PROJECT MANAGEMENT PROCESS GROUPS: IMPROVING PLANNING, MONITOR AND CONTROL OF IT PROJECTS

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Dedication

I dedicate this work to my family for their unconditional support and for being a source of inspiration for life and giving me the chance to live great experiences. I dedicate this work to the nameless heroes who give me strength every day to believe that there is still much to do and a lot of why to work. Finally, I dedicate this to my friends, colleagues and people who have always supported me and have given me strength when I have needed it more. Many thanks to all of you.

Abstract

Objective: to examine the knowledge areas "planning," and "monitor and control. The study analyses the control, monitoring and generation of evidence by developers and project managers during the development of IT projects by SMEs.

Methodology: The methodological scope of the research is exploratory, with secondary research. The interpretive framework selected was the grounded theory.

Result: The results identify the success factors of project management that are part of the value chain, to understand them it was necessary to define the concepts of project success and project management.

Conclusion: It describes and justifies the success factors of the IT project management which are well defined scope of the project, adequate project planning, adequate stakeholder management, effective communication with stakeholders, trained, motivated and experienced project work team, project monitoring and control and senior management support.

Contents

Chapter 1 Introduction

1.1 Background

In all projects regardless of the methodology used to develop them, there are sponsors and managers who need to know some main variables such as time, costs, resources, scope, which help to determine the status of the project and to align it with the organizational strategy, but specifically in many IT projects, these items are not taken into account to control the work to be assigned to team members, since it is the development team who estimate and acquire the commitment to acquire according to their capacity.

Most authors of project management literature (Kerzner, 2018; Lock, 2017; Meredith et al., 2017) agree that project management is about establishing and then achieving (or exceeding) time, cost and performance (quality) objectives. So a possible definition of project management would be, the skills and planning and control processes necessary to finalize a project with project resources respecting or improving the limits of time, cost, quality and safety at an acceptable level of risk

The management of software projects is one of the fundamental parts to obtain successful results according to Jones (2010), considering a successful project such as the one that ends within the expected time, cost and quality (Chow and Cao, 2014; Agarwal and Rathod, 2012), mainly preserving the twelve principles of the agile manifesto of Chow and Cao (2014). In the agile manufacturing industry there have been good results of adaptability to external changes with less cost losses (Laanti and Kettunen, 2012), in terms of software development this adaptability is necessary in the changes of the products of software.

According to Marchewka (2016), organizations with lower project management capabilities generally exceed the allocated budget and do not meet the delivery dates of the project product or service. The level of maturity in project management indicated that only 13.6% of medium-sized companies and 8.6% of small businesses in different economic sectors have standardized processes for managing their projects. In small IT companies, only few organizations have certified personnel such as PMP and some SMEs do not have basic certifications aimed at the standardization of processes, such as ISO 9001 and CMMI. The low degree of specialization of SMEs generates few areas with focus and multiple tasks (Rodney et al., 2009) that influence the management of their projects.

According to Mirza et al. (2013), one of the main reasons why projects fail is due to an absent or inadequate identification of requirements, causing the objectives to be unclear; The correct and detailed definition of the scope is the most important thing. Since it has been shown that the reason why there are commonly cost overruns in projects is due to Gold Plating (Argawal and Rathod, 2012). Projects in the IT sector are characterized by the variation of the product requirements by the client during execution (Sökmen and Çebi, 2017), generating changes in the ongoing programming and therefore, the management style; In the last decade the direction of software projects has been recognized with agile methods and some SMEs use agile methodologies of project management such as SCRUM adapted to their needs (Turner et al., 2010). Therefore, it is of great importance, both for the country and for small and medium-sized companies in the IT sector to improve their performance in projects in order to make them more productive, competitive and therefore sustainable; constituting the raison d'être of the present work.

1.2 Problem Statement

According to the findings of Marchewka (2016), the success of project management includes a clear measurement and control, the standardization of management processes and the lessons learned. The success factors in the management of SME projects in the IT sector will be a reference for these organizations to take actions that allow them to increase the probability of achieving a successful management of their projects that generates value for their business.

Several authors have found a clear need for software project managers in IT Projects. There is little management and cost monitoring in IT Projects (Rusk, 2009; Sulaiman and Barton, 2006). Other authors indicate that there is little evidence about measuring the costs of a project for project managers (Jones, 2014; Rusk, 2009). The cost estimate agile methods are commonly based on expert judgment and not repeatable processes and upgradable (Pham and Pham, 2011). Without a well defined and measurable process, it is not possible to achieve optimization or cost reduction.

Many IT projects or at least two-thirds of all IT projects fail and result in a loss of financial investment. The problem is the lack of effective management, monitoring, generation of evidence and estimates based on cost-improvement processes for IT projects. The main affected are the project managers and the owners of the IT companies, with respect to the loss of costs, precision in the times and commitments with the client.

1.3 Purpose of the Study

The purpose of this research study is to examine the knowledge areas “planning,” and “monitor and control. The study analyses the control, monitoring and generation of evidence by developers and project managers during the development of IT projects by SMEs. Its purpose is

to discover the difficulties or problems regarding the use of the proposal in terms of loss of costs, precision in time, unforeseen and commitments with the client, from the perspective of a project manager. This study compares the previously mentioned findings to current IT project practices. The desired outcome is to discover if there are project management processes of "planning," "monitor and control can be adapted for IT projects with the desired outcome of making IT projects more efficient and raising the percentage of successfully completed projects.

1.4 Research Questions

The following research questions are developed to identify specific planning and monitor and control processes across diverse industries to determine if they are also viable for use in IT projects. Additionally, the research will investigate if identified processes can be adapted for use in IT projects as-is, or if said processes will need to be tweaked for use in the IT field.

2 What are the top three factors that lead to failures in IT projects?

3 Are the same three factors found in Q1 also attributed to the failures of non-IT projects?

4 If the same three factors do not attribute to failure in non-IT projects, then how are those factors managed differently to create success in non-IT projects?

5 Can those successful project management factors be applied to IT projects to increase IT project success rates?

1.5 Significance of the Study

The research will analyze and identify specific planning and monitor and control failures in IT projects. The study will then analyze those specific factors against non-IT projects in an attempt to identify project management practices that can be adopted in IT projects. The significance of the study is the potential of identifying new or unique methods of planning and

monitoring and controlling that can be adapted for IT projects. Discovering new or easily adapted project management techniques could increase project managers' available tools, ultimately leading to a high success rate across IT projects.

Chapter 2 Literature Review

2.1 The Success Factors

The aspects necessary to achieve the success of project management have been studied by several authors (Bryde and Robinson, 2015; Serrador and Turner, 2015; Joslin and Müller, 2015); however, the factors associated with success and failure are subjective and complex, because they are subject to the perception of different stakeholders, they change according to the type of project and there is no consensus on this (Joslin and Müller, 2016).

As the Association for Project Management (APM) Body of Knowledge mentions (Dixon, 2012), success factors are elements of the project context or management processes that must be controlled or influenced, and will increase the likelihood of project success; Below are some contributions from international authors.

Todorovi et al. (2015) and Osei-Kyei and Chan (2015), agree that the success factors of project management correspond to aspects that contribute to the achievement of the proposed objectives, whether from the context of the project or management processes (Dixon, 2012); although they do not guarantee success, their absence results in failure. On the other hand, Kliem and Ludin (2019) said that the understanding of the aspects that increase the negative risks in the project can contribute to achieve a reduction of them. Therefore, it is important to cover the factors of failure in the management of projects to increase the probability of success.

Failure factors are aspects that contribute to the increased likelihood of unfavourable risks for achieving the objectives (Kliem and Ludin, 2019). This is why it is a dominant topic in information systems to identify and analyze them in order to reduce them.

2.2 Success in Project Management

The definition of success in both the projects and their management has been complex to explain and there is no unanimity in this regard (Serrador and Turner, 2015), however Young (2016), based on the definition of project management as the process of controlling the achievement of project objectives through a collection of tools and techniques, states that the success of management is determined in a measurable way over time, cost and quality; while a successful project refers to the achievement of a specific objective. Therefore, its success goes further, based on the long term and the results oriented to the user and the client. The aspects that determine a successful project management, according to standards and relevant international literature, are mentioned below; although some refer to the success of the project, their contributions are taken into account by relating to aspects of project management.

A project can be successful despite inadequate project management and vice versa (Kerzner, 2018). Success, related to the achievement of the proposed objectives is evidenced in project management when it meets the requirements, since it offers what the user expects and is approved, complying with the quality parameters, within the agreed schedule and budget (Todorovi et al., 2015; Ramos and Mota, 2014). Identify and analyze the threats of success, allows to reduce failure (Kliem and Ludin, 2019), so the contributions of some relevant authors that refer to failure of the Project Management.

Although there is no consensus regarding the definition of failure in project management, Kliem and Ludin (2019) states that it refers to projects that are cancelled while Gargeya and Brady (2005) do not they agree. The characteristics of the contributions of the cited authors have in common that the failed project management does not satisfy the quality parameters, there are cost overruns, delays or a low level of customer satisfaction.

2.3 Success Factors in Project Management

International associations and authors worldwide have identified factors that influence the achievement of the objectives of project management, that is, that contribute to meet the requirements, complying with the quality parameters, within the agreed schedule and budget.

Just as the different project management standards around the world have sought ways to contribute to their success, some professionals have dedicated themselves to identifying aspects related to successful project management (Kerzner, 2018; Heldman, 2011). Heldman (2011) seeks to show the reader how the work of being a project manager every day is more complex, so they should prepare very good. Heldman (2011), in addition to give an introduction to the fundamentals of project management, also offers material on the different methods or practices of project management, in conjunction with some examples and questions. He mentions the word success and some of the success factors for project management, such as proper planning, monitoring, stakeholder expectations management and trained work team; However, it places great emphasis on four determining aspects, effective communication with all stakeholders, continuous project control, good documentation and finally recognition of the success of the work team.

Kerzner (2018) discusses some factors to achieve it, such as project manager with formal authority and a good position in the organizational matrix, maintain good relationships with all stakeholders and identify risks early. He places great importance on change management, communication between stakeholders and sharing recognition for the success of the project. He presents a Systems Approach to Planning, Scheduling, and Controlling where success is mentioned and refers to project management.

Berkun (2008) seeks to explain to the reader how to make better decisions, have more leadership and build trust. He mentions the word success focused on project management, as well as focused on how to increase the probability of success and some success factors for project management, which include respect for knowledge on the other hand, the quality from the design, a clear schedule, good handling of the lessons learned; and that inter-disciplinarity and communication with all stakeholders is very important for the success of project management.

Barker and Cole (2017) show how to get the projects to meet the deadlines set within the allocated budget. They mention the word success as well as some success factors for project management, such as a trained work team, lessons learned management, proper planning, project manager competencies and effective communication, emphasizing in quality and in that all people must know the purpose of the project, in order to go in the same direction.

When identifying the word success in literature on project management, different success factors were found in project management, some of which are mentioned by several authors. Effective communication and proper planning coincide with the main aspects found in international standards; followed by trained project manager, risk management and work team, as well as defining the criteria of success from the beginning of the project.

2.4 Success Factors in IT Projects

Research in project management focuses on large companies with standardized processes (Turner and Zolin, 2012), however Pollack and Adler (2014) identified that the use of project management practices in small and medium enterprises contribute to the fulfilment of

organizational objectives, especially to increase productivity; even above marketing or business management skills.

From the review of international literature, the factors proposed by different authors are identified, which contribute to the success or failure in the management of projects of companies of various sizes in the IT sector, some particularly in software development projects, in the context from different countries. Some authors (Cleden, 2017; Hughes et al., 2016; Berssaneti and Carvalho, 2015) refer to aspects that determine the success or failure of the project, however, according to the definition of project management, they refer to factors that contribute to the achievement of their objectives, so their contributions were taken into account to the investigation.

According to the review of international literature on success factors in project management in companies of various sizes in the IT sector in the context of several countries and with the categories defined to group the aspects proposed by the authors, some of the authors mentioned in the international context agree that a well-defined scope is essential for the success of the IT sector project management (Nicholas and Steyn, 2017; Taherdoost and Keshavarzsaleh, 2015), in addition, the project manager must involve key stakeholders from the client to work aligned with their needs (Argawal and Rathod, 2012).

A project manager with leadership and trained, is another of the critical success factors of project management in the IT sector (Ramos and Mota, 2014; Argawal and Rathod, 2012), since in addition to the attitudes of the leader to assume, skills such as conflict management and inconvenience, analysis, key decision making and effective communication, are considered great impact for the achievement of the objectives of project management.

Monitoring and control is mentioned by several authors (Zhang et al., 2018; Hazır, 2015), since they monitor the baseline allows to have a visibility of the indicators of the project to know the status of the project throughout its execution, identifying early alarms to make preventive or corrective decisions. It is important that the functional areas involved with the project focus on the development of the project, since the progress and completion of the tasks on time depends on their performance, which is why that support from senior management since the beginning of the project is essential (Zhang et al., 2018).

Proper project planning, as well as risk management, are essential for the proper management of scope, time and cost (Aloini et al., 2012; Papke-Shields et al., 2010) and that in addition to making good estimates from the identification of risks, the project plan must be updated throughout the execution, because there is greater certainty, and the identification and analysis of risks must be carried out continuously, to respond in timely manner to negative or positive aspects that may impact the project.

Other of the main success factors of project management of companies in the IT sector, correspond to the appropriate management of changes (Kappelman et al., 2006), involving the main stakeholders and prioritizing them in terms of their impact on the business (Jones, 2014), and a trained and motivated, competent, committed and multidisciplinary work team to address technical aspects that are part of the project, in addition to being focused on service to the client (Herrero and Salmeron, 2005). The way in which the project manager manages the work team is crucial (Ramos and Mota, 2014), since it must make it part of the project's decision making, Empower it, promote new ways of doing things in the work team and have a shared purpose of the project to achieve the objectives of project management in the IT sector.

In addition to the aforementioned factors, adapt structured project management methods and processes that fit the organizational culture (Chow and Dac-Buu, 2014), have experienced project managers who have led large projects as well as defining stakeholder expectations (Lock, 2017) and effective communication are of great importance to achieve the objectives of project management of companies in the information technology sector.

Learning from the good and bad experiences that have been had in other similar projects in the past allows for the identification, analysis and timely response of the risks, which in turn is an input to carry out adequate planning, with good estimates, increasing its probability of success (Chwolka and Raith, 2012; Zwikael and Ahn, 2011). Therefore, knowledge management through the lessons learned is another aspect that contributes to the success of IT project management (Alhawari et al., 2012).

The use of agile methodologies, with progressive deliverables and the use of prototypes allows the client to land the idea of what they need for their business and adjust continuously throughout the execution of the project, (Chow and Dac-Buu, 2014) and addressing large projects in different phases, increase the likelihood of project management success in IT projects. In addition to the aforementioned factors, there are other aspects that contribute to successful project management in companies in the IT sector, such as having availability of resources to carry out project activities (Heiberg and Wellmer, 2012; Demirbag and Glaister, 2010), define the criteria of success and acceptance of the project to establish if the objectives were achieved, as well as the test parameters that the product must meet in order for the client to proceed with the acceptance of the product (Hagen and Park, 2013), in addition to a good relationship with customers or users (Cserháti and Szabó, 2014; Purna Sudhakar, 2012).

The success factors of project management that are part of the value chain of companies in the IT sector identified from related international literature, indicate that, as stated by Herrero and Salmeron (2005), the technical aspects they are less critical than those associated with human and communication factors; and that an adequate knowledge of the users' requirements, which allows defining the scope, is the most important critical success factor.

According to the failure factors of project management in companies of different sizes in the IT sector, mentioned by the related authors of international literature, prioritization is carried out according to the frequency in which they are mentioned According to Herrero and Salmeron (2005) the most important failure factor of project management of companies in the IT sector corresponds to not involving the client in the project, which represents a serious problem that originates in the lack of understanding of their needs or problems related to software (Ikediashi et al., 2014), added to the fact that sometimes the client or user does not know precisely what he wants (Ramos and Mota, 2014).

The lack of clarity in scope corresponds to the following failure factor identified, since without a properly defined scope, the objectives are confusing and the work team loses focus (Turner and Zolin, 2012). However, as stated by De Bakker et al. (2010), it is complex to define the deliverables at the beginning of the project and there is difficulty in compiling requirements (Al-Ahmad et al., 2009).

With regard to the lack of support from senior management, El Eman and Koru (2008) mention that it is one of the most common reasons why IT projects are cancelled, managers or leaders of the areas do not perceive that the project is important and redirect their efforts to the activities requested by senior management (Kappelman et al., 2006).

Another factor of failure that appears in the literature is the lack of leadership and training of the project manager, as stated by Al-Ahmad and Al-Fagih (2009), generates a lack of understanding the needs of the users; In addition, it requires fundamental skills such as effective communication (Kappelman et al., 2006) and leader characteristics that should influence the work team. Unmotivated staff without adequate skills is another aspect of project management failure in the IT sector (Lopes et al., 2015; Lopez and Salmeron, 2011), as it does not have discipline and training technique, as well as service attitude, that contributes to the achievement of the objectives.

Change control is very important in projects in the IT sector, where the initial requirements tend to be modified during execution (Ikediashi et al., 2014), so the lack of change management, not being evaluated, approved and accepted by the main stakeholders is a failure factor in the management of IT companies' projects (Harrison and Lock, 2017). Likewise, non-effective communication is a restriction for improvement in the IT area (Ikediashi et al., 2014); frequently, the language used by the work team is so technical that the client has difficulty understanding (Ramos and Mota, 2014).

Together with the mentioned factors, the lack of planning (Bakker et al., 2010) as well as monitoring, control (Petter, S., 2008) and absence or failures in management of risks (Alhawari et al., 2012), constitute the failure factors of project management of companies in the IT sector most mentioned by the cited authors. In addition, there are factors such as the lack of available resources (Ikediashi et al., 2014), absence of structured project management processes, multiple assignments of the project manager (Alhawari et al., 2012), short response times required by the market (Petter, 2008), lack of handling of lessons learned (Al-Ahmad et al., 2009) and

disconnection between project objectives and customer value (Baccarini, 2004), among others which increase the probability of IT project management failure.

When comparing the success factors of the management of the projects of the companies of the information technology sector with those of failure, identified in the international literature, the affirmation of Ramos and Mota (2014) is confirmed, which argues that in the projects in the IT sector, success factors that are not managed in a good way can become factors of failure; indeed of the 17 success factors found, 12 are part of the failure factors.

2.5 IT Project Management

Cuadros López et al. (2016) carried out a characterization of the software development process in some producing SMEs, applying a survey of 103 companies, mainly dedicated to developing custom software. The most relevant results with respect to the stages of a software project are that in the initial phase of the development, the respondents rated the understanding of the client's request (70%) with very high importance and with high importance the requirements work (45%), software analysis (53%), modelling (40%) and software design (50%). The development stage, which includes testing, maintenance and software removal plan, was rated as low importance, and the final phase with the programming, implementation and project management activities, about 65% of respondents consider it very High and high importance.

Finally, the study by Cuadros López et al. (2016) concludes that companies seek an agile methodology without leaving behind the stages of standardized methodologies, mixing RUP with agile methods for project management such as SCRUM and extreme programming. It also refers to the low rating that the risk management received as opposed to the results of the surveys that determined that the success of the project lies in adequate monitoring and control. The study

shows that the most important project management stages for respondents are planning, identification and analysis of requirements, quality management, cost management and time management; with a medium importance in the management of risk and incidents.

There are international studies related to project management tools adapted for SMEs, with techniques and software adjusted for small and medium enterprises. Xu and Lin (2016) have proposed the framework to achieve quantitative project management for SMEs of asset-centric software for project planning, monitoring and control with a metric system that contains the process data, of the product and the task (planned and real) of the different projects carried out in the organization.

Birkenkrahe et al. (2012) presented the INTERCOMP SME 2.0 program which is intended for the SME user to select the tool according to their project management needs and the experience of the project management practitioner. In the case of software developing SMEs, meta-models have been formulated that identify the basic elements of project management focused on improving at the project level, but that do not reach the level of processes such as the DPMP add-in for Microsoft Project® (Xu and Lin, 2016). According to Marcelino et al. (2014), specialized methodologies in risk management of SMEs have been designed, taking into account the importance of the success of the project in the results of these companies, which evaluate strategic aspects for the selection of the project.

As described by Tomanek and Juricek (2015), the use of the PRINCE2TM project management model for medium-sized projects has been accepted; as well as, in the software sector, the initiative led by Intel that uses the CMMI model as a guide to simplify project management processes has been recognized. In the last decade the management of software

projects with agile methods has been recognized, however these are practical for project-centric organizations but not for functionally organized small businesses (Xu and Lin, 2016). On the other hand, Andler (2016) points out that it is not possible to catalogue a single tool as the best option for project management in SMEs, since each one demands different characteristics according to their needs.

In the administration of project management of IT projects, the measure used to evaluate the performance of a team is to know the speed with which the elements of the product register are developed (Liu, 2015), in addition to the size of the project is measured in the total effort that is needed for its development. According to Liu (2015), the most common measures in agile methods are effort and size, however, this leads to various economic losses due to lack of cost measures. The problem with costs in agile methods is the lack of effective administration and monitoring (Taherdoost, 2018; Nicoletti, 2018; Liu, 2015; Sulaiman and Barton, 2006), in addition to lacking the generation of evidence (Taherdoost, 2018; Jones, 2010; Sulaiman and Barton, 2006) and cost estimates guided by improvable processes (Pham and Pham, 2011), thereby affecting the owner of the Software company and causing a lack of control with project managers and experts in agile methods.

Ghosh et al. (2012) propose the improvement of the PMBOK when compared with the project management standards of the agile methodologies P2M, ICB, PRINCE2, APM and SCRUM. On the other hand, Fitsilis (2008) compares a generic set of processes used in the PMBOK with a series of processes that are taken into account in the management of agile projects. The result is that agile project management methodologies cannot be considered complete, from the point of view of traditional project management, since several processes are missing or not explicitly described.

Díaz and Enrique (2017) carry out the study of the different traditional and agile methodologies to determine which is the most appropriate in the management of the projects that implements integral software and hardware solutions for the telephone management of contacts and telephone transactions through the Interactive voice response, finally determining that the SCRUM methodology is the one that best suits the needs and business rules of that company.

Medina (2017) integrates the different methodological concepts and good practices proposed by the Project Management Institute (PMI) through its PMBOK 5th Edition guide and the SCRUM framework for Project Management within an Innovative and Technological Base Company. It concludes that these frameworks are not exclusive, on the contrary they complement each other and that the effectiveness of each one depends on the adaptation of its processes to the needs of the different types of companies. Alfonzo et al. (2012) set out a proposal generated as a result of a previously tested ad-hoc design, to be treated through the practices and activities of an agile methodology such as SCRUM. The different phases of the two methodologies are described in order to manage and control the software development process.

Godoy et al. (2014) present the task management subsystem as part of a "Dynamic Simulation Model for Software Development Project Management Under SCRUM", which can be used as a tool to assess the impact of alternative management policies and bottleneck detection. Nazareno et al. (2016) propose a traceability model based on the practices of SCRUM, which allowed to represent the existing traces among the artefacts generated during SCRUM processes.

Cortes (2017) proposes to integrate some of the good practices of the PMI methodology in the development of software factory projects and resort to strengthening work dynamics with

the recommendations of the SCRUM methodology in product development, for the Factory of Software of the Cardiovascular Foundation of Colombia (FCV). As a future work, the strategy of having a profile or role within the Software Factory, as a Software Project Manager, is proposed. Velásquez et al. (2017) select the company Greensqa to carry out the identification and analysis of risks, through the agile SCRUM methodology, because methodologies such as those proposed in the PMBOK involve detailed planning, in which the risks are identified, a qualitative and quantitative analysis is carried out and a series of different techniques and tools are used, in order to generate a risk response plan, with the aim of being able to control them. Through the model, risk management is improved in Software test projects, specifically in the components of time, budget, communication and methodological tools used.

Tomanek and Juricek (2015), develop a methodological proposal for project management based on the good practices of SCRUM and PMBOK, as a guide for project management reducing the probability of project failure. They conclude that the proposed project management methodology and no other methodology ensure the success of a project, since it implies a lot in the ability of the Project Manager, the commitment and support of senior management and the response to organizational change that will be generated when this methodology is adopted. Villalta (2018) conducts a guide to procedures aimed at making decisions in the direction of human and economic resources management. In addition, an implicit list or matrix was developed in which the risks occurred in this phase were identified. This methodology was applied through practical techniques such as daily meetings, assignment of roles granting responsibility to a member of each module, constant communication, training, among others, thus managing resources in an agile and orderly manner.

Rodríguez and Diaz (2018) analyze some of the most used agile methodologies: Kanban, Lean Project Management, Scrum, XP and Canvas, defining the operation of each one, and analyzing its ability to integrate into specific PMBOK processes. The analysis allowed exploring the usefulness of agile methods within different processes and areas of knowledge, detecting a high dependence on the level of integration with the type of project and its level of uncertainty, defined in generic terms in a high utility in projects exposed to changes during its development, but presenting risks of documentation and information deficit in large projects. Uribe (2018) establishes a holistic approach to link the best techniques, tools, procedures and standards of the Project Management Institute (PMBOK), with agile software development methodologies, for greater efficiency in project management. In this sense, the scientific contribution of the research is precisely, in the proposal of a model for the integration of the PMBOK to agile methodologies to support the management of software development projects, carrying out the analysis of the current situation, the conceptual theoretical study of the PMBOK guide and agile methods, as well as the analysis of the methodologies selection criteria. The proposal is checked when implemented in a project management process if it is considered that as expected results, project management must be structured, planned based on the optimization of time and resources.

Palacios and Merchan (2014) create a fundamental guide for the management of software development projects, which will solve the problems of the company when developing projects for its customers. Case studies and success stories were analyzed that allowed to know the best practices and methodologies for managing projects used worldwide in recent times. In addition, due to the good results and the great reception they have had for their flexibility and ease of use, the Project Foundation Institute Project Guide: PMBOK 5th Edition, and the agile hybrid methodology SCRUM / XP were analyzed. Next, opinion polls were formulated and applied to

the company's technical staff and project managers. With the results obtained, the presence of the problem, the existing gaps and the improvement needs of the project management per se could be corroborated; the same that have allowed to develop the guide of foundations for the management of software development projects within the restrictions of scope, time, cost, quality, risks and human resources; making it easier for the company to obtain high levels of satisfaction for its customers.

Jiménez (2016) builds a generalized product of easy understanding, to commercialize in organizations or academic centres where there is an interest in training or advancing mature and professional projects in an agile way in digital environments, said product unified the key elements of both the reference framework provided by PMI as the agile methodology for Scrum software development, under an interactive dynamic with application for digital environments, in terms of its content, its conventions and its rules.

If it is possible to create a method capable of estimating costs based on historical evidence, controlling and monitoring costs periodically, it will be possible to minimize the loss of costs and adjust the program to the times and commitments with the client.

2.6 Budget Monitoring and Control

Sulaiman and Barton (2006) discussed a methodology called AgileEVM, which has the purpose of monitoring the progress of a project in the attributes of time and cost. AgileEVM is based on the method of administration earned value (EVM, Earned Value Management). In AgileEVM SCRUM metrics are directly related to traditional EVM metrics seeking not to add unnecessary bureaucracy to the development process. The monitoring of the performance and the budget of the project in AgileEVM is carried out at the end of each iteration, in these revisions

four parameters are collected: the current iteration number (n), the history points finished during the iteration (PC), the points of history added or removed from the work list to be developed in the next iteration (backlog list) during the current iteration (PA) and the cost of the iteration (SC). Monitoring metrics of AgileEVM shows the cost performance index (CPI), the index of performance over time (SPI) and points SP History (Story Points) missing during each iteration. Then, knowing the CPI and the SPI it is possible to know if the project is going according to plan, since if so, the value of CPI and SPI should be equal to 1. If the CPI is greater than 1 then it is being spent less than planned, a CPI less than 1 means that more than the budget is being spent. If the SPI is greater than 1 then the project will be completed earlier than planned and if the SPI is less than 1 the project will end late.

Rawsthorne (2015) discusses the AgileEVM method which is based, but adding to the CPI and SPI indices the value of the business earned during each iteration (EBV), since Rawsthorne (2015) considers it a important metric to know the business value that the development team adds to the product and that benefits the customer during each iteration. In the proposed method, a development cost is assigned to each SP and the project cost estimate is based on days per person. At the end of each iteration, in addition to obtaining the necessary parameters to meet the CPI and SPI, is essential to know the business value (BV, Business Value) contributed by each US (User Story).

Taherdoost (2018) research is also related to cost control and monitoring, its proposal is based on the EVM described in the ANSI / EIA-748 standard. Taherdoost (2018), based on his experience, mentions that the traditional EVM approach fits quite well in agile methods and that its application is very easy to understand. According to Taherdoost (2018), knowing the financial

context of projects developed in agile methods is not possible using only the burn down graphs provided by the agile administration.

To monitor the project performance and financial context, a graph was used where the budget metrics and SP developed are represented with percentage values during each iteration in relation to the total SP of the product. Taherdoost (2018) used a graph, where he drew a dotted line corresponding to a linear function, based on the speed of the development team, in which a constant speed is assumed to show the expected progress in each iteration. He used a black line to show the progress of SP developed at the end of each iteration and a gray line to illustrate the budget expenditure in each iteration, this graph is called the time and budget graph. In it, it is possible to identify risk situations when the budget is consumed faster than planned or the cost of the effort is higher than expected.

Miranda and Bourque (2010) present a technique for monitoring projects based on the technique of Line Of Balance (LOB) and using control points in the activities of the development process also proposes that the collection of information is carried out in the version control systems used for product integration. In this technique, monitoring is carried out during each iteration although the information is collected during each commitment (commit) performed to the version control server by the team. To obtain information from the code repositories it was necessary to standardize the way commits are sent, writing the US to which it belongs and the control point where that US is located. In this model it is only possible to know the amount of planned and actual requirements at each control point in the form of US for a certain time.

Kang and Choi (2010) propose a dynamic monitoring model, the basic monitoring metric is the function points FP (Function Points), which describe the functionality of each US. In this

model the monitoring is daily, so there is a historical base of information. This model uses the Kalman filter and the modelling of state spaces in order to make very precise projections of the progress in function points that the product is expected to have according to the historical speed of the equipment. The state space model is fed with the information of the missing FP and the variations of the scope in the project.

EVM-based methods (Rusk, 2009; Rawsthorne, 2008; Sulaiman and Barton, 2006) do not take into account the change in the scope of a project, that is, the planning is not shown in the support graphics for monitoring, only the value obtained from the first planning as a whole is always considered, so the information that is Sample is not reliable when making changes in the scope of the project. In the method described in Kang and Choi (2010), the assertion that FPs are absolute values is used, so that they are more precise to plan the cost and time of a product, the investment of greater effort to plan a product in FP It is not justified to obtain more precise planning. In the method of Miranda and Bourque (2010) the precision of each control point is shown with a minimum unit of US, so the effort invested to each US is not reflected in its methodology. The improvement points identified in the proposals of Kang and Choi (2010) and Miranda and Bourque (2010) were to contemplate the changes in the scope of the product in the rescheduling during each iteration, in addition to using the history points as a metric for the effort.

2.7 Cost Estimate

In agile methods, empirical practices based on expert judgment are used to estimate the cost of development for a new product, in the literature two common practices were identified for this purpose, the most common one involving SP as a base metric (Miranda and Bourque,

2010; Rusk, 2009; Rawsthorne, 2008; Sulaiman and Barton, 2006) and the second is based on FP (Kang and Choi, 2010).

The first way identified, which is the most common in agile methods, has SP as its main metric (Cohn, 2015). In this practice, the first task to be performed is the estimation of the total effort required to develop the project, this estimate is carried out by the team in charge of its development. Next, an acquired base speed of historical data that is not very reliable, or expert judgment, is defined to know the approximate time in which the project will end. Knowing the time needed to develop the project, the project leader calculates the cost of the people who are part of the team to obtain the necessary budget for the human resource, to this estimate other types of expenses that the project needs are added and add a cumulative sum of expenses to the total estimated budget (Cohn, 2015).

Another way to obtain the cost estimate was proposed in Kang and Choi (2010), where the basic metric to make these estimates is to use FP, which involves more effort in product planning, but the authors assure that their model is more precise, since FP are absolute and non-relative values like SP. The way in which they estimate the cost of the project is similar to that commonly used in agile methods, with the difference that each US corresponds to a set of FP, which have a cost based on lines of code or people per month.

Cost estimation practices based on expert judgments and using SP lack a formal model to make estimates, the historical data of a team's projects in a company are not always considered for future projections in cost estimation, possibly due to the bureaucracy that would lead to generating this information. In the methodology proposed by Kang and Choi (2010) historical data are taken into account, but only those of the project in which they work, in addition to the

cost being a function of FP, as it is an effort metric that implies a greater detail in the planning of the US. The potential improvements found in the cost estimate are to make cost estimates based on historical project data, with similar attributes in a company, using SP and adjust the cost per SP during each iteration based on the development of the current project.

In the literature some deficiencies were found in the methods of monitoring and controlling the budget in addition to the cost estimation. In the monitoring and control of the budget it was found that the scope of the projects is not planned again at the end of each iteration, so that re-planning is one of the fundamental parts of the agile methods (Cohn, 2015) to adapt to the change. The motivation section shows a proposal that considers the change of scope in the monitoring and control of costs, following the administration of the earned value (EVM) and the principles of the agile manifesto. In the analysis and interpretation a technique is proposed to estimate the cost of a development project based on historical times for a set of US with the same effort. The proposal is aimed at companies that develop software using agile methods, in which there is an estimation plan based on relative metrics and they see the need to monitor the budget of their projects, in addition to seeing the need to have a historical basis for Cost estimation based on historical facts within the organization.

The development plan in agile methods must be flexible and changing due to the very nature of software development projects (Cohn, 2015), it must be monitored and controlled to avoid jeopardizing project success, negotiating with the client the changes of the scope, reduce the uncertainty of the current state of the project, support the decision making with the client and the development team, build trust and transmit reliable information to those involved.

2.8 Planning and Control

According to Obrutsky (2015), in the planning phase there is one of the biggest differences between the SCRUM framework and the PMBOK, since in the first one who defines the activities to be developed is the development team, in the second it is the project manager who later defining them will assign to each resource the activity to be implemented and the time allocated for it. In this model, the development team will continue to select the user stories that will enter the sprint, it is highlighted the importance of the same team who defines which user stories they commit to comply, taking into account that it is the same people who They estimate and those who will execute the tasks.

Cassidy (2016) divides this ceremony into two. In the first part, the product owner will be in charge of giving the team the prioritized user stories, which were reviewed in the previous ceremony. At this point the development team will be in charge of selecting the user stories to which it can be committed, taking into account the priority given by the product owner. In the second part of the ceremony, the team will have to break down the tasks required to fulfill each story and then perform the estimate for each story, counting on the uncertainty that has to be fulfilled, the time, the resources involved and the complexity of it.

In the same way, Kjersem and Jünge (2016) said, the product owner defines the acceptance criteria of the user history which will be necessary inputs to propose the tests to be carried out on it, complying with the INVEST criterion that the history must be Testable, in this way in this ceremony the scope to give the tests of the product increase is agreed. Keep in mind that the commitment acquired by the team will have the design, development and testing phases, so the user stories must have such a small scope to meet these development phases in the same

sprint. Therefore, user stories must have such a small scope to meet these development phases in the same sprint.

Chapter 3 Methodology

3.1 Introduction

According to the literature reviewed, the main causes that affect the failure of project management of SMEs dedicated to IT can be framed in the lack of clarity of project managers on the definition of success of their work (Ramos and Mota, 2014). The theoretical framework of this research is divided into three general aspects. First, the definition of success in project management and the factors contributing to achieve successful project management in the main international standards and books. Second, to identify the success factors in the management of projects in the IT sector from the review of the international literature. Finally, a review was carried out on the characterization and analysis of project management in SMEs, identifying some practices, methodologies adapted to their context, as well as success factors in the projects carried out by this type of companies.

This research study will use qualitative research methodology where data is collected through secondary sources. The literature is analysed on recorded project successes across all industries.

3.2 Research Approach

This research study uses secondary or desk research approach. The secondary or desk research is the instrument of support that facilitates, within the process of Scientific Research, mastery of the techniques used for the use of literature. It allows the creation of skills for access to scientific research, reported in documentary sources in an organized way.

The organization of the content file and revision of the scheme are important ways to verify that the research process is correct and not wrong. The evaluation of the material

collected, the location of possible gaps, detection of excesses in transcribed ideas, in order to give greater organization and uniformity to the research and to know if essential data are missing. It is essential that the researcher obtains complete mastery of all the materials collected and assesses its usefulness to think of a more perfected scheme than the previous one.

This scheme will be the result of the maturation of the ideas taken from the materials accumulated in the file, in order to face a new classification of the same. The classification of the materials begins with a first distribution according to the themes, categories or chapters and sub-chapters of the research that were elaborated at the beginning. The materials should then be sorted into tabs within each chapter and distributed in small sub-themes or sub-chapters. The researcher will distribute small divisions of the sub-themes to the detail of each record with respect to the preceding one and the one that follows. The Card allows the process of detailed classification of the information to be agile and flexible. It is the element that allows to distribute with ease the set of sub-themes, making them more and more meticulous. The procedure of successively sorting chips has great advantages. It allows to analyze the same chip several times. It allows a more analytical distribution of information. The data collected in the transfer are better understood and controlled.

3.3 Secondary Research

Secondary research thus uses sources and information that have already been collected by others, in contrast to primary research, in which one's own data is evaluated by questioning, observation or experiments and is to be assigned to market analysis in market analysis. First of all, the question arises: to which topic do you need information? Is there a specific market, a specific target group, a particular product or service to which the data material should relate?

In a second step, it must be investigated whether there is current information or studies on

the desired topic. Are statistical evaluations needed? If so, appropriate statistical data sources are to be researched. With their help, one's own actual state can be determined, i.e. read strengths and weaknesses (Chu and Ke, 2017), but above all also market potentials or trends, should respond to the libraries.

Studies are indispensable for market research. Secondary studies provide already collected and evaluated primary data, either for a company or for the public (Verschuren et al., 2010). Contract studies of companies are generally not freely accessible as they have been commissioned by the companies. However, some companies release studies to the public after a certain period of suspension. Libraries can use studies to obtain information that they would not have to collect themselves.

The main advantage of many studies is that the data collected in the study has traditionally already been evaluated and interpreted. Libraries have the opportunity to receive relevant and well-founded data for their strategic orientation regarding their services. The studies that are presented are relevant for the target groups of the libraries on the one hand, and relate to different media types or media usage behaviour (Walliman, 2017), so that they provide information on trends in terms of products and services.

3.4 The Grounded theory

According to Stern and Porr (2017), the research used grounded theory; where the theory is elaborated and arises from the data obtained in the literature review, it must be verifiable in current or future investigations and be easily understandable. The main reasons for the election were the purpose of the research is to identify or discover what are the success factors in project management; the theory will be constructed according to the analysis of the interaction of project

managers with the success factors in the management of their projects. The analysis of the data was carried out as they were obtained from the literature; the analysis was performed with the constant comparison of the results of different literature reviewed.

The grounded theory is a theory proposed by Barney Glaser and Anselm Strauss in 1967 (Glaser and Strauss, 2017), which is based on the generation of theories (findings) based on the data. As Glaser and Strauss (2017) affirm, if the proper procedure is followed, anyone could develop a substantive theory by means of the grounded theory which should be proven. On the other hand, after some conceptual differences that Glaser and Strauss had, two (2) types of grounded theory designs were generated: the systematic and the emerging.

The emerging design, born as a criticism by Glaser to Strauss and Corbin, where he judges that the rules and procedures for the generation of categories should be highlighted and that the structure of his process established a way to preconceive the categories and whose final objective would be to verify the theory instead of generating it (Dougherty, 2017). Glaser (2007) emphasizes that the theory must be born from the data rather than from a system of categories as happens in axial coding. Additionally, the emerging design uses an open coding (constant comparison is also used) in order to find the categories, relate them to each other and thus generate theory, that is, at the end of the exercise the researcher can explain the theory and the relationships between the categories.

Strauss and Corbin (1990) (mentioned in Cooney, 2011)indicate that the grounded theory has four (4) important moments: the selection of the research question, which can be verifiable; data collection; the coding data (analysis), this stage is when the data is organized, and therefore it is there where the three coding stages are: open, axial and selective; and validation of the story

line, at this stage the researcher seeks to find the existing relationships in the model through some field tests.

3.5 Search Strategy

Taking into account that the objective of the research is to identify and analyze the success factors in project management in some SMEs in the IT sector, to carry out this work, the PRISMA-P methodology was followed (Moher et al., 2015). In the first step, the keywords such as IT Projects, Success factors, Control, Budget, Planning etc. of the search equation were entered into the search engines of the following databases: Ebscohost, Google scholar, ScienceDirect and Cochrane. The Boolean Operators of OR and AND were used for joining the keywords and making different combinations of it.

After excluding duplicates, a first selection was made, on the basis of titles and abstracts, according to the following inclusion criteria: studies published since 2000, whose objectives, main or secondary, study the relations between IT projects and its success factors, the planning and control of IT Projects etc. Excluded articles written in a language other than English or not based on a study (Qureshi et al., 2015).

A second selection was made after reading the full text. Data from the selected studies were collected using an extraction form according to the following criteria: title, author, year of study, year of publication, region / country, type of study, objective, method, main results and study score (McGowan et al., 2015). Study selection and data extraction were done by two researchers independently. In the event of an initial discrepancy, the articles concerned were discussed between the two readers in order to obtain a consensus.

In order to be able to easily compare the different studies, it was decided to try to obtain an assessment in the form of a score. By counting the number of criteria present and reducing it to the total number of criteria, a score is obtained as a percentage. The data were given priority in the studies with the best scores, nevertheless no reference was excluded, the objective of the study being to be exhaustive.

3.6 Data Analysis

The analysis was performed following the grounded theory. In the description of the analysis of the results of the investigation, the procedure is stated. To define the weight attributed to each of the success factors of the management of projects in the IT sector, identified through literature, a weighting scale was used. To define the weight attributed to each of the failure factors of the management of SME projects in the IT sector, identified by literature, the weighting scale was used.

The information subject to research analysis comes from previous literature. The analysis process is iterative and simultaneous with the information collected and the handling of this information is presented with the clarity that was not necessarily carried out following this order since its execution is not linear but deserves an order for its explanation.

Chapter 4 Discussion

To determine the type of projects carried out by the companies, the business lines to which they are dedicated were reviewed. The literature mainly dedicated to software development projects. Technological renewal projects, software and hardware integration, as well as email migration are characterized by being short-lived. For majority of projects, the estimated time for their execution is one month, while some projects can take up to 3 months. The companies in the IT sector handle short projects that can take from one week to four months. With respect to the projects of maximum duration, which by their scope require a period of tests to ensure quality, as well as projects with several requirements in which they must interact and work in a coordinated manner with the client, or that have a relationship and connection with other networks in the financial sector and software development projects, which due to the complexity of their objectives require research. Many software companies believe that they can take up to 1 year.

When using grounded theory analysis, taking into account the aspects according to the reality of some companies in the IT sector that influence the management of their projects, as well as the characteristics of the sector found in the study from the literature review, the findings are related to the success factors found to analyze their relevance. This chapter presents the analysis of the success factors identified during the research process.

4.1 Well-defined Scope of the Project

The adequate knowledge of the users' requirements and the correct information about their needs constitute the most important critical factor (Herrero and Salmeron, 2005) and it is required that the clients or users be aware of the product that they need, a well defined scope of

the project must be oriented to generate value to the client, organizations in the IT sector must offer solutions, not services.

The product of the IT sector projects is characterized by being intangible and it is complex to define the deliverables at the beginning of the project (De Bakker et al., 2010), so the requirements management is one of the most important aspects in the software development industry because the correct and detailed definition of scope is the most important thing to avoid (Agarwal and Rathod, 2012).

Customers and their satisfaction with the company's products or services are the key to success (Heldman, 2011). However, in the IT sector where it is found that sometimes the explanation of the vision or purpose of the project fails (Petter, 2008), there is poor definition of requirements, as well as incomplete requirements and inadequate documentation. In some of the companies, a good definition of the scope is not made, so objectives are confusing and the work team loses focus making it difficult to ensure the connection between the product of the project and the need of the clients.

Sometimes the definition of the scope is difficult due to ignorance of technical aspects of the client, so in the IT sector it is recommended that companies illustrate the user the solution proposed, as well as its functionality before testing the product (Petter, 2008) and reducing the scope to handle a project in several phases to land what the product can do and facilitate the abstraction of ideas in a way that identifies the problem or need and define what is going to be done.

The well-defined scope of the project requires an adequate lifting of requirements to establish the specifications of the product that respond to the client's problem or need, which is

why in the IT sector, in which its products are characterized by being intangible, it is of great importance of defining the work that is part of the project and explaining to the client and the user how it generates value.

4.2 Proper Project Planning

A well-planned project is more likely to be successful as compared to poorly planned project; hence reliable estimates about projects are required from the project team. However, some project managers in the IT sector tend not to carry out planning (De Bakker et al., 2010), increasing the unfavourable risks for achieving successful project management.

Among the problems and difficulties presented by some of the companies, it is found that they have established and agreed times, but they are not well planned and unreal. Planning and proper risk management improves the overall probability of success of the project. However, one of the disadvantages is that in an environment of multitasking, estimates are made with the assumption of the dedication of human talent in the project, without taking into account that in parallel, they are executing tasks from both other projects, and from the functional area, so the planning must be carried out by the project manager with the work team taking into account the dynamics of the organization (Kerzner, 2018).

Dedicating enough time to the planning phase is crucial for the achievement of the project management objectives, since within its success criteria is the fulfilment of the requirements agreed with the client, within the estimated time and cost. Hence, if the estimates are not made in a correct way in conjunction with the work team taking into account the dynamics of the IT sector in these organizations, despite the good work of the project manager

with the work team, management, the project may not be classified as successful because it does not comply with the schedule or with the budget allocated.

In the IT sector, project time is usually short, and work is carried out in a defined time scenario to carry out project planning, so one might think that there is no opportunity to carry out adequate planning; however, re-processes are presented as a result of not having done a good planning, so planning the project on the way will save time (Heldman, 2011), since the effort of the team is focused work to the expected results and avoid re-processes.

4.3 Project Monitoring and Control

Failed or overdue projects usually do not have proper management of milestones by the project manager (Jones, 2010). The monitoring and control of the project allows to determine the status of the project to take corrective measures and identify risks, so it is key to anticipate possible problems or inconveniences through monitoring, as well as reactivate the activities with the commitments of those in charge of the same. Without a project status report, team members do not know if their tasks are on time and the delay in the project is ignored (Kappelman et al., 2006). However, despite its importance, in some of the companies in the IT sector, it was found that strict and sufficient monitoring and control is not carried out.

One of the factors of failure in software development projects is that the scope is not validated during project execution (Jones, 2010); the lack of control of the scope, generates gold plating, as well as a lack of handling of the expectations of the users (Petter, 2008). In the IT sector, the project manager has to take strict control over the scope and requirements of the project and transmit it clearly to the main stakeholders, to meet the criteria of successful project management, as well as prevent SMEs from incurring additional expenses due to gold plating.

4.4. Project manager with leadership

Successful project managers must integrate fundamental issues of behavioral science, which involve knowledge of leadership practices, team motivation development, conflict resolution and negotiation skills (Anantatmula, 2010). One of the most important lessons for successful project managers is "start with the end in mind." Clear goals at the beginning of a project will make the conclusion clear (Anantatmula, 2010).

Successful project managers must operate within the limits; the border that divides technical and behavioral problems is an example, and project managers need to feel comfortable in both tasks (Anantatmula, 2010). The efficiency and effectiveness of project management is related to the ability to handle inconveniences caused by inadequate estimates, as well as handling the requirements in a favorable manner (Argawal and Rathod, 2012).

The success of project management could easily depend on the location of the project manager within the organization (Kerzner, 2018). In matrix organizations, functional employees must have the ability to report vertically to line managers, while reporting horizontally to one or more project managers (Kerzner, 2018). In these types of organizations, project managers often have little or no direct authority over team members. With respect to the SMEs, they recognize the role and authority of project managers and the project manager's ability to timely influence stakeholders is critical to the success of the project (Müller and Rodney, 2010).

Effective project management requires a professional with leader characteristics, ability to achieve objectives and manage restrictions, as well as adequate performance (Ramos and Mota, 2014). Project managers are people with multiple talents who need to master various skills for success in the field of project management (Heldman, 2011). Project managers must

understand that the success of their project depends on the commitment and productivity of each member of their team (Anantatmula, 2010), they must recognize talent, recruit it, shape it and apply motivational techniques; they must understand human behavior in order to motivate people towards the successful achievement of project objectives (Kerzner, 2018; Petter, 2008) and try to find a way to ensure the job stability of effective members of the project team (Kerzner, 2018), as well as achieving a shared purpose of the project with its work team.

In project management, successful team leaders are often those who are better able to create a collaborative attitude between themselves and their teams (Anantatmula, 2010), project managers who build trust and behave with authority, justice , honesty and attention, will succeed in creating an environment in which team members strive to do their best (Anantatmula, 2010). Without the commitment of an energetic project leader, it is very unlikely that the project will be carried out successfully, the selected person must put emphasis on all aspects of the work, not just the technician (Kerzner, 2018); since it must ensure that the expectations of the users of the projects, such as those of software, are realistic and consistent with the deliverables of the project (Petter, 2008), manage stakeholders to reach agreements (Ramos and Mota, 2014), as well as having intellectual and charismatic abilities.

A good project manager must be able to tell users what they don't want to hear (Petter, 2008), create an environment that facilitates teamwork, have a solid understanding the capabilities of team members and determining if external resources or experience are needed in order to guarantee the success of the project (Heldman, 2011) as well as recognize the success of the team, no matter how small the project (Heldman, 2011).

The wrong person named as project manager is one of the reasons why projects in the IT sector fail (Ramos and Mota, 2014), although there is no consensus in the literature reviewed if it requires technical capabilities or not, to avoid problems in SMEs with the interaction with the work team. It is important that the project manager knows the aspects and dynamics of projects in the IT sector and has leadership capabilities, conflict resolution, negotiation and management of the work team (Anantatmula, 2010), to generate a shared purpose of the project and thus overcome situations and manage the project so that it is achieved with the success of project management.

In SMEs, the management of the work team is related to the functional areas, so the project manager must ensure that the team performs the project tasks on time, work that is difficult in an environment of limited resources. So a project manager with qualities of leader, trained and experienced, it is important to overcome the project situations adequately within the organizational dynamics to focus the work so that technology is the answer to user requirements.

4.5 Trained, motivated and experienced Project Team

There is difficulty in the management of the projects due to the lack of training of the work team, as well as inconveniences to obtain human resources with the required capacities, increasing the probability of failure of the management of the projects that are part of its value chain. In addition to the motivation, training and leadership of the work team, the experience allows the teams to identify areas of greatest risk that need to be closely monitored. Therefore, having a trained, motivated and experienced work team is essential since it contributes to the fulfilment of the objectives of project management. It is also identified that the lack of clarity of roles and responsibilities is difficult for the management of projects, so they must be defined and agreed with the work team, as well as guarantee their compliance.

4.6 Adequate stakeholder management

The main stakeholders must agree with the definition of the project, the expectations of the users must be correctly identified and constantly reinforced, listen to them, understand their needs and in turn understand the project product purpose (Petter, 2008). Proper management of stakeholders is important because in software projects, managing perceptions and ensuring that development satisfies them may be more important than perfecting it.

In the IT sector, the participation of the main stakeholders as users, customers, project manager and work team in the different stages of the project is essential, to increase the probability of success (Argawal and Rathod, 2012; Herrero and Salmeron, 2005), the project manager should not forget the key stakeholders, since relevant stakeholders are not committed to the project and do not participate in meetings can be a factor in IT project failure.

4.7 Effective Communication

According to Ramos and Mota (2014), the lack of communication is the main factor of failure in IT, since the definition of the communication plan and its objectives is deficient and often, the language used by the IT work team is so technical that the client has difficulty understanding.

There is inconveniences of communication both with the project work team, generating conflicts within the team, as at the organization level and sometimes with the client. Therefore, frequent and timely communication with stakeholders is important. Despite having the relevant knowledge, if it is not known at the right time, it can contribute to the failure of project management (Alhawari et al., 2012).

4.8 Senior Management Support

Senior management support is considered a success factor in the management IT projects which coincides with the results of the research carried out by De Bakker et al. (2010) and Kappelman et al. (2006). Its importance lies in the fact that the interest of senior managers allows the entire organization to be aligned with the project and to obtain the support of the functional leaders involved. However, there are organizational aspects that hinder such alignment and support required to ensure successful project management.

Conclusion

According to the success factors in the IT project, the technical aspects are less critical than those associated with human and communication factors; an adequate knowledge of the requirements of the users allows defining the scope, becoming the most important critical success factor. Some success factors are not the autonomy of the project manager, since they refer to organizational processes and characteristics of the IT sector. Successful project management contributes to the achievement of better performance results in companies, and therefore contributes to their productivity, competitiveness and sustainability.

The lack of clarity in the scope generates problems, difficulties and is a factor of failure of the management of IT projects, so a well defined scope, which responds to the client's problem or need, is essential to achieve a successful project management. In accordance with the review of international literature, the main success factors of project management in the IT sector mentioned more frequently are scope definition, Involve key stakeholders by the client, a project manager with leadership and training; as well as monitoring and control. The companies in the IT sector of this study perceive the success of the project as: comply with the scope, time and cost, delivering a product that meets customer expectations in terms of functionality and generates value to the client's business and the organization that runs it.

The common success factors of high importance are related to the planning and control processes and the area of knowledge of scope, in accordance with the PMI. With the same level of importance are the skills of the project manager and work team, reflecting the importance and high dependence of human talent in the IT sector. Stakeholder management is essential in the IT sector, to align customer expectations with a product that is intangible and to guarantee its functionality, generating customer value.

The support of senior management is relevant to the success in the management of IT projects in the study, since the context of these organizations, in which resources are limited, the project team does not have exclusivity due to the multiple tasks and there is a lack of autonomy, authority and empowerment of the project manager, it is essential to have the support of functional leaders so that the organization focuses on the project.

Recommendations

- The project managers of IT projects must orient the product of the IT sector projects to generate value to the client, offering solutions and not exclusively services.
- The way to approach the projects of the IT should facilitate the clarification of the scope with the client, as well as the management of their expectations.
- The projects of small and medium-sized companies in the IT sector must have a work plan prepared by the project manager with his work team, taking into account interdependencies, as well as the dynamics of the sector and the organization.
- The IT project manager must manage the stakeholders, the needs and expectations of the project are not only those of the client with whom it has interacted, the user and the key stakeholders must be involved, to have a shared vision of the project , which responds to the opportunity or need for which it was created.
- Some of the projects in the sector require a joint work with the client, so involving key stakeholders from the client generates support to have the resources on time.
- Contemplate with the human resources area of IT SMEs, an incentive plan so that specialized human talent does not rotate frequently and is more committed to the execution of projects.
- Project managers of IT SMEs must establish the communication plan, socialize it with the work team and implement it in order to make it appropriate and timely.
- SMEs in the IT sector must implement or increase maturity in structured methods and processes of project management, based on the dynamics of the company and its vision.
- Implement management of lessons learned in small and medium enterprises in the IT sector.

- The project manager of the IT projects must define roles and responsibilities both within the project team in the organization and with the client areas involved in the projects.
- The SME projects of the IT sector must be monitored and controlled so that the project manager generates alerts to the functional areas, takes the corresponding corrective measures and anticipates negative risks that could materialize.
- The IT project manager and his work team should not lose clarity in scope during project execution and with customer interaction.
- Perform an adequate change control, in which the manager determines its impact for the project, is formalized and accepted by the authorized persons.
- Project management in SMEs in the IT sector should focus on the management of requirements as a core element, as well as on progressive planning and monitoring and control, through a methodology consistent with the reality of these organizations that generate value, as a result of better performance results in the management of IT projects.

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