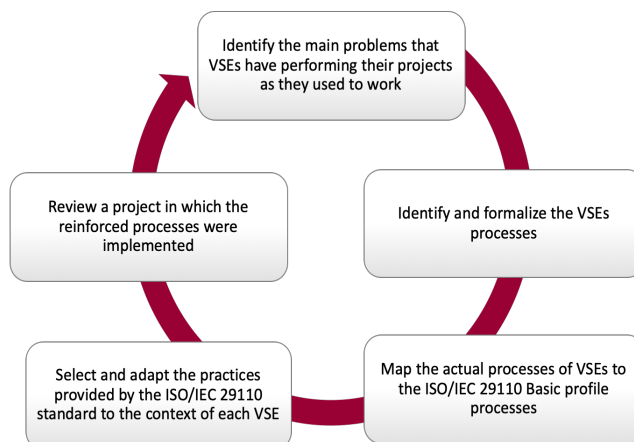

Figure 4 Five-step method to reinforce the VSE's processes

1. *Identify the main problems that VSEs have performing their projects as they used to work:* in this step we performed meetings with each VSE in order to obtain information about activities they do to carry out a project (see section 6.1).

2. *Identify and formalize the VSEs processes:* in this step we help VSEs in the identification and formalization of their software development process. We focused on project management and software development processes.

3. *Map the actual processes of VSEs to the ISO/IEC 29110 Basic profile processes:* in this step we map their formalized process with the activities and task provided in the processes of ISO/IEC 29110 in order to identified gaps in their processes. This step allows the VSEs to highlight the need for implementing a proven practice.

4. *Select and adapt the practices provided by the ISO/IEC 29110 standard to the context of each VSE:* in this step, together with each VSE, we analyzed a set of practices provided by the ISO/IEC 29110 and how each practice could impact their actual processes and its importance in the reinforcement of their software development processes and finally we suggest a way in which the VSE can tailoring the practice according to the way they work.

5. *Review a project in which the reinforced processes were implemented:* in this step we analyze a project in which they implement the reinforced processes and give them a feedback focusing on the providing a non-conformities report. It is important to highlight that we work with each VSE in solving the non-conformities.

The execution of the five-step method was conducted by a series of meetings with each VSEs, in an average to perform the step 1 to 4 there were performed 4 meetings and to perform the step 6, there were performed at minimum 2 meetings. Besides, each meeting was 4 hours-duration.

To carry out the five-step method, on the one way, a 6 people-team were integrated as illustrated in Table 3. On the other way each VSE integrated a team according to each VSE environment as illustrated in Table 4.

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Table 3. Team for the research center.

# of persons	Skills
2	• Software engineering researchers with high experience in process definition and improvement using multi-model environments. • They have high experience in the implementation of models and standards such as CMMI-Dev® [18], ISO/IEC 330XX [19], ISO/IEC/IEEE 12207:2008 [20], MoProSoft[21] and ISO/IEC 29110 [13]; as well as other frameworks such as the PMBOK® Guide [22] and the SWEBOK® Guide [23] and the methodologies such as TSP (Team Software Process) [23-24], Scrum [11], XP [25] and Crystal [26].
4	• They have knowledge in software engineering practices, software tools, the CMMI® for Development. • The ISO/IEC 29110 standard and the Scrum methodology.

Table 4. Skills of VSEs' teams

VSE_ID	Skills of people involved in the VSEs team
VSE1	1 person with experience in CMMI-DEV, he participated in the certification of the maturity level two and he was certified as Scrum Master
VSE2	2 people with training in software process. Both were certified as Scrum Master.
VSE3	1 person with training in CMMI-DEV and Scrum methodology
VSE4	2 people with minimum knowledge in agile practices.

6.3. VSEs reinforced with the ISO/IEC 29110

The method presented in previous section was implemented in 4 VSE of Zacatecas in order to reinforce them using the ISO/IEC 29110. The 4 VSEs which participated in this project are briefly described in Table 5.

Table 5. VSEs of Zacatecas that participated in the project

VSE_ID	VSE Description	# total of persons
VSE1	• This organization develop hardware and software solutions.	12
VSE2	• This organization are experts in the use of web-oriented technologies and platforms as well as in mobile applications. • They produce their own software products that are offered to their customers.	7
VSE3	• This organization offers IT services to their customers.	3
VSE4	• This organization produces hardware, firmware and software solutions to meet needs of diverse sectors (e.g. mining, pyrotechnic, educational and technological).	4

It is important to mention that an overview of this 4 VSEs was previously included in [17]. However, this article analyzes in detail the information regarding the benefits detected in the VSEs.

Table 6 describes the project they carried out reinforcing their software development process with ISO/IEC 29110. Besides, the benefits identified are included.

Table 6. Projects performed and benefits detected with the reinforcement of their development process.

VSE_ID	Project Description	Detected Benefits
VSE1	System to control the access for the company offices.	• A software development cycle containing a clear step, work products and roles was obtained. • The information of a well-defined project plan was obtained. • Practices for the monitoring and control were implemented, so that the project control was improved. • Activities that reinforce the software control was adopted. • The configuration management of the project as well as the software delivery were improved.
VSE2	Web system that quotes and compares car insurances.	• The software development process was improved. • The communication with the customer was improved. • Practices related to change request were implemented. • Forms to be implemented as part of the development cycle were established to provide evidence of the performance of activities such as meetings with the customer, change requests, customer acceptance. • The verification procedure was improved. • Practices to validate and approve the project artefacts were adopted and therefore validation procedure was improved. • Practices to document the test and test results were adopted.
VSE3	Software to manage medical consultation.	• Practices for monitoring and controlling the project were adopted, resulting on an improving of this. • The communication with the customer was improved since the

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		beginning by adopting the delivery instructions.
		• The risk management was improved.
VSE4	Redesign of Control Systems of Permanent Magnet Engines.	• A standardized methodology for managing the project was implemented, so that, cost was reduced (especially unforeseen cost). Besides the estimation of delivery time was reduced.
		• Practices for estimation of projects were reinforced, so that the project estimation was improved
		• An improvement to place the products in the market, in a more quickly and efficiently way.

Besides, there were analyzed the issues solved by the VSEs with the reinforcement of their projects with the ISO/IEC 29110; The issues are described in section 6.1.

Table 7 shows the analysis for the project management solved issues and Table 8 shows the analysis for the software implementation solved issues.

Table 7. Solved issues of project management process

VSE_ID	PM1	PM2	PM3	PM4	PM5	PM6	PM7	PM8	PM9	PM10	PM11
VSE1	N	X	X	X	X	X	X	X	N	N	N
VSE2	X	X	X	X	X	X	X	X	X	X	X
VSE3	X	X	X	X	X	X	X	X	X	X	X
VSE4	X	X	X	X	X	X	X	X	X	X	X

N: means that the VSE does not have that issue

Table 8. Solved issues of software implementation process

VSE_ID	SI1	SI2	SI3	SI4	SI5	SI6	SI7	SI8
VSE1	X	X	X	X	X	X	X	N
VSE2	X	X	X	X	X	X	X	X
VSE3	X	X	X	X	X	X	X	X
VSE4	X	X	X	X	X	X	X	X

N: means that the VSE does not have that issue

7. Discussion, Conclusions and Next Steps

Agile approaches are the most common software development approach used in VSEs. Unfortunately, most of the time VSEs do not implement it in a correct way, this situation contributes to implement an inefficient software development process.

This article presents a set of issues identified in VSEs using an agile approach classified in two groups:

a) *Lack of evidence in performing activities*: in this category we include problems such as the reception of a statement of work as well as the customer approval. VSEs do not develop a project plan, they do not use a traceability matrix, they do not have evidence of the result of project progress, they do not have evidence of the agreements of meetings (both with the customer and team), they do not produce an architectural or software design, they do not document unit test, they do not document the test procedures executed as well as their results.

b) *Lack of performance of specific activities*: in this category we include problems such as the lack of management of change requests. VSEs do not track corrective actions, lack of the implementation of a configuration management, they do not perform verification and validation activities.

The issues listed before highlights the importance of helping VSEs in the adoption and use of software engineering practices toward an improvement of their software project performance. However, this type of organizations due to its nature, just implement a practice if they are convinced of the value of the practice.

In this context, this research article aims to provide evidence of the reinforcement of four VSEs, which use the Scrum methodology as development approach, using the Basic profile of ISO/IEC 29110 as reference. The ISO/IEC 29110 was selected because nowadays, it is a well-accepted standard in Mexico, since it can be easily implemented in Mexican software industry. These standard series contain a set of basic practices to be performed by a small team to perform a project, it focuses on two processes, the project management and the software implementation.

As result of the reinforcement of the software development processes of the four VSEs with the ISO/IEC 29110, the 4 VSEs achieved the certification, by independent auditors of NYCE, to the Basic profile of ISO/IEC 29110 standard. This result confirms that the five-step method used to reinforce the VSEs had very good results.

The lessons learned identified from the implementation of the five-step method are:

• Start by formalizing the current software development process of each VSEs, help them to understand the value of the practices the used to perform as well as the gaps they have and that should be covered.

• The five-step method enable the VSEs to adapt proven practices according to the way they work and their environment needs and features, because they understand the importance of the proven practices to improve their development processes.

• The five-step method allows providing support to the VSEs all time until they are certified.

• The five-step method allows maintaining a continuous communication that helps to reduce the resistance to change in VSEs regarding the adoption of proven software engineering practices.

The results of the four VSEs reinforced, highlight the that the ISO/IEC 29110 can be easily implemented in VSEs, helping them to improve their development processes, with impact in better quality products, and better budget and schedule estimations.

We are aware that the sample presented in this article is very small, even when it is representation due to the lack of

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publication of Mexican VSEs that has been improved with the ISO/IEC 29110. Therefore, as next steps, on the one way, we are using the five-step method to reinforce more VSEs of the state Zacatecas. On other way, we are actively working in the deployment of the eight-step strategy to other states of Mexico.

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