Development of an Application in a Large State-Owned Utility Provider Using an Agile Approach with ISO 29110

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Mini Case Study

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The IT division of a large Canadian utility provider has 1950 employees that support more than 2,100 applications. The organization had already implemented 12 Process Areas of level 2 and 3 of the CMMI-DEV. Traditional lifecycles were used for the development of applications.

The deliverables requested, by the methodology in place, were too numerous for small projects. This improvement project was conducted in a department specializing in the development of web-based and georeferenced applications. This department, a very small entity (VSE), consisted of 11 people.

This project combined the benefits of ISO/IEC 29110, specifically designed for very small entities, with some elements of the CMMI®. During this 1,500-hour project, done in 4 sprints, the Basic profile and the deployment packages guided the development of an application to quickly produce a superior application. For this project, only 9.6% of the total effort was devoted to the correction of defects (i.e. rework) detected by the evaluations such as reviews and tests.

The VSE and its environment

The information technology division of a major Quebec state-owned company has 1,950 employees supporting more than 2,100 applications. The traditional life cycles used are not designed for all types of projects.

Due to the increase in the field of mobility, the mobility and georeferenced solutions department was called upon to develop applications more and more quickly, using a wide range of technologies. The problem was that the requested deliverables, by the methodology that had been put in place, were too numerous: the level of documentation required was not suitable for small projects requiring few resources. The methodology was based on the Fujitsu Macroscope framework. For example, for the "implementation" part of the repository, there are more than 60 deliverables to be developed.

It is sometimes difficult to separate what is useful in a project from what it is not. Traditional life cycles are used for development, but the need for new development approaches was required in

order to respond better and more quickly to its internal customers.

This project aimed to understand how to use ISO 29110 in a context where several CMMI® for Development (CMMI-DEV) Level 2 and 3 process areas have been implemented as illustrated in table 1.

Project Planning	Product Integration
Project Monitoring and Control	Verification
Supplier Agreement Management	Validation
Requirements Management	Measurement and Analysis
Requirements Development	Process and Product Quality Assurance
Technical Solution	Configuration Management

Table 1. CMMI® for development process areas implemented (Translated from Lebel & Laporte, 2016)

We also wanted to explore how to integrate an agile approach within the IT division.

Starting Point

The evaluation of the processes of the "Mobility and Georeferenced Solutions" department in relation to the activities and tasks of the Basic profile of ISO 29110 allowed us to identify the important improvements to implement.

Figure 1 shows the percentage of tasks performed for each of the activities of the software implementation process before the implementation of ISO 29110.

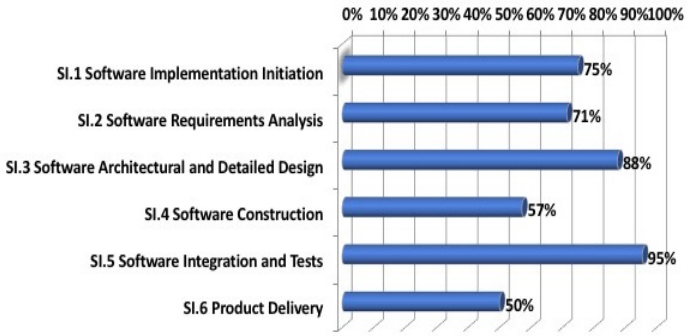

Figure 1. Software Implementation Process Evaluation (Translated from Lebel & Laporte, 2016)

Figure 2 shows the percentage of tasks performed for each of the activities of the project management (PM) process before the implementation of ISO 29110.

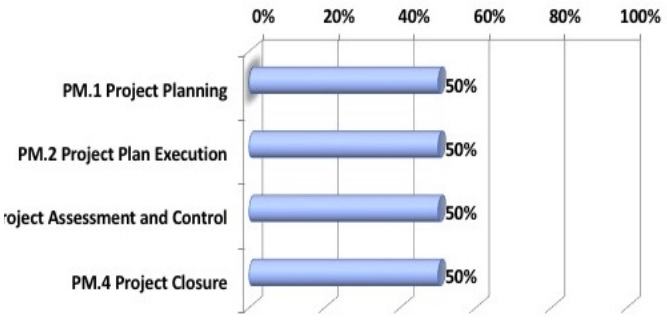

Figure 2. Project Management Process Evaluation (Translated from Lebel & Laporte, 2016)

The Improvement Project

Table 2 shows what was done during the five 210-hour sprints.

Each sprint was of a fixed duration of 3 weeks. For the duration of this project, 2 people worked 7 hours a day.

Sprint	Description
Sprint 0	Preparing environments (servers, access, database creation, etc.) Developer Training Adaptation period
Sprint 1	Selection of the application template (open source) Using a First Web Map Service Tests on all modules of the template Adaptation period
Sprint 2	Adapting the printing module to secure environments Tests of modules Adaptation period
Sprint 3	Creating the Research Module and Reporting Module Adaptation period
Sprint 4	Complete the functionalities and refine them according to the customer's comments Adaptation period

Table 2. Overview of 5 sprints (Translated from Lebel & Laporte, 2016)

Results

Table 3 shows the elements of the cost of quality (i.e., prevention, evaluation and correction efforts) as well as implementation efforts of the project.

The project required 1,511 hours of work. As for prevention efforts, a 28-hour training session was followed by the construction of web applications using the ArcGIS API for JavaScript.

The 35-hour prevention effort, under the heading 'Code Development', was aimed at reducing the risk of the project by developing code to verify the concepts learned during the training.

Task	Prevention (hours)	Execution (hours)	Evaluation (hours)	Correction (hours)
Environment installation	35			14
Project Management		252	2	2
Requirement Specification		56	14	14
Code development	35	798	105	112
Maintenance document		49	7	2
Web site deployment	1	7		2
Project Closure		4		
TOTAL (hours)	**71**	**1166**	**128**	**146**

Table 3. Effort to execute, detect and correct defects by the 11-person team (Translated from Lebel & Laporte, 2016)

For this project, 8.5% of the effort was devoted to evaluation tasks and only 9.6% of the total project effort was devoted to the correction of defects detected by the evaluations (e.g. peer reviews, testing).

Many challenges were encountered during the implementation of this project, such as resistance to change, the difficulty of sensitizing satellite teams to the project and the challenge of finding the right tools to achieve an agile approach.

The ISO 29110 process improvement project allowed the small department to shine within the IT division, as it became a model for future small IT projects.

Lessons Learned

One of the lessons learned at the end of our project is not to try to change everything at the same time. Since developers are already

invested in projects, an improvement project should establish a list of priority of the improvements to be made. The implementation of the Management and Engineering guide the Basic Profile of ISO 29110 can be done, step by step, by implementing the deployment packages one at a time.

We have learned that it is not needed to use complex software products to implement the tasks of ISO 29110. Tools already in place or free software can often be suitable.

Ideally, when a process is changed, all stakeholders are involved. But unfortunately, in a large organisation, it is difficult to get everyone involved because they are too people. It is therefore essential to communicate the changes properly so that they are understood. These changes must be clear, easily identifiable and logical. For example, one of the challenges faced during the project was working with a "non-agile" department. Ensuring that changes were implemented properly required an understanding of their rationale and their added value. Therefore, changes should not be imposed without explaining them and without taking the time necessary to train the stakeholders.

Using "champions" to train team members has been a good way to communicate information properly. Appropriate training was provided to selected members. Then, they developed an expertise and subsequently trained the colleagues of a team. This reduced training costs, as there were fewer people to train.

Whenever possible, the use of a coach, a facilitator (e.g. a Scrum Master), could be very beneficial to the team. By finding someone who can accompany the team, assist them and remove tasks that might cause them to lose focus is a way to get a better team.
Another lesson learned is to avoid, to the extent possible, developers working part-time in a few projects. When a person is assigned to a single project, this person remains more concentrated and there is less wasted time and effort when switching from one project to another and go back to his productivity level.

A good way to encourage collaboration among developers is by using peer reviews. Peer reviews facilitates collaboration. Peer review should be done to increase the quality of products delivered collectively. One should not be afraid to identify a defect by fear of hurting his author. On the contrary, it must be pointed out to the author so that it can improve. Each member of the team must work to improve the quality and productivity of the team.

Managing technological change requires identifying people who seem to 'resist' change and trying to understand why. This will make it easier to meet their needs and address their concerns.

To disseminate changes to processes, several tools can be used. For example, the Livelink Knowledge Management tool. This tool can also be used as a collaborative environment. E-mails can be sent to the individuals concerned to inform them of changes and directions of management. Finally, the Intranet makes it possible to publish and facilitate access to new templates, checklists and examples.

Plans for the Future

For the mobility and georeferenced solutions department, this project is a flagship project. The department is now shining within the IT

division by being a model for future projects.

The next steps are to disseminate the new process to other departments within the information technology division of the Quebec state-owned corporation and to continue to improve this ISO 29110-based software process.

References

ISO/IEC TR 29110-5-1-2:2011 – Software engineering - Lifecycle Profiles for Very Small Entities (VSEs) – Part 5-1-2: Management and Engineering Guide – Basic Profile. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland.
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Lebel, K., Laporte, C.Y., Développement, en mode Agile, d'une application à l'aide de la norme ISO/CEI 29110 au sein d'une grande société d'État québécoise, Génie Logiciel, Vol. 118, septembre 2016, pp. 48-58.

More information is available on the following web sites:
http://profs.logti.etsmtl.ca/claporte/VSE/index.html et http://www.29110.org/