

Project Management System Implementation in SMEs: A Case Study

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Abstract

This paper aims to describe the implementation of a Project Management System (PMS), supported by a Project Management Information System (PMIS) in a SME. The implemented PMS was designed to be flexible in order to support the different organization's business areas that have different types of projects requiring different project management (PM) approaches. Therefore, a hybrid model was implemented, merging traditional with agile PM practices, and thus achieving the flexibility demanded by the organization, without unsettle projects planning. After implementing the PMIS, several difficulties were experienced with the embedding process. It was felt the system implemented was too complex for the organization's PM maturity, and that it would be necessary to re-evaluate the scope of this implementation. So, difficulties, failures and successes experienced are presented, as well as improvement actions that may facilitate the embedment of the PMS in the organization. The conclusion was that the main problems were related to the complexity of some PMIS requirements, associated with more formal PM practices, and with the range of the initial dissemination of the system. Therefore, it was suggested a revision of the PMS to become less complex, and a new embedding approach, more realistic and measurable.

Keywords: Project Management System, a Project Management Information System, SME

Introduction

Due to professional's requirements to execute projects more effectively (Dinsmore & Cabanis-Brewin, 2014) and their growing need to access models and examples that support their work (PMI, 2017), the first Project Management (PM) standards become to emerge. These standards represent professional-focused knowledge guides that allow a more effective execution of those projects (Dinsmore & Cabanis-Brewin, 2014).

Some time ago, most of the research and existing documentation addressed PM in the context of big sized enterprises, thus implying more complex systems (Murphy & Ledwith, 2007). However, nowadays the context has changed with the emergence of Small and Medium Enterprises (SMEs) with a fundamental role in our economy (European Commission, 2015), therefore it is very important that these enterprises can be supported by PM, in order to be more successful. Bearing in mind that the practices extracted from traditional PM tend to be inadequate when implemented in the SMEs (Borštnar & Pucihar, 2014), this

implies a need to provide PM's methods adapted to the reality of the SMEs (Murphy & Ledwith, 2007), that usually need simpler solutions and easier-to-use systems (Turner, Ledwith, & Kelly, 2010). In this context, the agile methods have emerged (Špundak, 2014). Theoretically these methods make development process faster, maintaining the focus on the final product, team work inclusion, and management of unanticipated events, recurring to an incremental and flexible approach (Hayata & Han, 2011; Rodríguez et al., 2018). However, these new methods end up to neglect project documentation (mostly in its initial phase) and high-level planning, which traditional methods usually focused on. Consequently, hybrid approaches have emerged which aim to complement the main characteristics of agile approaches (flexibility and work team inclusion), and to obtain a more robust process, adjusted to the enterprise's needs (Hayata & Han, 2011; West, Gilpin, Grant, & Anderson, 2011).

This paper aims to describe and analyze a Project Management System (PMS) implementation, sustained by a Project Management Software (Project Management Information System - PMIS), in a SME organization. The PMS is an idealized system which contains the PM processes and PM practices developed, the PMIS is the information system that will support the idealized PMS. Finally, the implementation is evaluated with the objective of improving that PMS and of giving directions to SME organizations willing to implement a PMS.

The following section of this paper presents the relevant literature background for the paper. The third section explains the methodology adopted to conduct the research and will subsequently explain the steps taken to collect and analyze data through a cross sectional case study. The fourth and fifth section illustrate and discuss the research findings.

Background

Project Management in SMEs

The Small and Medium Enterprises (SMEs) have a fundamental role in economic and social development (Turner et al., 2010). According to European Union (EU), in 2013 more than 21 million SMEs were registered, which provided 88.8 million jobs. Throughout all EU, 9 in 10 enterprises are SMEs being responsible for 2 in 3 jobs. In that way, SMEs are key for creating jobs and economic growth. Not to mention that they also stimulate entrepreneurship and innovation in the EU (European Commission, 2015).

However, the SMEs have different PM needs (Ghosh, Forrest, Dinetta, Wolfe, & Lambert, 2012; Murphy & Ledwith, 2007; Turner et al., 2010). Usually, these kind of enterprises require more flexible and lesser bureaucratic PM methods and processes (Ghobadian & Gallea, 1997; Turner et al., 2010). For these reasons, the direct application of PM methods used in big companies in SMEs may not be adequate (Ghobadian & Gallea, 1997). Nevertheless, adequate PM is essential for SMEs to succeed (Pollack & Adler, 2016), and is already being applied in numerous SMEs (Murphy & Ledwith, 2007; Pollack & Adler, 2016; Turner & Ledwith, 2018; Turner et al., 2010; Turner, Ledwith, & Kelly, 2012).

When SMEs need to implement PM practices (Tereso, Ribeiro, Fernandes, Loureiro, & Ferreira, 2019), especially if they are growing rapidly, the traditional PM methods can be inadequate, and normally project planning and control systems need to be simplified (Borštnar & Pucihar, 2014). It is also common for the SMEs' employees to carry out multiple roles in the projects and in the company, so these companies usually do not hire professional project managers (Turner et al., 2010).

In the analysis performed by Turner et al. (2010), they concluded that the PM practice with more presence in the SMEs analyzed was the requirements management. They also verified that most of these companies use resource management (Turner et al., 2010), and risk management practices (Turner &

Ledwith, 2018). So, Turner and Ledwith (2018) concluded that SMEs are supported by ad hoc tools, templates, documented processes and software systems. Another study of PM practices in private organizations (also the case of the studied organization) indicated that some of the most used practices were: kick-off meetings; activity lists; progress meetings; Gantt charts; and baseline plans (Tereso et al., 2019).

Hybrid Project Management Approach

According to many academics, the traditional approach and the agile approach are two completely different approaches (Fernandes, Moreira, Araújo, Pinto, & Machado, 2018; Hayata & Han, 2011); they also state that the traditional approach is more adequate for large scale projects with an approach focused in planning, such as Waterfall. And favour the use of the agile approach in smaller projects. This statement makes sense considering that a major project can rapidly become chaotic without at least a high level planning and without documentation (Hayata & Han, 2011).

The agile methods were created with the objective of allowing software development teams to focus on the product rather than design and documentation (Hayata & Han, 2011), which does not mean these methods cannot be applied in other contexts. The traditional approach, usually applied in the last decades, commonly called Waterfall, can be used for both large and small projects. The traditional approach favors requirements analysis before the software design and the next activities appear in a sequential logic. It is usually unfolded in the following steps (Maassen, 2018): Requirements Analysis, Design, Development and Tests.

According to Hayata and Han (2011), the tendency to combine agile approaches with traditional approaches is emerging and originating hybrid approaches. According to them the project teams applies the Waterfall method in the initial phase of the requirements analysis, in order to develop initial documentation and contractual commitment. This strategy minimizes initial doubts about the project purpose. Afterwards the team apply agile methods during design, implementation and tests, since this strategy minimizes the risk of rework, delay and reschedule. In the final phase of the project the team applies again traditional Waterfall methods to manage high level tests and project acceptance criteria.

Reference to the hybrid approach is also made in the PMI (2017), noting that some of PM methods are evolving to the application of new successful practices. According to West et al. (2011) the future PM professional will apply hybrid approaches more adequate to each problem, resulting in a more robust and flexible process that will evolve in response to specific problems, instead of an inflexible and well documented approach that assumes things will not change.

Project Management Information System

In order to speed up and modernize PM, Project Management Information Systems (PMIS) were created, which help to reduce the time spent in PM, simplifying the implementation of the related methods, tools and techniques thus increasing the success rate (Kostalova, Tetreva, & Svedik, 2015). The PMIS became a fundamental tool to organizations, even considering that they may not be sufficient to guarantee the success of their projects (Kostalova et al., 2015; Raymond & Bergeron, 2008).

PMIS are projected to support the PM during all the phases of the project life cycle. Many of them also include documentation management and sharing, and support multiple projects (Kostalova et al., 2015). According to Braglia and Frosolini (2014), PMIS allows its users to follow the project since the idealization phase up to its conception, and provide fundamental information to the project managers and other elements, such as resources, budget, suppliers, and time management, tasks assignment, quality

control, documentation and collaborative tools. Raymond and Bergeron (2008) refer that important quality indicators of a PMIS are its ease of use, flexibility, agility, intuitiveness and capacity of integration with other systems. The quality of a PMIS is a strong indicator of the quality of the provided information. In fact, PMIS are useful for project managers, improving the effectiveness and efficiency of their tasks management in terms of planning, scheduling, monitoring and control. Usually they have benefits in the decision-making process and their advantages are not limited only to individual performance, but also to project performance. Thus, these PMIS have direct impact on the project's success (Raymond & Bergeron, 2008).

Methodology

Our research used a functionalist paradigm, focused in analysis of a PMS implementation problem in a Portuguese PME, presenting practical solutions. So, the main goals are the development and implementation description of a PMS, considering the improvements that can be applied.

Research Strategy

Case study is perceived by researchers as one of the most used research strategies (Yin, 2009). By using it, researchers can focus on a particular phenomenon and discover crucial knowledge (Saunders, Lewis, Thornhill, & Bristow, 2016). As recognized in the literature, a new PM practice is unlikely to deliver the desired results if it does not 'fit' within the organization or in its competitive environment (Cooke-Davies, Crawford, & Lechler, 2009). In order to address this issue, the overall case study was sought to understand the difficulties, failures and successes of the implementation of a PMS supported by a PMIS. The case under study is a Portuguese organization with around 35 collaborators that carry out functions in multiple projects in very distinct areas, mostly in information technology. Some of the collaborators assume multiple responsibilities, which is very common in the majority of SMEs (Borštnar & Pucihar, 2014). During the year of 2017 (year prior to the implementation of the PMS) the business turnover was around 5.5M€. According to the EU, this billing volume falls into the category of a small company.

Data Collection

During this research, a Project Management Office (PMO) was formed in the company, with the responsibility of developing and improving the organization's PM practices and training future project managers. This office was managed by one of the researchers and sponsored by top management. During the implementation, some of the directors of the company were involved, being also leaders of several teams and having project manager roles. All the elements of these teams were also involved, aiming to gather feedback from their daily problems and adapt the system to the way they work.

In order to collect the necessary data for the implementation of the PMS evaluation, unstructured interviews were carried out, with both top managers and project managers, which are the team leaders too. Participant observation and unstructured focus groups were performed after the training of the PMIS and in the next six months, to get feedback from the project's teams. The purpose of this analysis was to gather feedback of all stakeholders, to understand the degree of the embedding of the PMS, the difficulties of the users, the PMS's successes and failures, and to identify improvements needed.

Project Management System Implementation

This section aims to demonstrate the work developed during the implementation of a Project Management System (PMS) in the Portuguese SME case study. A PMO team was created in the organization with the responsibilities to develop and continuously improve the PMS, to support the project managers, but also to manage projects. However, the elements of this team also performed work in other project teams.

In this SME, the PM practices were practically non-existent, and there were several ongoing projects from different areas, most of them in the information technology area. The need to manage these projects successfully lead the top management to decide for the implementation of a global PMS that could encompass the PM of the organization. Furthermore, this SME operated in different business areas. So, the ongoing projects were from different types, had different dimensions and complexity levels. Thus, the implemented PMS had to be flexible enough to adapt to all the existing projects the organization embraced.

Although there were some processes already defined, and several software tools implemented, many of them were not embedded in the organization, there was a lack of standardization and no interoperability. Frequently some of the processes and tools were not routinely used or were only used by some departments and particular employees. In Fernandes, Ward, and Araújo (2015) research, the term “embedding” is applied to reflect an organizational perspective, rather than a single or individual perspective. It means that even if some employees apply some PM practices, it does not mean that these practices are embedded in the organization. These practices will only really benefit the organization and its employees if they represent an organizational routine that involves all employees and if they interact with other management practices.

The PM maturity of this Portuguese SME is very low, since the project planning and project prioritization was practically non-existent, which is a very common scenario in Portuguese organizations (Silva, Tereso, Fernandes, & Pinto, 2014). This means that the organization teams were continually developing projects without an efficient planning, trying to develop several projects simultaneously and with insufficient resources. Time management proved to be inefficient, since several projects exceeded the dates planned, there was no costs control, and no register of the time expended by the employees in each project. In that way, it was impossible to analyze the projects benefits or the losses for the organization.

In order to respond to the problems described above, it was mandatory to start by defining a PMS that would allow the organization to operate in an organized and efficient way, and to improve and facilitate the organization management process. The requirements defined for the PMS were the following: a) portfolio view; b) possibility of grouping projects by programs; c) definition of the projects lifecycle; d) resource management; e) task planning; f) costs and revenues budgeting and monitoring; g) work progress monitoring; h) upload documents and project informations (e.g., financial values, dates, project identification and classification); i) agile module; j) timesheet registration; k) financial closures; l) reports and dashboards.

After a market analysis and in order to implement a PMIS to respond to the PMS's requirements previously defined, it was decided to implement a pilot project of Triskell Software (Triskell, 2019). This software was selected due to its tools and configuration flexibility. It was the only one that responded to all the identified requirements, and when applied it proved to be very flexible. One of the assets of this system was also its capacity of interoperability with other software in the organization. As mentioned in Fernandes et al. (2015), the interoperability of PMIS with other management systems is one of the key factors to improve its embedment in organizations.

Figure 1 represents the PMIS architecture defined. The root is the Company object, that in turn have several Commercial Procedures, each of these having one or more Projects. Each Project has several tools (planning dates of execution, cost and benefits management, resources management, attachments and commentaries), and also associated objects to carry out the planning and management of the project's activities (Tasks and Cards), and to manage the customer's issues after the project are concluded (Tickets). However, this last object is outside the scope of this paper.

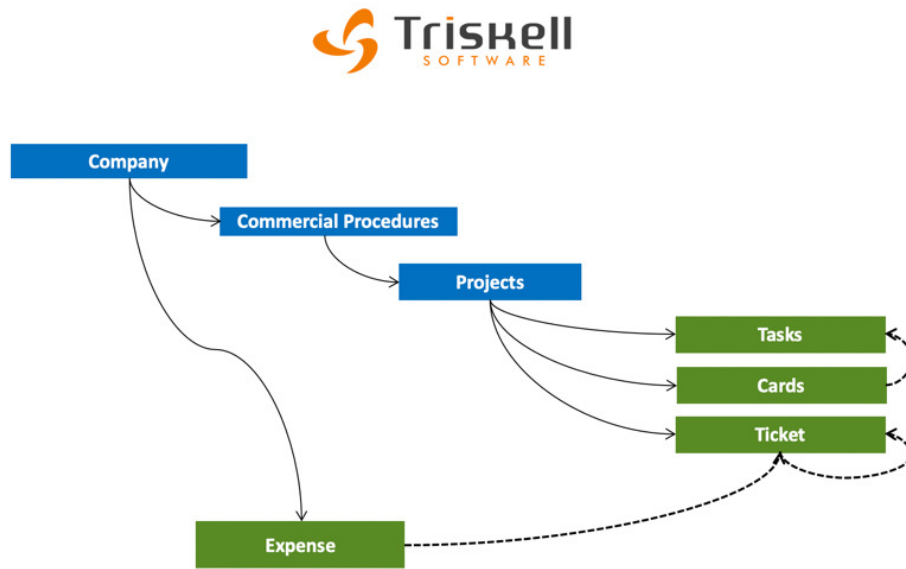


Figure 1 : PMIS Architecture

Tasks and Cards were created in order to implement the PM hybrid approach. The Tasks object is used to develop the Gantt chart, in order to carry out a project high-level planning that follow a traditional PM approach, which provides the project manager an estimation of the project execution time, and allow him to manage the resources and costs of the projects. From then on the tasks can be detailed in the various activities with agile activities (Cards), which are used to allow a versatile approach to the execution of the projects activities. These are visualized and managed using Kanban organization, with the following life cycle: To Do; Doing; Waiting; Done. In addition, these two objects can be used separately, allowing the project manager to adopt a traditional or agile approach in specific cases.

This configuration allows the PMIS to adapt to the specificities of different projects in the organization, which means that if some projects only require a traditional PM approach, in other projects, smaller and with high uncertainty, the agile management is adequate. The projects that need a hybrid PM approach usually are informational and technology projects with a considerable dimension. These require high-level planning to provide an adequate estimative of the temporal period and costs; and the flexibility that characterizes the agile methods is the adequate strategy to approach the implementation phase.

Project Management System Evaluation

The objective of this section is to evaluate the implemented PMS, from the description of the results obtained, including the experiences observed during the training of the key users and the embedding process; and, the identification of difficulties and benefits obtained with the PMS implementation.

As referred in the methodology section, in order to gather the feedback of all stakeholders to understand the difficulties of the PMS users, PMS's successes and failures and to identify the PMS improvements needed, observation, unstructured interviews and focus groups were carried out.

Difficulties

The PMS implementation implied several changes in the organization routines. And, as expected, several difficulties were experienced, not only during implementation phase, but also after completion. One of the first difficulties was experienced with the implementation of the same work logic throughout all the organization, which would centralize in the PMIS all the different projects from distinct areas of the organization.

At the beginning of the training process, some resistance to change was felt, and there was a huge lack of knowledge of PM concepts by the project managers and their teams. In addition, the PMIS was a new software tool in the organization, and therefore there were also difficulties during the adaptation of the users to the new tool.

In terms of implementation, the more formal practices, such as the Gantt chart and cost management, showed to be more challenging, because users were not familiarized with the concepts neither with the tools. The resistance to the use of the Agile component was related to limitations of the tool, since its functionalities were not flexible and fast enough.

The fact that top managers did not fulfilled their responsibilities adopting the new practices and technologies, added to the problems identified above. They were constantly changing project priorities and requiring teams to respond to more projects, implying a workload largely superior to their capacity of response. They also did not consult the PMIS projects portfolio and did not demonstrate to value the PM work done by the teams. This type of actions discouraged both project managers and their project teams to use the new PM practices, and as is well-recognized, sponsorship is critical to PM embedment in organizations (Fernandes, Ward, & Araújo, 2014).

In general, all teams were involved in several projects simultaneously and each team member had to deal with multiple responsibilities, being highly overloaded. The same problems happened within the existent PMO team, and their elements did not have the necessary availability to support the project managers and ensure the maintenance and improvement of the PMS.

Successes and Failures

PM processes were developed, and PM practices were implemented, which integrated several tools and fulfilled the objective of considering an organization with several companies with the consequent idealization of a common project work logic. Regardless of the difficulties experienced, the PMS implementation raised awareness in many of the organization's collaborators, and a large amount of work was performed. However, the PMS was not embedded throughout the organization, and several difficulties were daily experienced. In that way this implementation and its embedment should be

improved in the future, in order to allow the development of more efficient and organized work strategies and support the sustainability of the organization.

The first phase of the PMS implementation was perceived unsuccessful, because it was still far of achieving its full potential, and there is still a great resistance from the key users. Nevertheless, there are several successes of the PMS implementation that must be highlighted, such as positive developments and functionalities that are currently available and improved in the organization:

- Possibility of projects portfolio visualizing and monitoring;
- Forecast of ongoing projects costs and revenues;
- High level planning of project tasks;
- PM hybrid model;
- Possibility of managing the resources in the different projects;
- Possibility of evaluating the benefits obtained with a project implementation;
- Central archive of all the information related to each project.

The PMS implementation failures are mainly related to the:

- Low degree of embedment of the PM practices;
- Low degree of embedment of the PMIS;
- Demotivated users;
- Gantt chart has been perceived as too complex and formal;
- Project managers have difficulties defining project costs;
- Timesheets registration is not guaranteed;
- Agile components were not sufficiently agile;
- Lack of key users commitment;
- Insufficient support from PMO team to the key users.

Proposed Improvements

Firstly, the PMS must be resized. Although the idealized strategy for the initial phase of implementation aimed to be a simple PMS, it turned out to be too complex; in general, the key users' mindset and knowledge in PM practices were not prepared for such PMS.

The excessive formality of the Gantt chart tool should be eliminated. Its objective was to allow a high-level project planning, but in our experience the use of this tool quickly implied increasingly complex project planning. The implemented agile component in the PMIS must be replaced by a more flexible and versatile module/component. Independently of the necessary improvements at the high-level planning and the agile component, the hybrid model proved to be a good approach for the organization. The changes that have been identified as necessary don't compromise the validity of the model.

Concerning the change management process, a new embedding strategy must be sorted, which should include an incremental process of change, and a readjustment of the initial scope, in order to reduce the initial impact and select the teams of the organization that are more comfortable with the PM practices, in order to begin to disseminate the PMS in the organization using an incremental strategy rather than do everything at once. The cost management should be ignored in the initial implementation phase, because

it brings more complexity to the PM process, and it should be required to the project managers in later stages.

The PMO team should also change some of its practices. Firstly, it is necessary to free its elements from some of the previous responsibilities, allowing them more availability to support the key users and to maintain and improve the PMS. The PMS should be supported by top management. In addition, the whole PMS should be documented in a simple way, with the objective of creating an organization Body of Knowledge (BoK), which provides guidance to all the project managers and remaining key stakeholders of the PMS, such as top management and team members.

Conclusions

The main contribution of this paper is to show to SME organizations, who want to implement or reformulate a PMS, the main issues which they must take into account before and during the implementation or reformulation, by showing the difficulties during this implementation and presenting the improvement needs, increasing therefore the probability of success of the PMS implementation and consequently the PMS embedment.

The fact that SMEs are characterized by organizations that need simpler and lesser PM systems, than big companies, should be highlighted (Murphy & Ledwith, 2007; Turner et al., 2010).

Throughout the whole PMS implementation it was possible to observe: a) high levels of resistance to change from some collaborators, and how they reacted to new PM practices and PMIS; b) improvement and development of processes; c) increasing awareness towards PM value; d) lack of commitment from some elements and top managers; and e) lack of knowledge of PM concepts. The PMS implementation also highlighted some of the organization's problems, which had already been previously identified, specifically: a) very unstable project priorities; b) overallocated resources; c) poor investment in training; d) inconsistencies in the definition of responsibilities and; e) poor internal communication.

Therefore, it is mandatory to redefine the complexity of the implemented PMIS according to the organization PM maturity, and it is also necessary to work on new embedding strategies for the PMS in the organization. According to Fernandes, Ward e Araújo (2015) the embedding of a PMS in organizations is a complex issue, and besides the existing PM tools, the authors highlight the need for a PMS to include PM improvement initiatives that are aligned with management activities throughout the organization, arguing that organizations should select a set of fundamental PM improvement initiatives to be embedded. This strategy may be similar to the incremental process of change management referred above, where those initiatives with which the organization feels most "comfortable" should be selected with greater priority. In the same line of argument, one must take into account the need to demonstrate the value of initiatives and guarantee the availability of all the necessary resources during the implementation and routinization processes.

Future research work can propose an adaptation and/or redefinition of the implemented PMS based on the improvement points previously identified and the development of news strategies to the PMS embedment in the organization.

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