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The Agile Scrum Method, Evolution and Application in Project Management

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Abstract: This paper addresses how companies are evolving in project management through the use of agile methods, such as Kanban and Scrum. For several years, companies used the fundamentals of project management from the Project Management Institute. Different industries were working with other standards: Agile, BIM, IPMA ICB, Lean, Open PM2, Prince2. The agile approach revolutionized the way teams work and enabled the adaptation of the project management processes.

Key words: agile, knowledge, methods, processes

1. Introduction

In its beginnings, project management applied the best practices of the PMI (2017) [1]. Projects evolve and thus increase their complexity. To solve this problem, some professionals applied the PMI methodology as if it were the only standard in the profession [1].

At the same time, industries were working on better project management, with: Prince2 (1975) [3]; BIM (Building Information Modelling, 1984); Scrum (1986); LEED (Leadership in Energy & Environmental Design, 1993); Agile (2001); Lean Construction (2002); IPD (Integrated Project Delivery, 2007).

Much has been said about agile methods, which is the management of continuous workflows, which can also be aided by visual techniques like Kanban that permit the visualization of the tasks and their evolution [2].

Recently, the Project Management Institute [1] has incorporated the Agile Practice Guide, created in partnership with Agile Alliance, one of the many organizations that spread these practices to software companies [3]. Some professionals and organizations try to apply them in other industries (Johnson, 2018).

The following questions arise: ¿do organizations apply maturity models before using a project management method? Are the projects aligned with the strategy of the company? Will IT technicians and operative personnel be able to use both to manage projects? Ultimately, a method that had success in one industry will not necessarily be successful in other.

Do these methods and standards aid in the direction of initiatives inside the constraints of each endeavor, so that they are done on time?

The information gathered from the interactions between teams nourish the project through a negative

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feedback loop.

It is for this reason that previously established registry mechanisms are needed to have a competitive advantage in the management of knowledge [4]: a) directives: set of rules or practice standards; b) work routines: set of tasks or protocols; c) autonomous work teams: employees capable of solving problems [4].

Knowledge is a variable that needs capable people in charge, so that the strategy, the plans and the project can move forward.

Thus the behavioral, technical and contextual competencies are the foundation of any project [5]. Discussing the project direction without training the personnel which will work on it would not be the correct approach [5].

In the end, standards must be applied by employees with a level of competency such that enables them to learn from the management of knowledge. The application of agile methods helps teams work in short iterations, or *sprints*. Sprints make tasks more manageable and easier to understand. The Scrum approach makes for a continuous workflow, achieving incremental, functional developments in a product [1, 2, 6].

2. Learned Lessons, Processes and Resources

Advancements in projects have induced the creation of the appendixes X4 and X5 to the best practices of the Project Management Institute [1]. Additionally, a book of agile methods complementing the good practices was released [3].

In section 4 “Project Integration Management”, the item 4.4 “Manage Project Knowledge” was added (see PMBOK Guide 2017, manage project knowledge, data flow diagram, graphic 4-9, p. 99).

We are of the opinion that an area of research denominated “learned lessons” should be created since a negative feedback of information is necessary in different areas of a project, e.g., cost and resource management; this would increase the knowledge of personnel and initiatives. The lessons learned should be applied gradually, since the beginning until the end of a project, by: a) the project manager; b) the team; c) sponsor; d) others interested, until reaching the high managers.

It is a common practice to use the lessons learned only at the end of the project. In consequence, no activity is changed and nothing is learned by the teams in the process. Therefore, support processes (TICs) have an important role in the storage and divulgation of learned lessons.

In his article, Comino López (2018) claims that learned lessons can be defined as: “The knowledge acquired from the experiences derived from the realization of one or many processes in the life cycle of a project”. The registry of these lessons is one of the most important aspects of project management for any organization. The failures and successes of projects are archived, to be used as reference for future initiatives, and through this way the organization can continually learn and improve [7].

Perhaps the biggest mistakes in project management are information overload and the loss of focus, which are some of the causes of inefficiency.

The lessons learned must be useful in changing current processes, otherwise the organization will continue facing the same problems.

Improvement initiatives are influenced by: a) a quality framework; b) a problem solving model. In consequence, the quality frameworks are the final results that should be obtained from the processes and the personnel involved. In relation to the problem solving models, these define the action plan, which must be adjusted to the initiative, e.g., ISO 21.500 which orients the processes related to the direction and management of projects [8].

Resources, and teams in particular, must be guided by a leading Project Manager Professional (PMP) that achieves cohesion between its members, dynamism and cooperation. They must be eager to learn from lessons.

According to authors Katzenbach & Smith (1993)

"Teams are a group of people organized around a common objective, with cooperation taking a priority over competition" [9]. Thus 3 basic elements are established:

- Competency: the team members must possess the technical know-how or skills needed to solve the problems they face on a daily basis.
- Responsibility: teams execute the assigned tasks.
- Commitment: the common goals, the cohesive element that justifies the existence of the team.

When we refer to projects, the most important organization structure is the horizontal project management, so that resources are applied in an orderly fashion.

Macroprocesses are reduced to processes and subprocesses for optimal performance, and they have a responsible project manager in charge of applying the resources used to manage the valuable initiatives of the organization. This stage must be manageable and controllable [8].

3. From Predictive to Evolutive Management

As we mentioned earlier in this paper, project management has evolved over time. We know that several different methodologies have been created and applied in different industries, from construction to software projects, etc.

What is better, predictive or evolutive management? The truth is that, while different in their conceptual bases, both are being incorporated to traditional projects managed by the PMI best practices [1].

The adaptation of agile methods with the PMI best practices must be done with caution.

Predictive management, which has been used for many years, employs sequential engineering and process-based production [2]. In other words, its scope is gradual along the project's course, which depends on the quality of the processes employed [2].

Evolutive management employs concurring engineering in overlapping phases. The production of deliverables is done in sprints. Production speed is expressed in terms of work per week, day or month [2, 3].

The authors Alaimo & Solis (2015) define Scrum as [1]: "A framework where people can face complex, adaptative problems, while delivering products with value added", therefore, the Scrum is an agile method [2].

It is based in the 12 principles behind the Agile Manifesto and it considers the following [2]:

- Product functions are developed incrementally.
- The focus is on quality over tacit knowledge of people.
- Development phases are overlapped, rather than in sequence.

The Agile Manifesto considers:

- People and their interactions over processes and tools.
- Working software over exhaustive documentation.
- Collaboration with the client over contractual negotiations.
- Adaptation to change over planification.

Scrum enables coordinated teams to work in short cycles. The sprint is analyzed retrospectively to see its strengths and weaknesses. In some aspects it is superior to the traditional methods [2].

The Lean Manufacturing method is a management model focused on the creation of a continuous work flow that can deliver maximum value to clients. To ensure this flow, team members may be called from execution to planification phases anytime, facilitating integration and saving time during the different work sequences [8].

In consequence, Scrum, Agile and Lean employ superior methods over predictive management, regarding team integration, work flow, etc.

Nowadays, the adoption of agile methods is still in an embryonic stage. However, it continues to evolve and is being applied with success in different organizations and projects. According to the latest PMI

report (PM Network, Volume 31, Number 7, 2017).

It considers the following:

- 94% consider agile methods as appropriate.
- Remaining organizations use agile methods in: a) marketing 54%; b) client support 53%; c) sales 52%.
- Why do organizations employ agile methods? 88% report they enhance their ability to manage changing priorities and project visibility.
- Only 30% of organizations have used the methods outside of software development, and only 6% have implemented them to the whole organization.
- What are the barriers of implementation? a) 43% security problems; b) 43% restrictions; c) 42% tool integration; d) 41% internal knowledge and skills; e) 37% organization culture.
- What is required to implement agile methods? a) 52% internal coaching; b) 48% executive sponsorship; c) 41 % coherent processes; d) 36% implementation of a common tool; e) 36% agile consultants.

4. Are Agile Methods for All Organizations, Projects or Phases?

The answer is no. Fewell (2018), the founder of the PMI Agile Community of Practice, expresses in his article: “The fact that the PMI is now conscious of agile methods does not mean they must be used for everything” [10].

The author made part of the team that worked on the Agile Practice Guide and the PMI-ACP certification. We can add that agile methods demand great adaptability from the organization’s culture, the work teams and the project. In other words, various methods can coexist in a same project, depending on the target efficiency and efficacy [3].

During the investigation, we observed that the foundations of these methods could not be assembled, and could be complementary depending on the project they are applied.

Engineer Zender (2017) has fractured the paradigm that the Scrum method is solely for IT projects, and that therefore it would not be possible to apply it in other projects [11].

The aforementioned professional intervened in the construction of an iconic shopping center in the city of Piura, Perú.

When questioned about the use of the Scrum method, he answered: “There have been no reports nor precedents in our country about the application of Scrum in construction projects, until now” [11].

Zender was convinced that Scrum would tackle complex, adaptative problems, with maximum results [11].

The decision to apply Scrum was agreed upon by the team, the engineer and the property owners. The different shopping spaces were bestowed in short cycles, given the need to begin shopping activities as soon as possible [11].

It was observed that the typical cascade like programming would not be the most appropiate. The feeling of uncertainty would affect the final product, in spite of the short time frames.

Scrum, Lean Manufacturing and Kanban boards were used in this project. The following results were observed:

- The application of Scrum in the building industry is different to the IT industry.
- The best work dynamic will depend on accumulated experience, team member disposition, high management support and client understanding. Therefore, project information is more readily visualized with Kanban boards.

5. Case Study — Pipe Welding in a Thermoelectric Company

Thermoelectric company Vuelta de Obligado S.A. was built by DF Duro Felguera S.A. Inc. (Gijón, Asturias, Spain). It is located in the village of Timbúes, 8 km away from the city of San Lorenzo, 6 km away

from the city of Puerto General San Martin, and 40 km from Rosario, Argentine. It is a vital part of the industrial region of Rosario.

The objective of the company is to generate 50% of the power demand of the province, which is also equal to 4-5% of the power generated inside Argentine.

Having a net power generation over 800 MW will permit the surge of new industries in the area.

5.1 The Problem

Power generation in this industry requires the use of interconnected pipelines. Proper pipe function essentially depends on the way they are connected.

The pipes are auxiliary elements of the system, which transport water, vapor and other liquids. For the organization of this project, Scrum and Agile methods were used.

The fabrication of the pipes continues to be done through the traditional method. Raw materials are first received, stored and classified. Later, the process of assembly and manual welding is done by specialized personnel.

The welding workshop is in charge of the following activities:

- Storage.
- Pipe cutting.
- Assembly.
- Welding.
- Cleaning.
- X-Ray control.
- First inspection.
- Paint.
- Final inspection.
- Delivery.

Problems found were increased cost and time waste in the delivery process.

- Manual welding.
- Manual inspection.
- Time waste by the quality inspector.
- Data errors in spreadsheets.
- Initial inspection (client and fabricator).
- Painting.
- Final inspection (client).
- Product delivery.

The final product, after being painted, is stored until the arrival of the inspector. An excess of stored pipes can be costly, since the work to find and separate them according to their serial number is increased.

The time wasted affects subsequent tasks dependent, e.g., transportation, which demands permits and customs clearance. The consequence is a final delay in the delivery process.

5.2 Scrum and Kanban: A Solution?

Is the application of Scrum and Kanban a solution to this problem? The answer is yes. In this particular activity, the welding of pipes requires the application of Scrum with sprints to prevent delays. Kanban helps in the visualization of tasks.

By applying both techniques, it is possible to:

- Eliminate short unproductive time.
- Build quality pipes.
- Share knowledge among welding and inspection teams.
- Optimize the cycles.

5.2.1 First Steps

The application of Kanban was organized in:

- Initial tasks.
- Running tasks.
- Revised and controlled tasks.
- Finished and delivered tasks.

By using Kanban boards, the welding process was properly organized and delayed tasks were eliminated (Figs. 1-6).

5.2.2 From Manual Control to App Development

The interactions achieved by the teams helped solved these problems. The manual processes were time wasting and error-producing. In consequence, it prevented the acquisition of new information from the lessons learned.

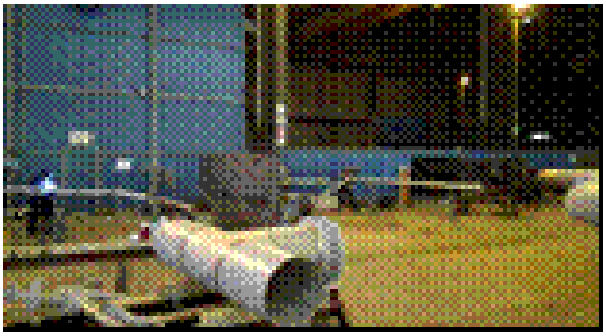

Fig. 1 Cutting.

Fig. 2 Assembly

Fig. 3 Cleaning

Fig. 4 Welding

Fig. 5 Control.

Fig. 6 Storage.

Traditionally, isometric plans were used which identified each welding and the worker in charge of the pipe. This information was written down on a spreadsheet before being uploaded to the office system. This is the current process, which lacks automatization.

A software currently in testing was developed to improve the process. It consists of the installation of a general server which connects remote terminals such as PCs, tablets and smartphones, depending on connection type and user properties. Construction data collected can thus be uploaded instantly to the server.

Through this way, higher work performance and human resource optimization can be achieved; unproductive tasks and operator error can also be eliminated through Lean Manufacturing. The above results in higher productivity, cost reduction and information gathering for better decisions.

The following data is uploaded to the application:

- Date and welding number.
- Isometric number.
- Worker assigned.

The variables are updated in real time and sent to an SQL database in the main server of the administrative office. The data is then replicated by a program designed for this specific task, with the advantage of precision, error elimination and time reduction in the transfer of data from the workshop to the office (Fig. 7).

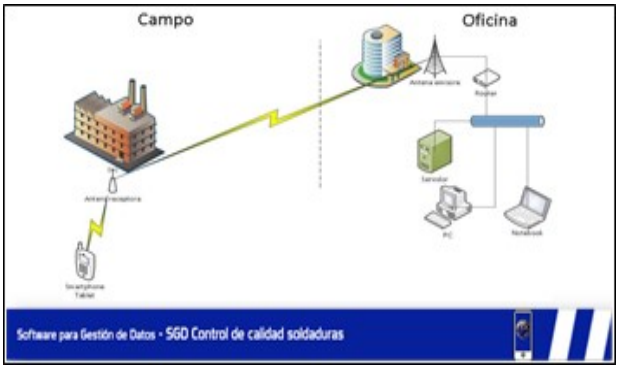

Fig. 7 Online data gathering model.

6. Conclusions

Traditional methods will have to coexist with evolutive ones and any other method the project manager chooses to use, considering that their application will be in periods or tasks that require teamwork, coordination, etc. Through this way, any information from the lessons learned will improve visibility of the initiatives in process, using methods such as Scrum and Kanban to organize work.

Agile methods have come to stay, but their application requires training, and an organization culture oriented towards horizontal processes.

Can traditional methods coexist with agile ones? Only time will tell.

References

[1] PMI, *A Guide to the Project Management Body of Knowledge* (VI ed., Vol. I), Pennsylvania, EE.UU: PMI, 2017, available online at: http://www.pmi.org.

[2] J. Palacio, Project management with scrum manager, *Scrum Manager*, 2015, available online at: https://scrummanager.com/index.php/es/.

[3] Project Management Institute, *Agile Practice Guide*, Vol. I, Pennsylvania, EE.UU: PMI, 2018, p. 190, available online at: https://www.pmi.org.

[4] R. M. Grant, Toward a knowledge-based theory of the firm, *Strategic Management Journal* (1996) 109-122.

[5] Spanish Association of Project Engineering, Foundations of project direction competency - Version 3.1, in: A. E. Projects, & UPV (Ed.), *Foundations of Project Direction Competency*, J. M. Almela, Trad., Vol. VII, 2009, p. 237, Valencia, Spain: Editorial UPV, available online at: Https://www.aeipro.com.

[6] M. Alaimo and M. Solís, *Agile Projects with Scrum*, Buenos Aires, Capital Federal, Argentine: Kleer, 2015.

[7] M. Comino López, *Methods for the Elaboration of Lessons Learned*, C. M. Project Management Institute (Ed.), Project Management Institute, Madrid, 2018, available online at: https://pmi-mad.org/index.php/socios/articulos-direccion-proyectos/1482-metodo-para-la-elaboracion-de-lecciones-aprendidas.

[8] I. Nonaka and H. Takeuchi, *The Knowledge Creating Company*, New York, EE.UU: Oxford University Press, 1995, available online at: https://global.oup.com/academic/?lang=en&cc=ar.

[9] J. R. Katzenbach and D. K. Smith, The discipline of teams, *Harvard Business Review* (1993) 118-128, available online at: https://www.falconi.com/wp-content/uploads/2015/11/artigo_10.pdf.

[10] J. Fewell The agile project director, *PM Network* 32 (March 2018). (3) 24-25, available online at: https://www.pmi.org.

[11] Y. O. Zender, *Scrum in Construction*, 2017, pp. 1-13.