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ROGERIO ALVES SOARES

STAKEHOLDER MANAGEMENT AND ITS INFLUENCE ON THE PERFORMANCE OF INFORMATION TECHNOLOGY PROJECTS

São Paulo

2020

Rogerio Alves Soares

GERENCIAMENTO DE PARTES INTERESSADAS E A INFLUÊNCIA NO DESEMPENHO DE PROJETOS DE TECNOLOGIA DA INFORMAÇÃO

STAKEHOLDER MANAGEMENT AND ITS INFLUENCE ON THE PERFORMANCE OF INFORMATION TECHNOLOGY PROJECTS

Tese apresentada ao Programa de Pós-Graduação em Administração da Universidade Nove de Julho – UNINOVE, como requisito parcial para obtenção do grau de **Doutor em Administração**.

ORIENTADOR: PROF. DR. BENNY KRAMER COSTA

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POR

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Tese apresentada ao Programa de Pós-Graduação em Administração - PPGA da Universidade Nove de Julho – UNINOVE, como requisito parcial para obtenção do título de Doutor em Administração, sendo a banca examinadora formada por:

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São Paulo, 04 de Dezembro de 2019.

DEDICATION

I dedicate this work to my wife Ana Paula, my sons Rafael and Sofia (in memorian). Your physical and spiritual presence moves me with each step.

ACKNOWLEDGMENTS

First, I want to thank God for my existence, my safe and perfect nature I received to execute my work. I also thank all the spirituality for the opportunity on this existence, the inspiration, and the positive vibrations.

I wish to express my deep appreciation to my advisor Professor Benny Kramer Costa, for helping me in different ways in this journey. First, his posture was always giving me the confidence to move on, even when I was utterly lost and thinking that I could not write a thesis. Then as a friend giving me advice about how to balance studies, professional work, and family life. The most important, as professor advisor sharing his knowledge, challenging me for the best and improving myself.

I want to thank all my friends at Uninove that has an essential role in my academic life and in this thesis. Thank you for all the time you have listened to me, helped me in different manners. This journey was beautiful, aside from you.

I would also like to thank Univinove professors for excellent classes and knowledge you transmit.

RESUMO

Nesta tese eu analiso e valido a relação do gerenciamento de partes interessadas com o desempenho dos projetos de tecnologia da informação. Para isso, eu desenvolvo três estudos sequenciais interconectados, sendo cada um deles com seu tema independente, método, coleta de dados e análise dos resultados. No primeiro estudo realizo uma bibliometria sobre duas décadas de estudos publicados sobre o tema gestão de partes interessadas, analisando área de publicação, autores, coautores e principais *clusters* identificados. No segundo estudo investigo o tema desempenho de projetos de tecnologia da informação (TI), realizando uma revisão sistemática da literatura para identificar variáveis comprovadas empiracamente como correlacionadas ao desempenho de projetos de TI e, identificar quais são as variáveis utilizadas na literatura para se medir o construto desempenho de projetos de TI. No terceiro estudo, investigo a moderação do engajamento das partes interessadas e da saliência das partes interessadas, na relação entre atividades de gestão de projetos e o desempenho de projetos de TI.

Palavras-chave: gerenciamento de partes interessadas, desempenho de projetos, engajamento de partes interessadas, saliência de partes interessadas, gerenciamento de projetos de tecnologia da informação

ABSTRACT

In this thesis, I am analyzing and validating the relationship between stakeholder management and the performance of information technology (IT) projects. To this end, I develop three interconnected, sequential studies, each with its independent theme, method, data collection, and analysis of the results. In the first study, I am conducting a bibliometric analysis of two decades of published studies about stakeholder management, analyzing the publication field, authors, coauthors, and critical clusters. In the second study, I am investigating the topic of IT project performance. Performing a systematic review to identify empirically validated variables as correlated with IT project performance and to identify which variables are used in the literature to measure the construct IT project performance. Thus, in the third study, I am investigating the moderation role of stakeholder engagement and stakeholder salience in the relation between project management activities and IT project performance.

Keywords: stakeholder management, project performance, stakeholder engagement, stakeholder salience, information technology project management

SUMMARY

TABLE INDEX

FIGURE INDEX

1 INTRODUCTION

Stakeholders are made up of a wide range of groups who can affect or are affected by an organization (Freeman, 1984). The primary stakeholder groups of an organization typically are comprised of employees, shareholders, and investors, suppliers, and customers, together with what is defined as the public stakeholder group, that is, the governments and communities that provide infrastructures and markets, whose laws and regulations must be obeyed, and to whom taxes and other obligations may be due (Hillman & Keim, 2001). Essentially the stakeholder concept holds that an organization occupies the center of a network of relationships that it has with various interested parties (Waligo, Clarke, & Hawkins, 2013). A stakeholder approach emphasizes cooperation between companies and their stakeholders as a more effective means of value creation (Strand & Freeman, 2015). Stakeholder theory comprises a collection of expressions, ideas, and metaphors related to the central thesis that the primary purpose of a company is to create as much value as possible for its stakeholders (Strand & Freeman, 2015).

In the project context, stakeholders are individuals or groups who have an interest or some aspect of rights or ownership in the project and can contribute to, or be impacted by, the outcomes of a project (Bourne & Walker, 2005). Stakeholders can potentially affect the activities and outcomes of a project, and therefore its likelihood of success (Olander & Landin, 2005). The project manager must develop relationships with the stakeholders that are of high quality and effective, aiming to enhance satisfaction with project outcomes (Mazur & Pisarski, 2015). In general, the literature describes that effective stakeholder management can improve the performance of the projects. In contrast, poor stakeholder management can lead to low project performance in terms of schedule, cost, quality, environment, return on investment, satisfaction, among others (Mazur & Pisarski, 2015; Mojtahedi & Oo, 2017; Di Maddaloni & Davis, 2018).

In the past two decades, there has been significant progress in the literature on the effects of stakeholder management on project context, regarding all lifecycle of the project. Despite this notable progress, the direct correlation of stakeholder management and project performance are not yet explored. Stakeholder management is being investigated as an

essential process to maximize positive inputs and minimize bad attitudes by taking into account the needs and requirements of all project stakeholders (Di Maddaloni & Davis, 2018). However, in the context of project management, the theory of stakeholders are not being explored, journals of project management area like International Journal of Project Management and Project Management Journal are publishing until this moment studies practical bias, like how to classify stakeholders, change perceptions and identify attributes (Waligo et al., 2013; Yang, Wang, & Jin, 2014; Mazur & Pisarski, 2015).

For this thesis, I use information technology projects as the empirical context of stakeholder management's impact on project performance. The context of information technology is relevant due to some reasons. First regards the plurality of contexts where information technology projects are developed, almost 100 percent of the organizations in the world has at least one information technology project, no matters in different sizes, industries, costs, or complexity (Bakker, Boonstra, & Wortmann, 2010; De Bakker, Boonstra, & Wortmann, 2011; Müller & Martinsuo, 2015). The second is about how critical are information technologies for the sustainability of any organization, information systems, hardware, and applications are intensively explored, and their efficiency is vital for many organizations (Taylor, Artman, & Woelfer, 2012; McKay II & Ellis, 2015; González-Benito, Venturini, & González-Benito, 2017). The third is about the need to enhance project results. According to The McKinsey Global Institute (MGI), on average, large information technology projects ran 45 percent over budget and 7 percent over time while delivering 56 percent less value than predicted. With these high failure rates, there have been several attempts from practitioners and academics to reduce those failure rates (Pimchangthong & Boonjing, 2017). In this regard, explore and understand theories that may contribute to minimize project failures and enhance performance is relevant to figure out how organizations and practitioners may explore additional options for project management.

I contribute to stakeholders theory and project management by providing a view about how stakeholders management contributes to project performance. I contribute to stakeholders theory, specifically stakeholder engagement and stakeholder salience, testing the moderation effects of two different ways of stakeholder participation. These two ways of stakeholder participation may affect project performance in various manners, and I will validate both approaches' efficiency.

I contribute to project management by providing an additional activity for projects aiming to enhance project success. I propose to test project management activities of human

resources management, communication management, risk management, and quality management to impact stakeholder engagement positively. These relations may provide additional focus to project management practitioners on current activities, to develop support to stakeholders, and impact the results positively.

1.1 RESEARCH PROBLEM

More than 50 percent of large information technology project in the United States of America has not accomplished planned time, scope, or cost in the year of 2015 (Pimchangthong & Boonjing, 2017). Organizations need to find out project management practices to enhance this performance. In this thesis, I analyze if the engagement of stakeholders or salient stakeholders can moderate project management activities and IT project performance improving their results. I am investigating project performance not only regarding the results of the project execution, like time, cost, and scope dimensions, but also the dimension of the impact of the information technology project's outcome and their acceptance and usage by users, internal or external of the organizations. I investigate these two dimensions as part of project performance, assuming stakeholder engagement and salient stakeholders will affect that in different manners.

1.1.1 RESEARCH QUESTION

The analysis of stakeholder management in project management shows that managing stakeholders is vital to successfully executing various standout projects (Xia, Zou, Griffin, Wang, & Zhong, 2018). Many problems in projects can be avoided or reduced by observing stakeholders, identifying their expectations, and thinking about how to fulfill them, since stakeholders may define a project's success (Eskerod, Huemann, & Savage, 2015). Understanding stakeholders and analyzing their interests promotes better project management results and helps the creation and development of products accordingly (Elias, Cavana, & Jackson, 2002). Hence, to dive deeper in stakeholder management and their efficiency to improve project results, the project question of this study is *How stakeholder management can improve project performance?*

1.2 GOALS

1.2.1 GENERAL

The more general objective of this thesis is to analyze **how efficient stakeholder management activities can enhance project performance**. This objective is developed in the context of information technology project. Given the inefficiency of many projects to run the entire lifecycle as planned and accomplish outcomes expectations, it becomes vital to identify elements of project management that may diminish the inefficiency. With this objective, it is possible to determine the current state of the art of stakeholder management, the relations with project performance and propose new strategies to tackle part of the inefficiency.

1.2.2 SPECIFICS

The three core-specific objectives of this thesis are:

- Identify the state of the art of stakeholder management in project management context;
- Identify how the construct project performance is measured on literature and what are their antecedents;
- Propose and test a framework about the mediation role of stakeholder engagement and stakeholder salience and the relation between project management activities and IT project performance.

1.3 STRUCTURE

RESEARCH QUESTION How can stakeholder management improve project performance?							
MAIN GOAL Propose and test new relations between stakeholder management and project performance.							
JUSTIFICATION OF DISTINCTION				JUSTIFICATION OF INTERDEPENDENCE			
Title of the studies	Research Question	Specific Goals	Hypotheses and/or propositions	Sequential or simultaneous searches	Single or mixed method	Data collection Procedures	Data Analysis Procedures
Stakeholders and Project Management - Bibliometric analysis of two decades of publications	What are the main studies topics for stakeholders management papers over the last 20 years?	Execute longitudinal analysis about stakeholder management scientific literature in order to find principal authors, themes, and emerging trends;	N/A	Sequence	Unique	Researches on Web of Science	Bibliometric

Information Technology Project Performance: What Impacts the Results and How Are Being Measured	How project management practices affect project performance, according to the literature?	To find on literature the relationship project management and project performance;	N/A	Sequence	Unique	Researches on Web of Science and Scopus	Literature Review
Effects of Stakeholders' Management on Information Technology Project Results	How stakeholders may positively influence project performance	To test improvements in the PM/PP association when stakeholders are engaged to projects and whether salient stakeholders can positively contribute to such an association	12 hypotheses described in the study	Sequence	Unique	Survey	PLS Method

Figure 1. Methodologic Matrix (MM)

2 DEVELOPMENT

This chapter contains the three studies described in the introduction of this thesis.

2.1 STUDY 1: STAKEHOLDERS AND PROJECT MANAGEMENT – BIBLIOMETRIC ANALYSIS OF TWO DECADES OF PUBLICATIONS

2.1.1 INTRODUCTION

The analysis of stakeholder management (SM) in the context of project management shows that managing stakeholders is vital to the successful execution of various standout projects (Xia, Zou, Griffin, Wang, & Zhong, 2018). Many problems in projects can be avoided or reduced by observing stakeholders, identifying their expectations, and thinking about how to fulfill them, since stakeholders may define a project's success (Eskerod, Huemann, & Savage, 2015). Understanding stakeholders and analyzing their interests promotes better project management and helps products to be created and developed accordingly (Elias, Cavana, & Jackson, 2002). Freeman (1984) published a book encouraging a managerial team to consider and analyze groups or individuals who can affect or be affected by a company's objective. The concept of stakeholder analysis was embraced by project management theorists and practitioners, and this field of research has been increasing since then.

Stakeholder management does not only concern one specific project area, but several, being applied widely in different kinds of projects. One important area applying SM is the area of megaprojects, be it public or private; managing stakeholders can improve the results and impact of projects for people and places (Di Maddaloni & Davis, 2018). The stakeholder management theory, when applied to project research and development, can stimulate the interaction among stakeholders and the project team, creating a better understanding in terms of mutual interests and teaching the team how to address those interests when creating new products (Elias et al., 2002). Non-governmental organizations deal with complex projects that demand an increased project management maturity; the ability to manage stakeholders increases this maturity, hence creating a path for the project's success in the short and long

terms (Golini, Kalchschmidt, & Landoni, 2015). For projects involving software, the risks are higher because of technological changes; the stakeholders' expectations about software technology need to be considered in order to build the bigger picture and manage risks effectively (Vrhovec, Hovelja, Vavpotič, & Krisper, 2015). Therefore, managing stakeholders entails a considerable amount of goals, applications and theories used by practitioners and studied by researchers.

This study aims to provide academics and project management practitioners with an in-depth understanding of the research area for stakeholder management for projects, as well as its trends, its evolution through time, and structures of references. To achieve this result, I will apply a bibliometric analysis of papers related to SM in projects. Bibliometric analysis is a branch of research method that quantitatively analyzes patterns in scientific literature in order to understand emerging trends and the knowledge structure of a research field (Chen, Hu, Liu, & Tseng, 2012).

2.1.2 METHOD

In this study I applied bibliometric analysis, review and visualization to papers published about the SM area. The use of this technique allows me to create a science map about a specific area, aiming to reveal the structure and dynamics of a certain scientific field (Zupic & Čater, 2015). Bibliometric analysis is described as one of the most used methods to evaluate and examine the development of a research in a specific field.

The research design applied for this study is represented in Figure 2. All the papers analyzed in this study were retrieved from the Web of Science's (WOS) core collection database. The WOS's collection database contains the most important and influential journals in the world (Zhao, 2017). The first step was to run the queries *"stakeholder*"* and *"project management*"* from the period of 1998 to 2017. These queries resulted in 987 documents. The second step was to select the papers, excluding proceeding papers, reviews, book reviews and editorial material. After this exclusion, 480 papers were selected. The third step was to export the papers' information from the WOS's database, load it in CiteSpace, and run validation tests to check if all the data exported had been loaded successfully with the total number of registers. After the data was loaded and successfully validated, I used bibliometric analysis techniques to evaluate and discuss the results.

In this study, I used three distinctive bibliographic techniques: co-word analysis, co-citation analysis and cluster analysis. All of them are based on co-occurrence analysis techniques, which are used to measure the frequency of co-occurrence of keywords' pairs or noun phrases and other terms in the same document. Co-occurrence analysis assumes that when two items appear in the same context, they are related to some degree. Keyword co-word analysis is a content analysis technique. Co-cited cluster analysis is based on the construction of a network of invisible colleagues that may or may not cite each other; as this network develops and connects to co-cited authors, it defines how closely related the documents are about a specific area.

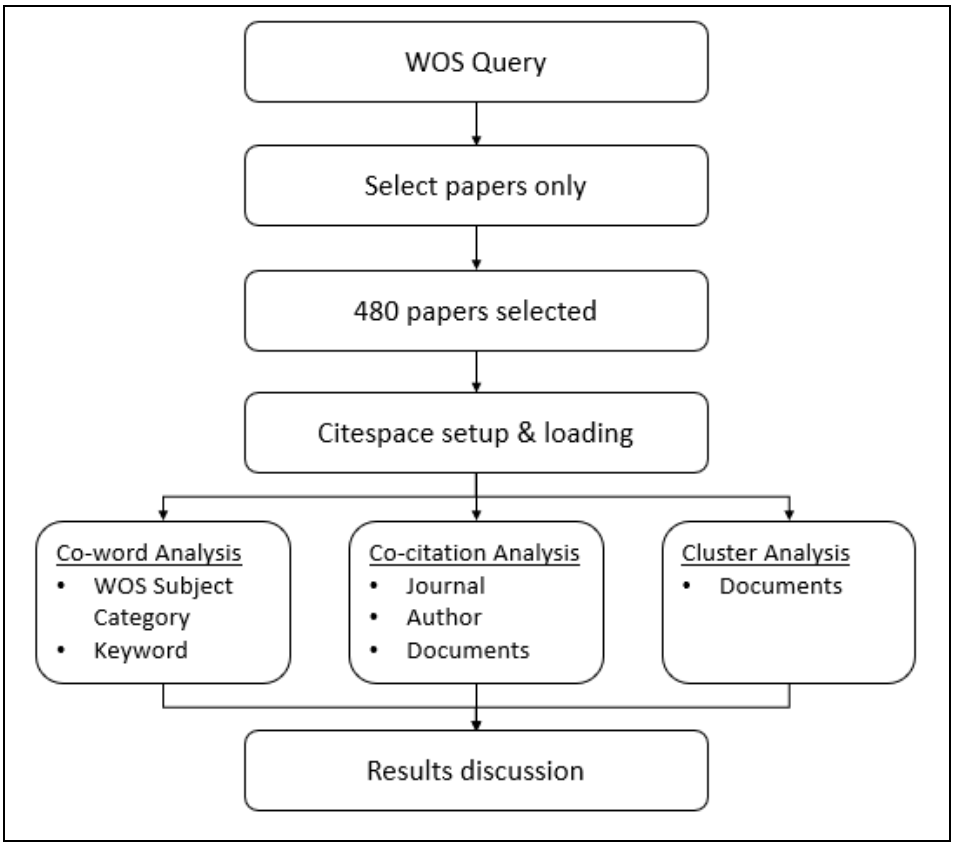

Figure 2 - Research Design

The definition of the period for the retrieved papers was based on the results of query tests over different periods. There were very few papers about stakeholder management in projects before 1998, and they were not published on a regular basis. Figure 3 shows the distribution of publications between 1998 and 2017. According to it, the distribution of papers was divided into two stages: The first stage shows the beginning of publications about SM in projects; over the years of 1998-2012, the number of studies increased in small proportions

annually. On the second stage, over the years of 2013-2017, we can see a quick and significant growth in the number of studies published. **Error! Reference source not found.** shows that the number of publications continues to increase annually and 63% of the total of publications were published over last 3 years. This increase indicates the relevance of the research field and the up-to-dateness of the theme.

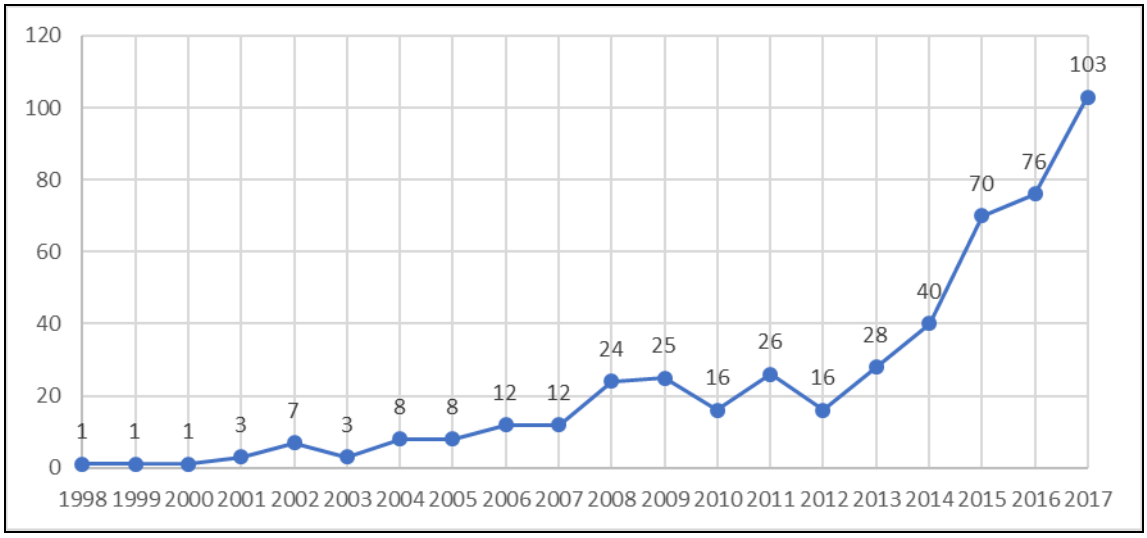

Figure 3 - Retrieved papers by year

The software CiteSpace was used to support the analyses in this study. This software helps researchers to analyze the contents of a scientific knowledge domain, allowing them to capture the notion of a logically and cohesively organized body of knowledge (Chen, 2006). Analyzing a scientific knowledge domain is an advantageous approach to discover the hidden implications in a piece of information and to trace development frontiers (Song, Zhang, & Dong, 2016). CiteSpace is adequate to map knowledge domains through the creation of various graphs and relationship views (Chen, 2006). I used CiteSpace version 5.18R to analyze the papers in this study.

2.1.3 RESULTS

2.1.3.1 Co-word analysis

2.1.3.1.1 Subject category co-occurrence

One or more subject categories are assigned for each article in the Thomson Reuters WOS database based on a corresponding journal using a journal classification system. For example, the International Journal of Project Management is assigned as “Management”.

Subject category co-occurrence analysis makes it possible to identify disciplines regarding the intellectual development of a certain knowledge domain (Liu, Yin, Liu, & Dunford, 2015). Figure 4 shows 31 nodes and 108 links, meaning that there are studies about SM published in 31 different disciplines. The size of the node is proportional to its co-occurrence frequency; the thickness of the ring, proportional to its co-occurrence time slice (Chen, 2006). The colors represent time; blue for older occurrences, orange for more recent ones. The colors of the links represent the first time co-occurrence happens between two nodes, and the thickness of the node is proportional to the frequency of co-occurrence. The purple ring around some nodes represents high betweenness centrality of the node; the thicker the ring, the stronger the betweenness centrality. Studies have shown that betweenness centrality can be used to identify potential turning points that may lead to transformative changes in the area.

While “Engineering” is not the biggest node, it is the subject category with greater betweenness centrality (0.79); this category contains 110 cited papers. Analyzing the top 5 most cited, we can find Baccarini, Salm and Love (2004), with 66 citations that affirm that managing stakeholders’ expectations helps to manage and mitigate key IT. Barlow, Bayer and Curry (2006), with 65 citations, analyzes the implementation of Telecare and how complex it is to manage innovation technology in an environment of diverse stakeholders. Eadie et. al (2013), with 64 citations, addresses the implementation of Building Information Modelling, and points out that one of the benefits of project implementation is financial benefits for stakeholders. Turner and Zolin (2012), with 61 citations, presents a study proposing a model to identify how stakeholders perceive a project’s success during its lifetime. The last paper of the top 5 most cited on the “Engineering” category is Faraj and Sambamurthy (2006),

presenting a paper about leadership in many circumstances; the authors address how to meet the expectations of a diverse set of stakeholders.

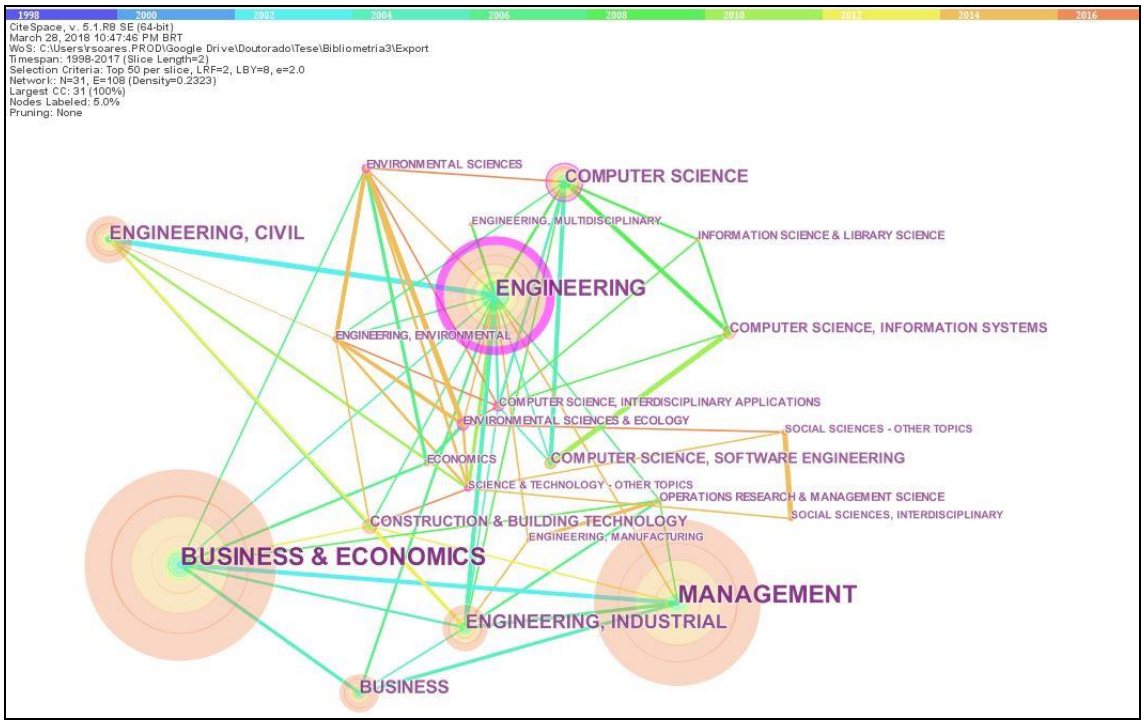

Figure 4 - Subject co-occurrence network

While “Engineering” is not the biggest node, it is the subject category with greater betweenness centrality (0.79); this category contains 110 cited papers. Analyzing the top 5 most cited, we can find Baccarini, Salm and Love (2004), with 66 citations that affirm that managing stakeholders’ expectations helps to manage and mitigate key IT. Barlow, Bayer and Curry (2006), with 65 citations, analyzes the implementation of Telecare and how complex it is to manage innovation technology in an environment of diverse stakeholders. Eadie et. al (2013), with 64 citations, addresses the implementation of Building Information Modelling, and points out that one of the benefits of project implementation is financial benefits for stakeholders. Turner and Zolin (2012), with 61 citations, presents a study proposing a model to identify how stakeholders perceive a project’s success during its lifetime. The last paper of the top 5 most cited on the “Engineering” category is Faraj and Sambamurthy (2006), presenting a paper about leadership in many circumstances; the authors address how to meet the expectations of a diverse set of stakeholders.

There are others subject categories with significant betweenness centrality; “Computer Science” is the second greatest one (0.40), containing 42 co-occurrences. In third place is the subject category “Engineering, Industrial” with betweenness centrality of 0.37. In fourth,

“Engineering, Civil” with betweenness centrality of 0.27. The other subject categories did not present significant betweenness centrality.

Figure 5 shows the top 10 subject categories classified by frequency of co-occurrence. Analyzing the numbers allows us to find the most recurring areas being cited on papers. “Business & Economics” is the greatest one; according to WOS, this subject category includes the topics of business ethics, business history, electronic business and commerce, international business, developing economies, forecasting, economic statistics, monetary economics, common market studies, and real estate economics.

Number of Occurrences	**Subject Category**
192	BUSINESS & ECONOMICS
171	MANAGEMENT
110	ENGINEERING
56	ENGINEERING; CIVIL
54	ENGINEERING; INDUSTRIAL
42	BUSINESS
42	COMPUTER SCIENCE
20	CONSTRUCTION & BUILDING TECHNOLOGY
20	COMPUTER SCIENCE; SOFTWARE ENGINEERING
16	COMPUTER SCIENCE; INFORMATION SYSTEMS

Figure 5 - Occurrence by subject category

Time-zone view can be used to highlight temporal patterns analysis (Chen, 2006). Figure 6 ows the time-zones for each subject category. For this chart, only the subject categories with 7 or more co-occurrences are represented. Each grid represents a span of 2 years, starting from 2000 and going all the way to 2017. The placement of each node represents the date the co-occurrence started. This view allows us to notice that SM in projects began in 2002, in the categories “Engineering”, “Engineering, Civil”, “Business & Economics” and “Management”. The most recent subject categories regarding SM in projects are “Social Sciences” – ‘Other Topics’, ‘Social Sciences Interdisciplinary’ and ‘Engineering Manufacturing’.

It is then possible to conclude that the multiple Engineering areas were the precursors on publishing materials about SM in projects, and the most recent areas to do so are related to Social Sciences. For engineering-related areas, SM studies cover the following topics: Risk mitigation (Nielsen, 2004), financial return (Eadie et al., 2013), software development (Baccarini et al., 2004; Jørgensen & Moløkken-Østvold, 2004; Patnayakuni, Rai, & Tiwana, 2007), etc. For social sciences, the topics covered are: Biology projects (Görg et al., 2014), project learning using simulation (Geithner & Menzel, 2016) and multi-stakeholder approaches for projects regarding tourism development (Hummel & van der Duim, 2016).

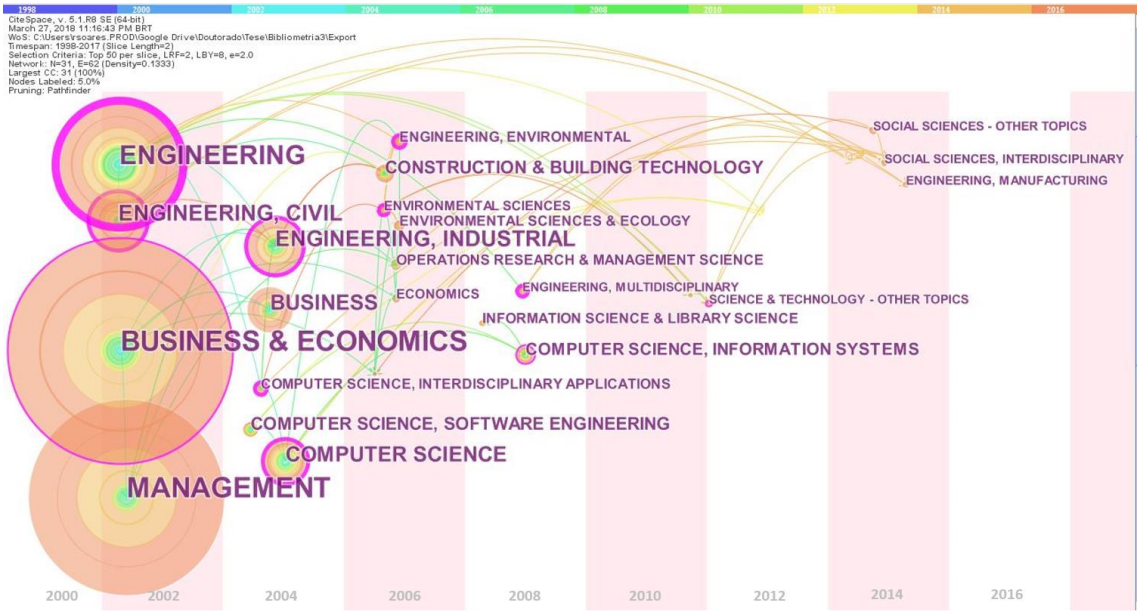

Figure 6 - Subject category time-zone

2.1.3.1.2 Keyword analysis

Analyzing keywords can help the researcher to find research frontiers and hot topics regarding a specific area (Xie, 2015). Keywords are used to show the core contents of articles, and analyzing these contents allows researchers to observe the development of research topics over time (Zhao, 2017). There are two types of keywords in the WOS database: The first one, keywords added by authors, called “Authors Keyword”; they are codified with DE. The second one, keywords added by journals, called “Keyword Plus”; these are codified with ID. For this analysis I am using both types, DE code and ID code.

To normalize the data, I applied an alias for similar keywords. The criteria used for the alias was to use same words with different spellings, and different words with similar meanings or spelling correction. Appendix 1 shows the list of aliases applied for the

keywords' co-occurrence analysis. After applying the aliases, we were left with 98 different keywords to analyze.

Figure 7 shows the top 10 most frequently used keywords on the scientific papers researched. It is possible to notice that only 5 of the top 10 keywords were used for the first time before 2008. After 2012, the frequency of usage for each keyword increased. The keywords 'project management' and 'information technology' first appeared in 2004. In 2006, the topics 'organization', 'performance' and 'model' show up. After 2008, 'success' followed by 'risk management', 'construction', 'management' and 'framework' appear.

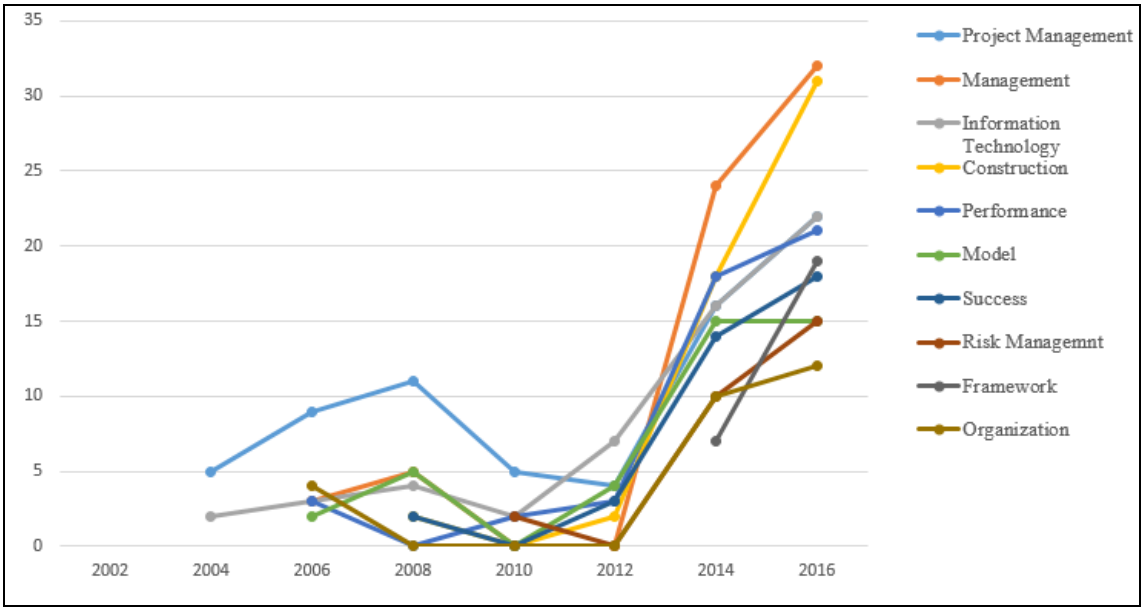

Figure 7 - Top 10 keywords by frequency

Keyword co-occurrence network analysis was used to identify the frequency, betweenness centrality and relationship between the keywords. Figure 8 shows 98 nodes and 224 links; the size of the node represents keyword frequency and the colors of the links represent when the linked keywords were first cited together. To scale down the network and reduce redundant links I used the pathfinder utility. Among the pruning utilities available in CiteSpace, pathfinder is regarded as the best option (Olawumi & Chan, 2018).

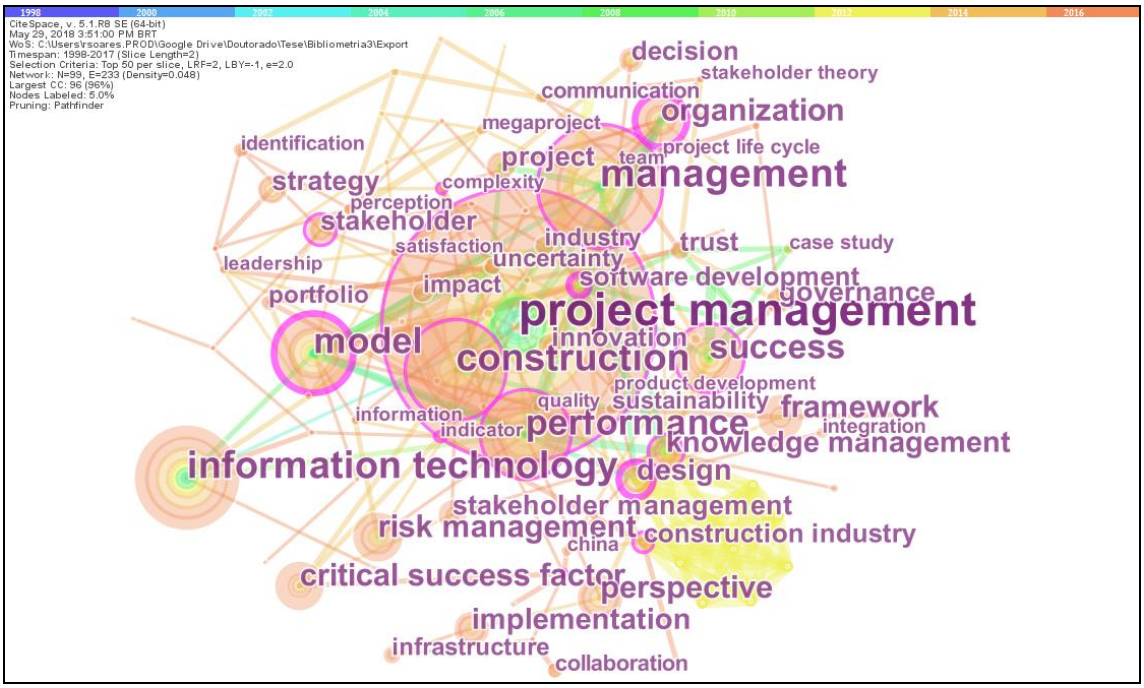

Figure 8 - Keywords co-occurrence network

The nodes with purple rings around them indicate betweenness centrality. This centrality tends to be intellectual turning point documents, which act as bridges in the development of a scientific field, linking researches from different time periods. Nodes with high betweenness centrality values tend to identify boundary spanning potentials that may lead to transformative discoveries (Chen, 2017). Turning point documents tend to be critical in intellectual transitions from one timeframe to another. The thickness of the purple ring is proportional to the intensity of centrality: the thicker the ring, the stronger the betweenness centrality. Small nodes with thicker purple rings indicate that intellectual pivotal documents do not necessarily have high citation scores (Liu et al., 2015).

The top 5 greatest betweenness centrality, in descending order, are: ‘software development’, ‘model’, ‘design’, ‘organization’ and ‘indicator’. ‘Software development’, as the name indicates, are papers regarding projects for software development. Papers about this area describe how to get a hold of stakeholders’ expectations and share the information among complex and diffused teams (Faraj & Sambamurthy, 2006; Parolia, Goodman, Li, & Jiang, 2007; Patnayakuni et al., 2007). Papers containing the keyword ‘model’ are related to different areas like construction, economy, and system management. These papers most commonly propose models to identify, gather and distribute stakeholders’ requirements and expectations (Oliveira, Lopes, Sousa, & Abreu, 2017; Turskis, 2008; Zavadskas, Turskis, & Tamošaitiene, 2008). Most of the studies containing the keyword ‘design’ also contain the

keyword ‘model’. Both of these keywords are not added by authors, but by journals, to identify papers proposing systems to gather, organize, classify, and distribute project management and stakeholder information. The way these keywords are organized come from papers adopting these keywords and applying project management theory and other theories of strategy management to them. For example, project management and agency theories (Biesenthal & Wilden, 2014), and project management and organization theories (Müller & Lecoeuvre, 2014). Papers containing ‘indicator’ as a keyword present studies regarding project performance or project success measurements (Carvalho & Rabechini Junior, 2015; Rashvand & Zaimi Abd Majid, 2013).

Since keywords provide information about the core content of an article, analyzing keywords over time can be useful to identify when new topics emerge on the field of SM studies. Figure 9 shows the results obtained from the time-zone analysis; the placement of each keyword indicates its first-time appearance and the size of each circle represents the number of occurrences. From this figure, we can observe how the number of different topics being studied for stakeholder management is increasing.

What is interesting about Figure 9 is that we can observe what the initial themes discussed in SM articles were, and monitor the most recent ones. Topics concerning SM studies started to be relevant in the area of application, such as information technology, software development and constructions. These topics were given even greater relevance through the application of SM in the measurement of project results and enhancement of performance, occurring on themes like success, model, design, performance, and organization. Analyzing the last 4 years of new keywords, it is possible to notice an exponential increase of new themes. This timeframe is important because we can compare it with the first studies, and observe the change in themes from specific SM applications and performance measures to themes that discuss how to influence stakeholders, improve results, and change negative aspects. These topics are discussed in studies containing keywords like ‘perception’, ‘collaboration’, ‘identification’, ‘leadership’, ‘satisfaction’, ‘resilience’, ‘stakeholder theory’, ‘relationship’ and ‘integration’.

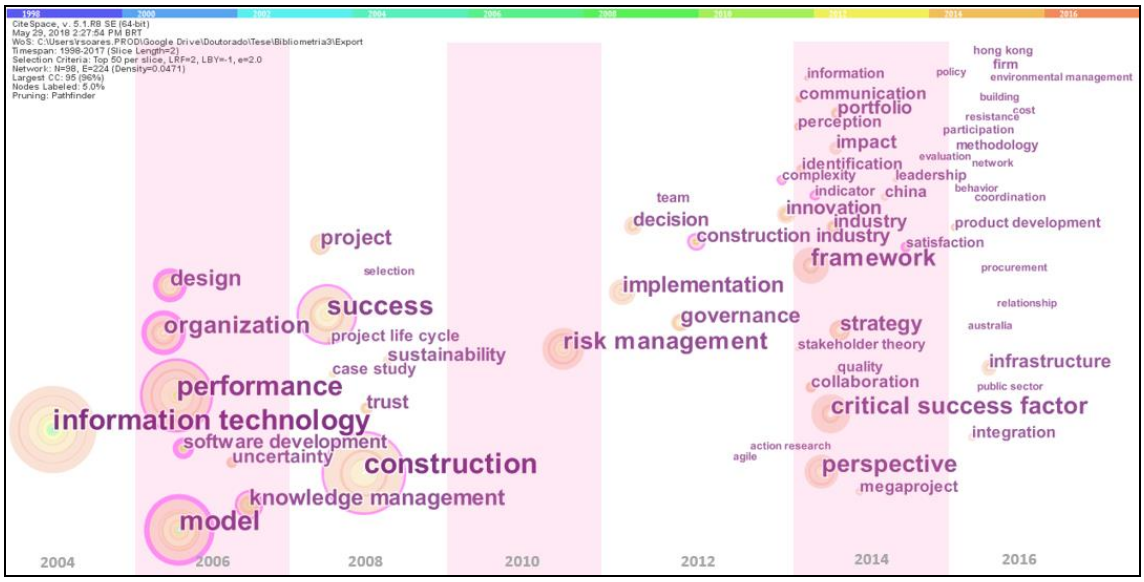

Figure 9 - Keywords time-zone

2.1.3.2 Co-citation analysis

This section presents co-citation analysis. This analysis identifies three types of relationships – co-cited journal, co-cited authors and co-cited papers – based on referenced journals, authors and papers (Song et al., 2016). In addition to this, I performed cluster analysis based on the results of the co-citation analysis. You can use co-citation analysis to find papers, documents and journals that are related to each other on a same context, even though they do not cite each other. A fundamental assumption of co-citation analysis is that the more two items are cited together, the more likely it is that their content is related (Batistič, Černe, & Vogel, 2017)

2.1.3.2.1 Journal co-citation

Journal co-citation analysis can be used to map journals that are the domain of a specific area of knowledge. By identifying frequently cited journals, we can determine important information and insights to create an intellectual base of a knowledge domain (Liu et al., 2015). As already mentioned, the journal co-citation information presented on this section is created based on the references of the analyzed papers.

As shown in Figure 10, there are 166 nodes, representing one journal per node, followed by 518 links among the nodes, representing journal co-citations. The colors of the links represent the years of the co-citations – blue for oldest, orange for newest.

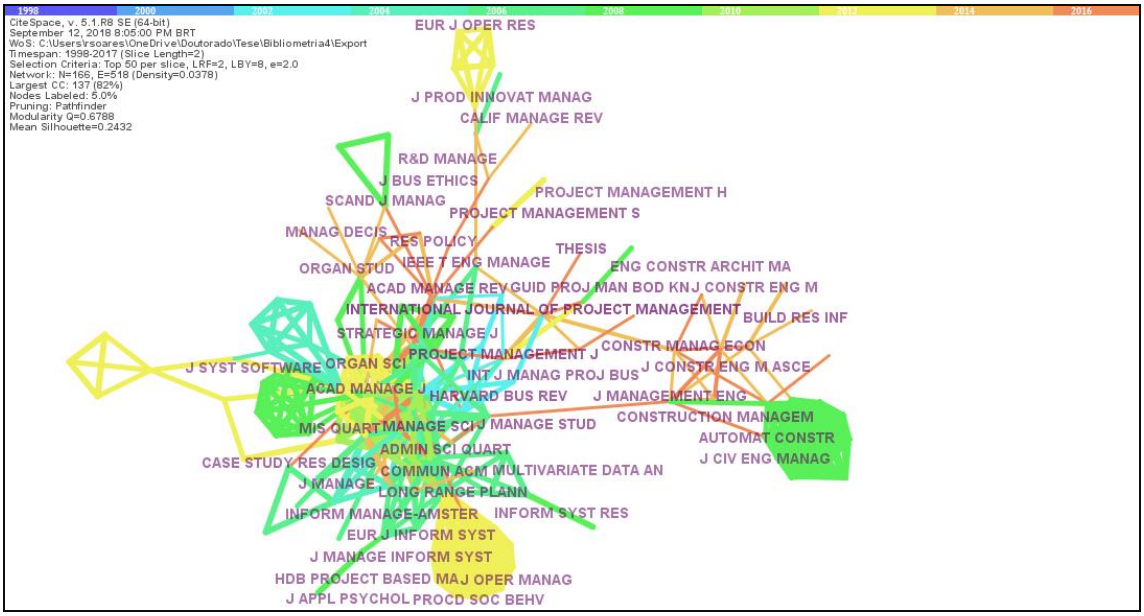

Figure 10 - Journal co-citation network

Figure 11 shows two important pieces of information about journals concerning the area of SM in projects. The first one is the top 20 cited journals, with The International Journal of Project Management highlighted as the most cited one. The second, is the betweenness centrality; journals with higher centrality have more links with other journals. This centrality classifies journals that are not related to a niche and are cited from journals of different areas. The journals with greater centrality are the International Journal of Project Management, the Academy Management Journal, the Strategic Management Journal, the Automation in Construction, and the Project Management Journal.

Citation	Centrality	Journal	Impact Factor*
215	0.31	INTERNATIONAL JOURNAL OF PROJECT MANAGEMENT	4.328
157	0.05	CONSTRUCTION MANAGEMENT AND ECONOMICS	1.210
134	0.10	PROJECT MANAGEMENT JOURNAL	1.957
95	0.07	ACADEMY OF MANAGEMENT REVIEW	8.855
69	0.27	ACADEMY OF MANAGEMENT JOURNAL	6.700

68	0.02	JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT	2.201
64	0.08	JOURNAL OF MANAGEMENT ENGINEERING	1.560
63	0.23	STRATEGIC MANAGEMENT JOURNAL	5.482
61	0.05	MANAGEMENT SCIENCE	3.544
56	0.00	ORGANIZATION SCIENCE	3.027
52	0.14	IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	1.416
51	0.02	INTERNATIONAL JOURNAL OF MANAGING PROJECTS IN BUSINESS	1.321
46	0.18	AUTOMATION IN CONSTRUCTION	4.032
41	0.02	ADMINISTRATIVE SCIENCE QUARTERLY	5.878
41	0.06	MIS QUARTERLY: MANAGEMENT INFORMATION SYSTEM	5.430
40	0.01	RESEARCH POLICY	4.661
40	0.01	HARVARD BUSINESS REVIEW	4.374
40	0.00	ENGINEERING, CONSTRUCTION AND ARCHITECTURE MANAGEMENT	1.613
37	0.04	BUILDING RESEARCH & INFORMATION	3.468
34	0.10	COMMUNICATIONS OF THE ACM	3.063

Figure 11 - Top 20 cited journals

*Source: InCites Journal Citation Reports 2017

2.1.3.2.2 Author co-citation

Author co-citation analysis aims to identify interrelationships between individual authors in a research field. By measuring the number of occurrences of co-citations, it is possible to identify interconnections between individual works that may or not cite each other. The more two authors are co-cited, the closer they are intellectually related (Liu et al., 2015). This analysis offers important information for understanding and representing the intellectual structure basis of the research on SM in projects.

Figure 12 shows the author co-citation network, containing 209 authors and 572 links of co-citation. The top 30 co-cited authors are named in the network. The size of the letters represents the frequency of citations of each author and, just like on the previous networks, the links' colors represent the dates of the co-citations.

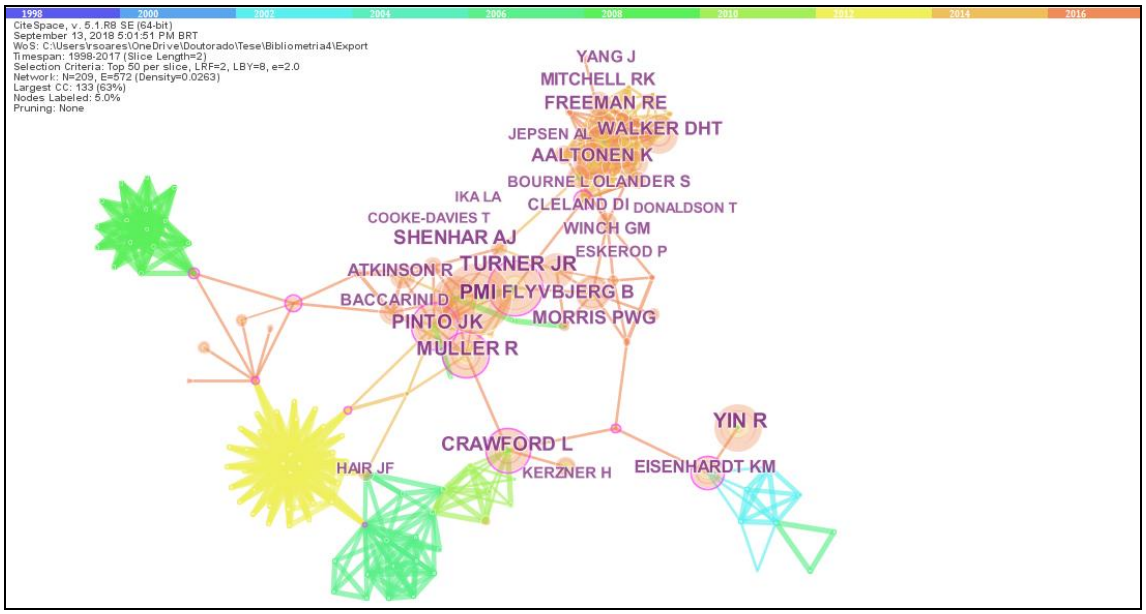

Figure 12 - Author co-citation network

Figure 13 shows the level of influence of each author. They are ordered by frequency of citation, betweenness centrality, the first year of each citation, and author name. The betweenness centrality is an important aspect to be analyzed because, as mentioned before, it represents the degree of where each node stands between each other. The more centrality on the author co-citation network, the more influence he has on the analyzed area.

Citation	Centrality	Year	Author
71	0.00	2006	PMI
52	0.14	2008	TURNER JR
52	0.00	2006	YIN R
45	0.03	2006	SHENHAR AJ
45	0.19	2006	PINTO JK
43	0.10	2012	MULLER R
41	0.16	2008	CRAWFORD L
36	0.01	2008	FLYVBJERG B
36	0.02	2008	FREEMAN RE
36	0.02	2014	AALTONEN K
36	0.00	2014	WALKER DHT
34	0.04	2012	MORRIS PWG
33	0.10	2002	EISENHARDT KM
28	0.00	2012	ATKINSON R
28	0.03	2014	MITCHELL RK
26	0.01	2014	OLANDER S

26	0.09	2008	BACCARINI D
25	0.00	2014	YANG J
24	0.08	2008	CLELAND DI
23	0.04	2007	WINCH GM
22	0.00	2008	KERZNER H
21	0.00	2011	WINTER M
20	0.00	2014	BOURNE L
20	0.01	2014	JEPSEN AL
19	0.10	2014	ESKEROD P
19	0.07	2007	HAIR JF
18	0.02	2008	COOKE-DAVIES T
18	0.00	2014	TOOR SUR
17	0.00	2014	DONALDSON T

Figure 13 - Top 30 cited authors

2.1.3.2.3 Document co-citation

Document co-citation is used to analyze the fundamentals of the intellectual structure of a knowledge domain, demonstrating quantities and authorships of references cited by publications. This analysis also enables us to visualize the most significant studies about a specific area and the co-cited references derived from papers.

The collection of papers for this analysis contains 14,695 citations. Figure 14 demonstrates the top 20 most co-cited documents in the SM area retrieved from this collection, according to the WOS citation metric. The Project Management Institute (2013) is the most cited one; this document is a collection of processes, best practices, terminologies, and guidelines that are accepted as standard within the project management industry. The previous version of this document is the fourth most cited document. Papers about method are also among the most cited ones. Eisenhardt (1989) is the fifth – this paper describes the process of inducting a theory using a case study, like Yin (2003), whose main subject is exactly case studies, and Fornell and Larcker (1981), who describe Structural Equation Models. Mitchell et al. (1997) is the second most cited one; this document proposes a typology of stakeholders, combining power, legitimacy and urgency. The third most cited one is Freeman (1984); this book is known as the fundamental study on stakeholder management theory.

Co-Citations	Centrality	Author	Year	Title	Source	Doc. Type
33	0.00	Project Management Institute	2013	A Guide to the Project Management Body of Knowledge: PMBOK® Guide	Project Management Institute	Book
28	0.01	Mitchell et al.	1997	Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts	Academy of Management Review	Journal Article
27	0.07	Freeman	1984	Strategic management: A stakeholder perspective	Pitman	Book
27	0.00	Project Management Institute	2008	A Guide to the Project Management Body of Knowledge: PMBOK(R) Guide	Project Management Institute	Book
23	0.00	Eisenhardt	1989	Building theories from case-study research	Academy of Management Review	Journal Article
22	0.22	Cooke-Davies	2002	The “real” success factors on projects	International Journal of Project Management	Journal Article
20	0.07	Bourne and Walker	2005	Visualising and mapping stakeholder influence	Management Decision	Journal Article
19	0.21	Atkinson	1999	Project management: cost, time and quality, two best guesses and a phenomenon, it’s time to accept other success criteria	International Journal of Project Management	Journal Article
18	0.02	Olander and Landin	2005	Evaluation of stakeholder influence in the implementation of construction projects	International Journal of Project Management	Journal Article
17	0.03	Aaltonen et al.	2008	Stakeholder salience in global projects	International Journal of Project Management	Journal Article

17	0.02	Jepsen and Eskerod	2009	Stakeholder analysis in projects: Challenges in using current guidelines in the real world	International Journal of Project Management	Journal Article
16	0.00	Yin	2003	Case Study Research: Design and Methods	SAGE	Book
15	0.02	Aaltonen and Sivonen	2009	Response strategies to stakeholder pressures in global projects	International Journal of Project Management	Journal Article
15	0.00	Winter et. al.	2006	Directions for future research in project management: The main findings of a UK government-funded research network	International Journal of Project Management	Journal Article
14	0.21	Fornell and Larcker	1981	Evaluating Structural Equation Models with Unobservable Variables and Measurement Error	Journal of Marketing Research	Journal Article
14	0.09	Littau et al.	2010	25 Years of Stakeholder Theory in Project Management Literature (1984-2009)	Project Management Journal	Journal Article
14	0.03	Donaldson and Preston	1995	The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications	Academy of Management Review	Journal Article
14	0.01	Shenhar and Dvir	2007	Reinventing Project Management: The Diamond Approach To Successful Growth And Innovation	Harvard Business Review Press	Book
13	0.11	Olander	2007	Stakeholder impact analysis in construction project management	Construction Management and Economics	Journal Article
13	0.05	Lim and Mohamed	1999	Criteria of project success: an exploratory re-examination	International Journal of Project Management	Journal Article

Figure 14 - Top 20 co-cited documents

2.1.3.3 Document co-citation cluster

The cluster analysis technique is used in this study to analyze pertinent contexts and to identify trends and their relationships with the SM research field. The network is designed containing 480 documents, from 14,789 references cited by the papers analyzed in this study. Figure 15 shows the network and the 8 clusters found. Figure 16 shows the clusters' names, descriptions, number of documents, and top 3 most relevant documents for each cluster.

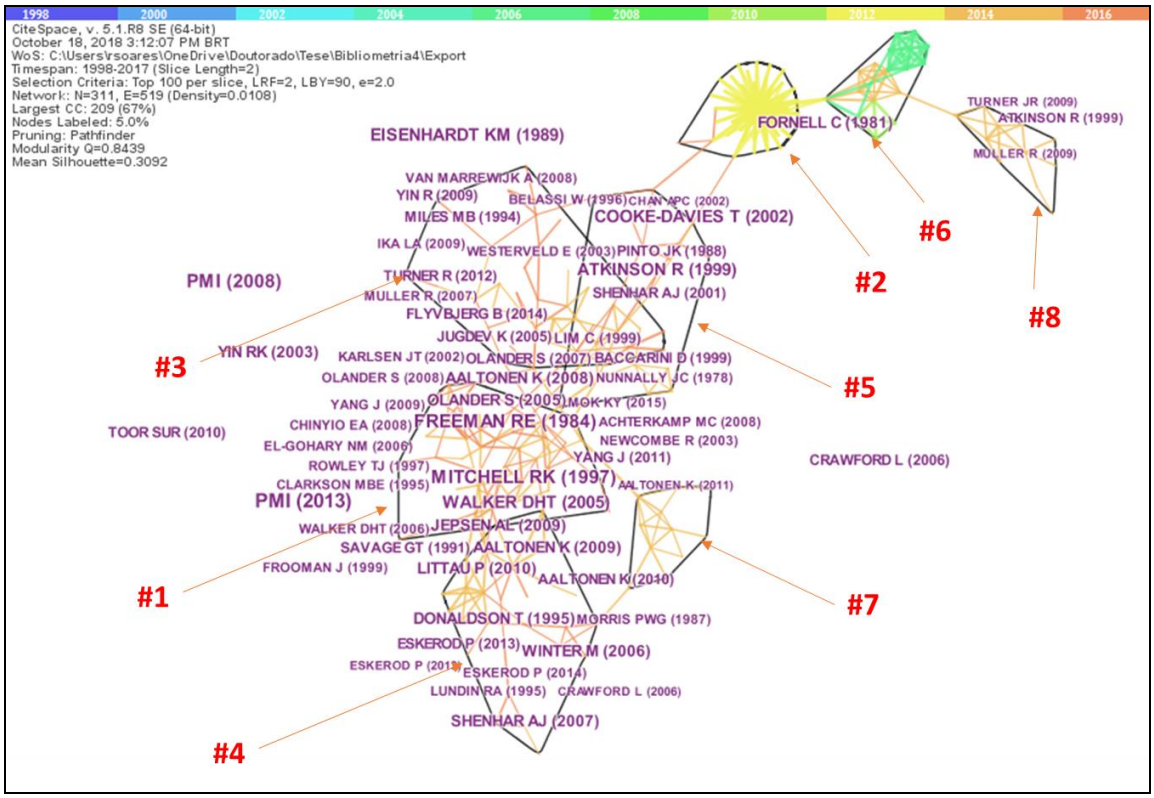

Figure 15 - Co-citation clusters network

Cluster #1 incorporates the theme 'stakeholder analysis', which explores how to understand and analyze stakeholders and their influence on projects' results. Most of its documents are specifically related to the area of construction projects. Elias et. al. (2002) is the central author of this cluster and applies 3 levels of Freeman's (1984) stakeholders' analysis to understand the impact stakeholders' interests have over R&D projects' results. Olander & Landin (2005) utilizes the power/interest matrix to investigate how stakeholders can influence two cases of construction projects. Manowond & Ogunlana (2010) presents several construction projects cases, advocating for stakeholder management and discussing

different aspects of this practice. The most recent document cited on this cluster is Mok et al. (2015), analyzing the latest research development of SM in mega construction projects.

Cluster #2 talks about project success and contains documents that propose how to measure or reach project success. De Wit (1988) presents a discussion about project success and project management success; the author determines that finding the stakeholders' goal throughout the project lifecycle is an important measure for success. Belout & Gauvreau (2004) present on their paper the impact of human resources management on a project's success, defining this management as a strategic role. Abalo et al. (2007) proposes a technique to identify the most important attributes of products or services, and where costs can be cut without affecting quality. The most recent document in this cluster is Alzahrani & Emsley (2013); the authors conduct a survey for practitioners on the construction industry to identify the impact of the contractor's attributes on a project's success.

Cluster #3 contains documents about how project management practices affect project and/or company performances. Nunnally (1978) is the main document in this cluster because it is used to support methods used for other papers in this and other clusters. The book talks about psychometric theory. Jugdev & Müller (2007) assesses 40 years of project management to discuss conditions for success and identify the use of program and portfolio management and individual projects that impact on companies' results. Golini et al. (2015) is the third most important document in the cluster, as well as the most recent citation. The authors conduct a survey for more than 500 practitioners to understand the impact of project management practices on non-governmental organizations.

Cluster #4 contains documents presenting distinct approaches on stakeholder management. Pernille Eskerod, a professor at the Webster Vienna Private University, is the most important author in this cluster, having written 3 of the main documents. Eskerod & Huemann (2013) analyzes how various approaches to stakeholder management are included in internationally-used project management standards. Eskerod & Jepsen (2013) is the second main document, where the authors present ways to improve stakeholder management and show how to adopt an analytical and structural approach to it. Eskerod & Vaagaasar (2014) writes an in-depth case study on how to apply strategies to develop a favorable relationship with each stakeholder. The most recent document in this cluster is Yang et al. (2014), where the authors identify, from the practitioners' perspective, three stakeholders' attributes and four stakeholders' behaviors to deal with when balancing stakeholders' claims.

Cluster #5 contains documents about elements that affect a project's success. This cluster presents themes that are close to cluster #2, focusing on two separate topics: project

success and project management success. Baccarini (2004) presents a logical framework method containing four levels of project objectives, two regarding project success, and two regarding project management success. Cooke-Davies (2002) investigates more than 70 organizations and identifies 12 factors that are critical to a project's success. Atkinson (1999) proposes a framework to evaluate a project success' criteria for information technology projects. The most recent document in this cluster is Mir & Pinnington (2014); this paper presents a multi-dimensional framework to measure project management performance and its correlation with project success.

Cluster #6 contains documents presenting computational models to evaluate project results. Its main document is Fornell & Larcker (1981), where the authors present statistical tests used in the analysis of structural equation models. This paper is about the area of marketing studies, and it is the central document in the cluster due to its support method for other papers. Wallace et al. (2004) developed and tested a model to measure software project risks and their links with project performance. Henderson & Lee (1992) tests the coexistence between management and team-member control, concluding that both affect the information system project performance in a positive manner. The most recent document in this cluster is Jiang et al. (2009), where the authors present a model to identify difference of perceptions about users and developers in software development projects, and how to address difficulties before a project starts.

Cluster #7 is about how leadership can influence and affect the project's results. Müller & Turner (2010) is the main and most recent document in this cluster, examining the leadership competency profiles of successful project managers in different types of projects. Keegan & Den Hartog (2004) compares the relationship between transformational leadership style and employee motivation, as well as commitment and stress for employees. Brill et al. (2006), using the Delphi web-based method, explores the competencies required for a project manager to be effective in the project.

Cluster #8 contains documents about management theory and how to stablish project governance. Its main document is Ouchi (1980); using the organization theory and transaction costs approach, the authors evaluate organizations according to efficiency. In this book, Muller (2009) provides a framework to explain the different preferences that organizations have when it comes to setting goals, along with the best practices, roles and responsibilities related to governance tasks. Clegg et al. (2002) reports an example of governmentality applied to project management, combining transaction costs and resource dependence. The most recent document is Müller et al. (2013); studying 9 qualitative cases, the authors investigate a

variety of ethical decisions made by project managers and their impact on corporate and project governance structures.

ID	Cluster	Description	Qty	Top 3 Central References
1	Stakeholder Analysis and Construction Projects	Explore how to understand and analyze stakeholders and their influence on projects' results.	43	Elias et. al. (2002) Olander & Landin (2005) Manowond & Ogunlana (2010)
2	Project Success	This cluster contains documents that propose how to measure or reach project success.	42	De Wit (1988) Belout & Gauvreau (2004) Abalo et al. (2007)
3	Project Management Practices	Documents about project management practices and how to impact project and/or company performances.	35	Nunnally (1978) Jugdev & Müller (2007) Golini et al. (2015)
4	Stakeholder Management Strategies	This cluster contains various approaches on stakeholder management	28	Eskerod & Huemann (2013) Eskerod & Jepsen (2013) Eskerod & Vaagaasar (2014)
5	Success Elements	Documents about what are the elements that affect a project's success	21	Baccarini (2004) Cooke-Davies (2002) Atkinson (1999)
6	Information System Projects	Documents presenting studies about performances on Information System projects.	18	Fornell & Larcker (1981) Wallace et al. (2004) Henderson & Lee (1992)
7	Leadership	How leadership can influence and affect projects' results	11	Müller & Turner (2010) Keegan & Den Hartog (2004) Brill et al. (2006)
8	Project Governance	This cluster contains documents about management theory and how to stablish project governance	11	Ouchi (1980) Muller (2009) Clegg et al. (2002)

Figure 16 - Clusters' Description

2.1.4 CONCLUSIONS

Stakeholder management in projects has been receiving increasing attention from academics and practitioners. This study explores 20 years of documents from this area through a bibliometric analysis, reviewing a total of 480 papers from the WOS database. I

used co-word analysis and co-citation analysis to understand the status and trends of the SM research area.

Applying longitudinal co-word analysis for subject categories and keywords using data from Figure 6 and Figure 9, it is possible to observe the evolution of this theme. The first discussions about this topic happened in the areas of engineering, management, and construction. Two years after its starting point, SM started to be discussed in the areas of computer science and software engineering, with focus on performance, model, success, project and information technology, organization, and construction. Project, information technology, construction, etc. are highlighted because before these topics appeared, SM was not being discussed in journals for specific types of projects; because of this, the authors point out on their journals that they were discussing SM from the projects' perspective, as well as their impact on projects of construction or information technology. After that, journals about SM in the environment, economics, information science, and social sciences started being published. With these publications, other areas started talking about SM, like communication, complexity, identification, behavior, quality, collaboration, etc. The longitudinal co-word analysis helps us to understand the evolution of SM studies and what the actual main topics in the area are.

The results stemming from the co-word analysis show the evolution of the studies in the SM area. From 1998 to 2010, most of the themes discussed like performance, knowledge management, model, success, etc., came from a passive management perspective on stakeholders. After 2010, these themes took on an active role on project management, like leadership, communication, collaboration, perspective, relationship, coordination, etc. This evolution shows that these studies started to focus more on how to understand stakeholders and how they influence results. Most recent studies also show us the need of an active relationship between management and stakeholders to achieve goals and success.

Applying co-citation analysis in this study reveals the most influential journals as references for the SM area. Two of the most influential journals about the topic are related to the area of project management: The International Journal of Project Management, and the Project Management Journal. Due to active publishing regarding construction projects, journals related to engineering are on the list of most influential, like the Construction Management and Economics, the Journal of Engineering and Management, and the Journal of Management Engineering. Other important journals related to strategic management are: The Academy of Management Review, the Academy of Management Journal, and the Strategic Management Journal.

Document co-citation analysis shows us the most influential papers about SM, like the Project Management Institute (2013). This version of the guide added SM as a field of knowledge for the first time. Mitchell et al. (1997) is the second most influential paper, followed by Freeman (1984), who is a reference when it comes to the definition stakeholder management.

Clustering co-cited documents allows us to organize references in same context and find similarities between them. This study aggregated 8 distinct clusters, as described in Figure 16, and with it we can identify the specific themes, main documents, and most recent documents of each one. Cluster 2 and cluster 5 are similar – both of them approach the theme of project performance. The documents on these clusters propose models to measure success, identify factors that can bring risks, and test correlations for independent variables that can affect a project's success. Professor Pernille Eskerod has a high influence in cluster 4, which involves papers about stakeholder management strategies.

We identify the most recent documents in each theme to understand what the recent discussions about them are, and possible ways that these themes can evolve from now on. Due to stakeholder management being a recent theme, with an increase in publications happening only in 2012, none of the clusters are spent. Analyzing recent publications and references allows us to find gaps for studies, comprehension, and further publications to develop the SM area.

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APPENDIX A – Keyword alias

ALIAS	KEYWORD
construction	construction industry
	construction project
	construction project
	construction management
governance	governance of project
	project governance
risk management	Risk
success	project success
	Success
portfolio	portfolio management
success	project success
information technology	Technology
	information system
	System
software development	global software development
decision	decision tree
	decision making
knowledge management	Knowledge
	project management knowledge
critical success factor	success factor
	success criteria
project lifecycle	Lifecycle
importance performance analysis	importance-performance analysis
performance	project performance
project management	project management
infrastructure	infrastructure project
	infrastructure delivery

2.2 STUDY 2: INFORMATION TECHNOLOGY PROJECT PERFORMANCE: WHAT HAS IMPACT ON RESULTS AND HOW SUCH IMPACT HAS BEEN MEASURED

2.2.1 INTRODUCTION

Information Technology Project performance (ITPP) has gained different definitions in the literature. It has been traditionally defined based on scope, budget and schedule targets; however, practitioners and researchers have suggested to broaden this definition in order to include business value results in it (Reich, Gemino, & Sauer, 2014). Project performance can be related to both processes (due to management practices) to project product results (Gemino, Reich, & Sauer, 2008). Process performance describes how well processes set to develop Information Technology (IT) projects, such as iron triangle scope, time and budget, are undertaken by covering project management activity results (Liu, 2015). Product performance describes the quality of products generated by IT, how such products are evaluated by stakeholders, as well as add value to business and fit quality criteria (Liu & Deng, 2015).

Measuring ITPP is challenging due to the diversity of factors related to planning, controlling and measuring results. ITPP depends on factors other than just a single successful or failed factor (Liu, 2015). Successful project outcomes depend on several factors affected by project managers' competences, by project teams comprising individual and group skills and by organizational skills that create an environment that affects project activities and results (Hadad, Keren, & Laslo, 2013). Many studies in the literature measure ITPP as success or failure factor, as well as how project variables likely drive success or failure (Sewchurran & Barron, 2008; Chen, Law, & Yang, 2009; Araújo & Pedron, 2015; Hidding & Nicholas, 2017; Foote & Halawi, 2018). Other studies define project performance as dependent variable used to test the effectiveness of any assessed construct in project results (Gemino et al., 2008; Lechler & Dvir, 2010; Heim, Mallick, & Xiaosong Peng, 2012; Aubry & Brunet, 2016; Nabelsi, Gagnon, & Brochot, 2017; Wei, Du, & Bao, 2018). It is possible finding many ways to measure project performance and to relate it to project practices, human skills and organizational factors. It is important taking into consideration that project performance

changes due to the degree of fitting to planned and expected results in order to achive effective project performance mesurements (Sicotte & Langley, 2000).

The present systematic review on ITPP was run to identify how performance has been measured and related to project management constructs. Data were collected at Web of Science and Elsevier Scopus databases, based on retrieving blind review journals regarding IT projects and performance results. The aim of the current study was to answer the question about IT project practices identified in the literature as ITPP impacting and the variables used to measure it. Connections between project practices and performance variables were analyzed to draw a relationship-map by identifying four groups of antecedents and two groups of results. The designed map made it possible identifying the IT project management practices that have been measured and related to project performance, in addition to management practices relating project IT performance to organizational factors, human resource skills and IT tools.

Literature reviews can capture theoretical pluralism, offer some degree of integration and combination, or parallel considerations on theoretical concepts, as well as foster new ideas and the overall development of a given study field (Stingl & Geraldi, 2017). Actually, different systematic review types have been conducted by researchers to better understand project performance or project studies; however, these studies only investigate specific project management practices or behaviors, rather than investigating and building broad reviews about associations between project performance and project management (Brooks, Waylen, & Borgerhoff Mulder, 2012; Sherman & Ford, 2014; Ahmad & Aibinu, 2017; Jayatilleke & Lai, 2018; Lappi, Karvonen, Lwakatare, Aaltonen, & Kuvaja, 2018). The present systematic review was based on the assumption that references are studies presenting conceptual connections to project results identified as successful ITPP or IT projects.

The present study also aims at contributing to the ITPP subject by comparing articles reporting empirical findings about the addressed topic by representing common conceptual ties among them. While some articles report project management practices affecting ITPP (Foote & Halawi, 2018; Keil, Rai, & Liu, 2013; Naqvi, Bokhari, Aziz, & Rehman, 2011), others address the organizational factors influencing it (Sarif, Hamidi, Ramli, & Lokman, 2016; Gu, Hoffman, Cao, & Schniederjans, 2014; Sewchurran & Barron, 2008). There are research focusing on different constructs as independent variables and variables dependent on ITPP, namely: project cost (Keil et al., 2013; Gu et al., 2014; MacCormack & Mishra, 2015), stakeholder’s satisfaction (Chung, Skibniewski, & Kwak, 2009; Ram, Corkindale, & Wu, 2013) and product performance (Liu, 2016; Liu & Deng, 2015), among others. A relationship

map was employed to identify the measured ITPP variables available in the literature, and the constructs assessed by researchers as ITPP impacting. Hence, the study is an attempt to find common factors on ITPP by identifying groups of variables linked to project managers' skills, project management practices and environmental factors.

The present article was divided into four sections. The next section introduces articles on project performance and project success definitions, and on ITPP. The adopted literature review method will be explained, including the search, selection and evaluation procedures, as well as the list of included or excluded articles. The results section will analyze the literature, find correlations among publications, draw the relationship map and present groups of ITPP and antecedent variables. Conclusion section will recall the research question, and present the addressed contributions and limitations of the present study.

2.2.2 LITERATURE REVIEW

Project performance measurement and project success atributions are traditionally defined based on three criteria: budget, time and scope. In order for a project to be successful, it must fullfil planned time, budget and scope constraints (Pinto & Mantel, 1990; Mitchell & Zmud, 1999). Based on the literature, there are many other criteria and variables concerning project performance; however, according to practitioners' traditional understanding about a successfully implemented IT project, success comes from project's delivery in time, cost budgets and compliance with specifications - these factors still prevail as paradigms in this field (Müller & Martinsuo, 2015). As for most project managers, their job is successfully complete when they finish the project within the expected budget, time and specifications (Karlsen, Andersen, Birkely, & Ødegård, 2005). Results have been represented by the so-called iron triangle, which encompasses cost, time and scope criteria. The cost criterion concerns full project completion within expenses below the agreed maximum for it; time criterion means its completion at the agreed date and (Mahaney & Lederer, 2010) the scope criterion means delivering outcomes in compliance with the agreed specifications (Karlsen et al., 2005). Some iron-triangle variances regard quality targets, which means that IT projects must reach the perceived quality system (Keil et al., 2013). IT project quality means its compliance with some pre-set technical and functional criteria or achieving acceptable user or management satisfaction levels (Munns & Bjeirmi, 1996; Mahaney & Lederer, 2010). IT projects are often divided into three groups based on the application of these criteria, namely:

failed, challenged and successful projects, which are intended at finding out common factors affecting the final status of the project (Handzic, Durmic, Kraljic, & Kraljic, 2016).

Project results are not only measured through the iron triangle, since there are other criteria applicable to that. They have been measured by criteria other than project time, including the time of operations necessary to achieve project outcomes (Jugdev & Müller, 2005; Müller & Martinsuo, 2015). Actually, factors other than budget, schedule and scope are acknowledged as influential to benefits brought from business (Reich et al., 2014).

Some researchers have divided the project performance definition in two different parts: product and project performances. It is done to distinguish results from activities, from projects put in place and from project outcomes, which are measured after the project is concluded (Nidumolu, 1996; de Wit, 1988; Reich et al., 2014; González-Benito, Venturini, & González-Benito, 2017; Engelbrecht, Johnston, & Hooper, 2017). Project and product performances concern effective project management and the achievement of global project outcomes (González-Benito et al., 2017). These two performances are interconnected and interdependent, since project implementation procedures affect users' satisfaction with project outcomes (Mitchell & Zmud, 1999).

The project management performance has been thought in terms of whether it meets pre-set constraints such as planned schedule, pre-set budget and agreed scope (Reich et al., 2014). These three factors can also be used to measure project manager performance, which is also addressed as process performance in the literature (Keil et al., 2013; Liu, 2016). Although both terms are employed with the same meaning, project management performance describes how well IT-project processes are undertaken (Liu, 2016). Project management performance regards projects' internal view and focuses on successful time, cost and quality accomplishments, as well as on project management conduction, including the fulfilment of stakeholders' needs (Engelbrecht et al., 2017). Using project management performance variables is a way to capture critical iron–triangle elements and to broaden project manager performance analyses (Keil et al., 2013).

Product performance variables are applied to measure how a given project has delivered reliable outcomes and met functional requirements (Reich et al., 2014). IT project performance can be defined as a measurement applicable to a point in time set for benefits resulting from information systems perceived by all groups of key users (Gable, Sedera, & Chan, 2008). Project results cannot be measured while project is still running and before outcomes are accomplished, but throughout project-outcome's operational life (Mahaney &

Lederer, 2010). Product performance represents the external effectiveness of project environment and regards long-term perspectives (Engelbrecht et al., 2017).

2.2.3 METHOD

The systematic literature review method is a way to combine a large body of information and to help answering questions about studies in the literature that regard the research topic, or not (Petticrew & Roberts, 2005). This method provides researchers with specific tools to disclose core subjects, approaches, trends and results in a given research field (von Danwitz, 2018). It can be used by researchers to gather evidences that fit pre-set eligibility criteria in the literature in order to reach specific goals (Green & Higgins, 2005). Systematic literature reviews allow researchers to collect, analyze and develop academic contributions to a research topic in a transparent and reproducible manner (von Danwitz, 2018).

The systematic literature review was herein applied to address the research question presented in the introduction section. The adopted process was adapted from Tranfield et al. (2003), who used three steps to do so: Planning, Running and Reporting. Figure 17 shows the steps taken during the current research and the procedures applied to each step.

Planning a systematic literature review is essential to define scopes, relevant research, literature extension and to delimit the knowledge field (Tranfield et al., 2003). Planning concerned identifying and justifying the need of the study. Searches about ITPP were carried out in scientific databases to validate existing studies and topic comprehensiveness. A research protocol to retrieve the literature about ITPP topic was developed. Search meshes were defined based on the research question, namely: project management and performance, and information technology - word success was added as synonym with the term “performance”, as it is used by several researchers in the literature. Search meshes were “*project manage*", performance and "Information Technology", or "project manage*", success and "Information Technology"*. The following databases were accessed: ISI Web of Science and Scopus. Query concerned articles’ title, keywords and abstract. Creating a “must have” validation to be applied to the selection stage was the last step in this phase. The selected articles about IT Project were validated based on reports on project performance results and on empirical data published for the first time.

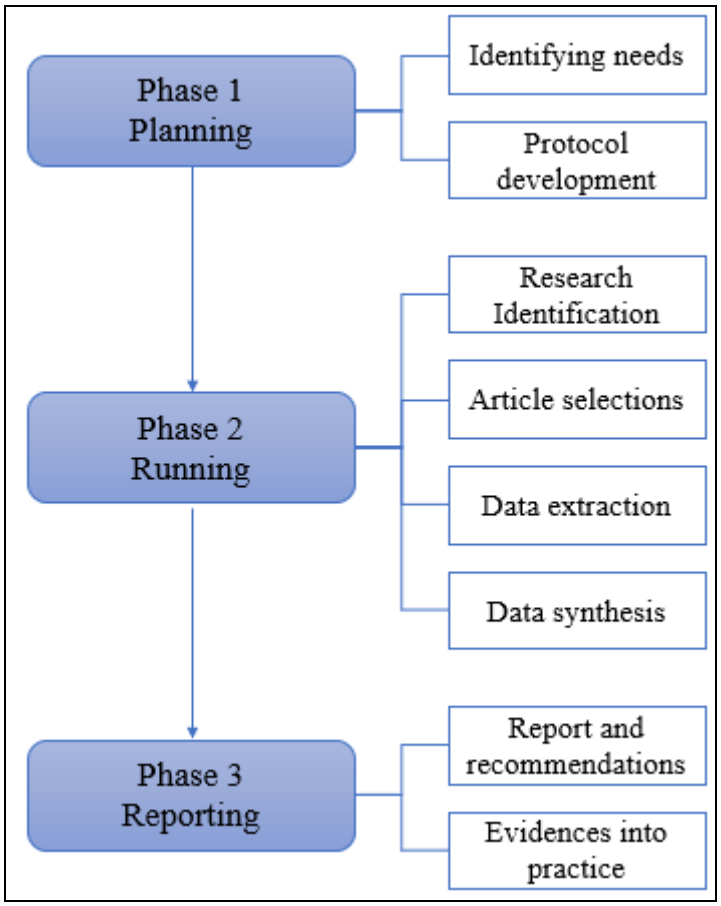

Figure 17 - Systematic Literature Review process

Adapted from Tranfield et al. (2003)

Systematic literature reviews must concern a comprehensive and unbiased search aiming at achieving the most efficient and -qualified method to identify and evaluate publications available in the literature (Tranfield et al., 2003). Figure 18 shows the steps to phase 2 in the current project. Searching terms defined on the previous step in Scopus and ISI Web of Science databases was the first step in this phase, and it led to 618 published articles. Results from both databases were exported to a single excel file comprising title, authors, publication date and database source; it was done to separate articles in Scopus from those in ISI Web of Science. Next, duplicates were excluded, data imported to the excel file were sorted based on title in alphabetical order; duplicate titles (with same authors) were removed from the sample. After duplicates' removal, only 385 articles remained in the sample. Subsequently, abstracts were read straight at the interfaces of the source databases. Abstract reading was used for article validation - only articles in compliance with all inclusion criteria were select. Only 135 articles remained in the sample after this step was over. The last step on this phase regarded the full reading and final selection of articles to be analyzed, reported and

criticized. All 135 articles were read to identify whether they concerned the research scope, had high-quality empirical data, dependent and independent variables, and would validate the proposed hypothesis. Articles not clearly related to project performance, lacking clear data source and clear hypothesis validation or proposition were excluded. After all steps set for this phase were over, only 76 articles remained in the sample to be analyzed and reported in the next phase.

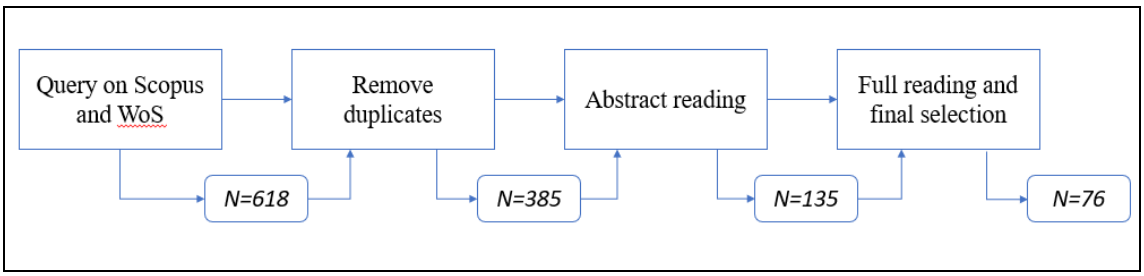

Figure 18 - Article selection steps

A good systematic literature review shall make it easier for other researchers or practitioners to understand the research topic, since it must synthetize publications on primary research used as source for derived studies (Tranfield et al., 2003). The reporting phase was followed in order to introduce synthetized data from the 76 analyzed articles in order to answer the present research question. Identifying antecedents reported as ITPP impacting variables used to measure ITPP, relationships' meanings and reported results were the criteria adopted for articles' analysis.

Results were reported in two parts; the first part aimed at identifying groups of relationships and creating a relationship-map to provide the big picture of construct-relationships about ITPP. The CMapTools software was used to create such big picture and to interconnect relationships. The second part of them regarded the descriptive analysis of relationships applied to identify groups based on similarities and on describing how a given article would relate to each variable. The next section provides details on the recorded results.

2.2.4 RESULTS

2.2.4.1 Relationship map

Figure 19 shows the relationship-map plotting based on relationships reported in all analyzed articles. Each article in this section provides reports on ITPP impacting constructs and their empirical validation. Some of the articles have identified variables used to measure results of a given construct and some others did not identify variables, but only addressed construct concepts.

Four groups of antecedent constructs were identified in the literature and they were defined based on similarities. The first group encompassed articles reporting Project Managers' Competences, it was called *Project Mgr Competence* Group and comprised activity assets including knowledge, skills, abilities and personal features necessary for successfully accomplishing project goals. The second group encompassed software used to manage projects, which were called *PM Tool*, as well as information technologies used in projects for different purposes, such as efficiency instrument for project managers. The third group was called *Firm Factors*, its factors referred to events outside the project environment, wich were determined by firms' structure. The fourth group concerned project management activities, also knonw as *PM Activity*; this group encompassed constructs focusing on identifying activities carried out by project managers and teams during the lifecycle of a given project.

Two groups of project performance were identified in the literature and they were defined based on focus on results. The first performance group regarded project management efficency, which was called *PM Result*; this group encompassed constructs set to measure results from project activities in comparison to the planned numbers. The second performance group focused on project outcomes, the so-called *Product Result*; this group encompassed constructs regarding measurements set to evaluate the quality of a given product created by the project in question and how this product is evaluated based on the use and enhancement of firms' results.

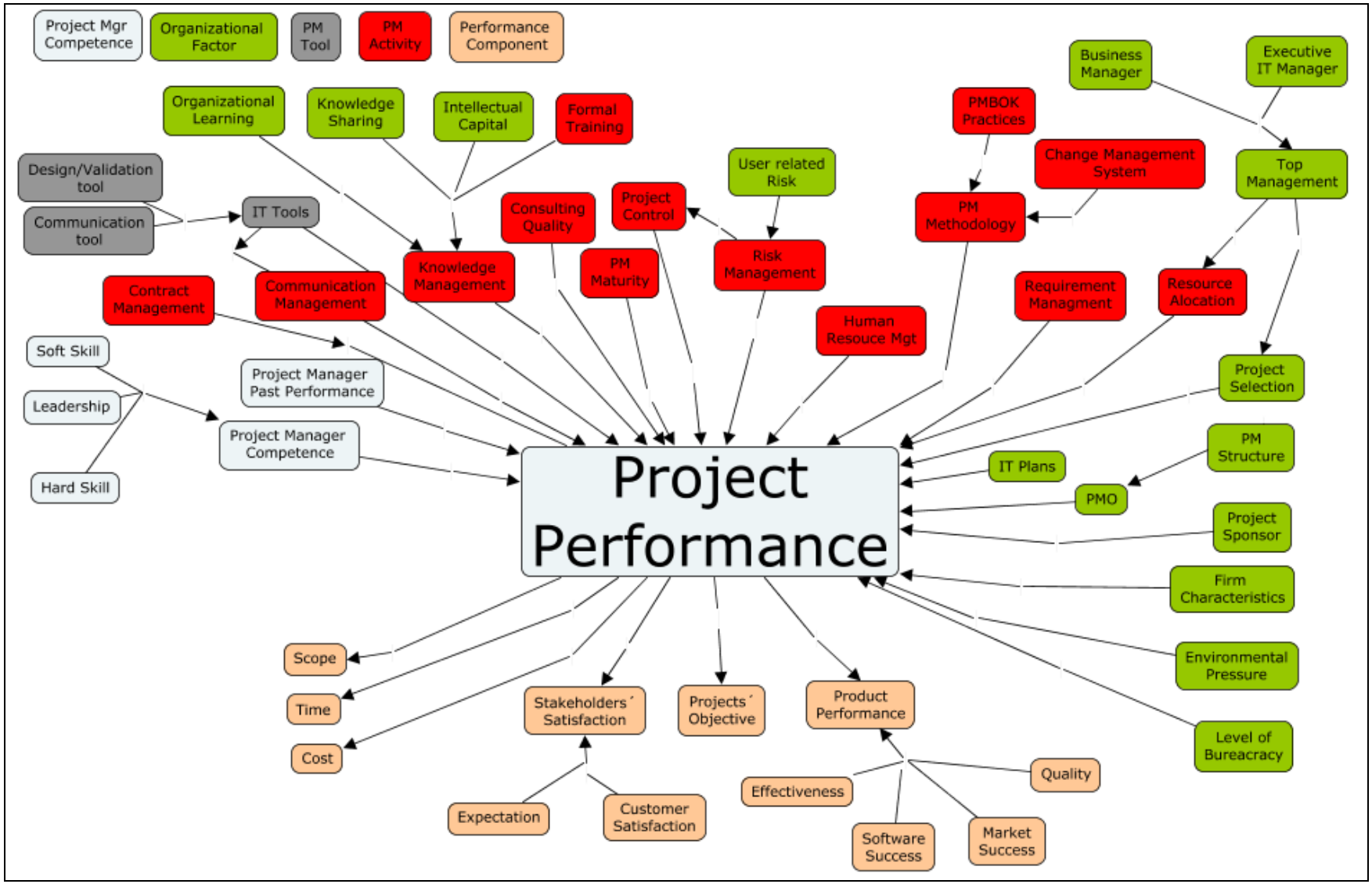

Figure 19 - Project performance relationship map

2.2.4.2 Information technology project performance antecedents

2.2.4.2.1 Project managers' competences

There is not only one definition of competence, but it has been the object of debate and remains a contentious topic in the organizational literature (Crawford, 2005). Some authors identify technical and interpersonal skills to define competences (Geithner & Menzel, 2016; Pant & Baroudi, 2008). Other authors identify competence as set of individual knowledge, skills and personal features used to perform a specific task or activity. Oftentimes, competence definition is disrupted into specific competences or skills.

Authors in some of the herein selected articles address hard and soft skills, and past project performance as part of project managers' competences (Sarantis, Smithson, Charalabidis, & Askounis, 2010; Afzal, Khan, & Mujtaba, 2018; Wang, Chou, & Jiang, 2005; Napier, Keil, & Tan, 2009), which, in their turn, are related to project performance. These authors have tested and presented specific skills through empirical evidences about the association between project results and project management performance (Hadad et al., 2013; Araújo & Pedron, 2015; Pollack & Adler, 2016). Results of projects previously experienced by project managers are also related to project performance (Sicotte & Langley, 2000; Hadad et al., 2013).

The literature makes available a list of skills related to project performance. Napier (2009) lists nine skill categories, namely: client management, communication, general management, leadership, personal integrity, planning and control, problem solving, system development and team development. These authors present evidences on how improvements in this skill categories reflect on successful project management practices. Araújo and Pedron (2015) addressed five skills essential for project managers - based on order of importance - for project performance: team management, business domain knowledge, project management, communication and individual skills. Pollack and Adler (2016) showed how technical project management skills have significant effect on whether an organization reports profitability increase. There are empirical evidences about the relevance of project managers' soft skills, but such relevance does not mean that hard skills are not important. Hard skills are described by specialists as important skills to the establishment of clear communication with technical teams and to make technical decision-making easier (Araújo & Pedron, 2015).

The literature also related project leadership to project performance. Formal leadership is related to project performance, reduced uncertainty at acting as data transmission connection between team members, and between team and top management (Sicotte & Langley, 2000). These authors found evidences that empowered project leadership reduces mistakes and uncertainty, since it has positive correlation to project performance. Afzal et. al (2018) investigated transformational leadership and its positive association with project performance. Transformational leadership tends to apply open communication and progressive leadership styles. Transformational leaders are inspiring and encouraging, they stand for their teams, motivate employees, show them the correct path and boost their confidence; consequently, they achieve a responsive and pleasant environment to attain to project goals (Afzal et al., 2018). Charismatic leadership is also relates to positive influence on project performance. Project leaders following the charismatic leadership style significantly influence team cohesiveness levels, which, in their turn, affect the overall performance of project teams (Wang et al., 2005). These studies have shown different leadership styles, although there is nobetter or worse style, but specific leadership styles that can be related to specific project results.

2.2.4.2.2 Organizational factors

Organizational factors result from organization structures such as project environment. Organizational factors must encompass activities such as task allocation, coordination and supervision, which head towards organizations' goal. Moreover, the environment and local culture perspective can influence the formation and success of organizations' structures (Sarif et al., 2016). Sarif et al (2016) presents project management officie structure as an organizational factor, the role of top management in project conduction, organizations' features and capabilities. Some organizational factors are not directly related to effects on project performance, but they moderate project management activities and project performance relationships or act as antecedents affecting project management activities related to project performance.

Organizational factors can have positive effect on project knowledge management and their results can affect ITPP. Every organization has valuable intellectual material expressed in data; documents; procedures; in people, organizational structure and process' capabilities, as well as in relationships with customers (Handzic et al., 2016). Handzic et al. (2016) found

positive influence of project-related intellectual assets on project success based on direct and indirect project-success variables concerning team performance, process and customers. These authors also confirmed the mediation role played by the intellectual capital in exploiting team/customer's relationships in order to reach project success. Organizations incentive and support to knowledge sharing is another important factor affecting knowledge management. Knowledge sharing, development, reuse and outspread make it possible reducing project time and costs and improving the quality of the project (Nabelsi et al., 2017). Nabelsi et al (2017) found strong positive correlation between wiki quality and project performance when wikis are used to register and share lessons learned from a given project. Project managers must make sure to properly measure the intensity of knowledge needs in order to motivate team members to share their knowledge about challenges set by the task to be accomplished (Nabelsi et al., 2017). An important aspect of knowledge sharing lies on how individuals learn from the outspread information. Organizations should make it easier for individuals to learn from the development of systems and processes at corporate level (McKay II & Ellis, 2015). McKay II and Ellis (2015) have shown the positive and significant correlation between learning from projects and ITPP in their research. They also identified organizational learning processes as project learning facilitators.

Top management teams play important role in projects and are directly associated with project performance results. Collective and cooperative participation of top managers, business managers and IT managers increases IT quality and reduces project implementation-associated issues (Kearns & Sabherwal, 2007). Several factors influence project success, but business managers' IT can have substantial influence on IT PP (Engelbrecht et al., 2017). Top managers' participation effects on IT projects is vital to IT success; on the other hand, their indifference towards IT could lead to poor performance (Kearns & Sabherwal, 2007). Assessing IT Executive managers' role in project results is essential, since they blame themselves for failures, but acknowledge external factors for successful outcomes (Standing, Guilfoyle, Lin, & Love, 2006). Top management support is an essential factor in all project environments, and its importance is expected to remain in the mainstream (Rosacker & Olson, 2008).

The project management office deals with several projects at the same time and keeps all of them under control and effective (Güngör & Gözlü, 2017). Public administrations companies dealing with environmental projects, should adopt project management offices in order to help project managers to anticipate changing needs, so that projects can be carried out successfully (Aubry & Brunet, 2016). The internal structure of a project management office

does not have direct influence over project performance; support to project management's authority is more important than its structure in the way to project success (Lechler & Dvir, 2010). PMO success in managing project teams has positive effect on communication management and on project performance results (Güngör & Gözlü, 2017).

2.2.4.2.3 *Project management technologies*

Bardhan, Krishnan and Lin (2007) investigated how Information technology applications are translated into higher project performance. According to these authors, IT applications, underlying project tasks and operating environments are associated with improvements in project competencies. Their findings suggest that just measuring alignment impact on project performance is not enough. It is more important assessing whether IT project alignment is followed by corresponding improvements in operational project competences. They have concluded that organizations bring significant benefits to project outcomes when alignment is translated into measurable improvements in project competences.

Other studies have investigated the impact of IT applications on project performance. Bardhan, Krishnan and Lin (2013) found that high volume of information on IT projects help mitigating the negative effect of team dispersion on project performance. Mitchell & Zmud (1999) addressed that project performance improves due to tightly coupled IT and works as process strategy when process inventions are implemented, as well as to strategies loosely coupled when imitations are implemented. Heim et al (2012) described that IT tools supporting design/validation phases are correlated to positive product performance, time-to-market and responsiveness. Tools supporting high-quality communication in outsourced information system projects also support internal control function and enhance project results (Gantman & Fedorowicz, 2016)

2.2.4.2.4 *Project management activities*

Different project management activities are directly correlated to project performance. This section describes correlations between project management activities and IT PP.

Risk management is a key part of project management because it provides project managers with forward-looking view of both the threats and opportunities to improve project success (Pimchangthong & Boonjing, 2017). Poor project risk management is negatively associated with product project performance (Liu, 2016). Risk mitigation is a proactive project management activity aiming at reducing risks' negative impact on project performance (Gemino et al., 2008). Liu and Wang (2014) observed strong correlation among performance, social subsystem and project management risks in both internal and outsourced projects.

Knowledge management enables organizations to capture, store, transfer and retrieve knowledge by ensuring the effective use of knowledge by employees to understand how, why and what to accomplish (McKay II & Ellis, 2015). Reich et al. (2014) did not find evidences to support correlation between knowledge management and project management performance, but they found that lack of investment in knowledge management drives project managers to significantly increase budget and schedule variances. Knowledge management should also pay close attention to knowledge losses and focus on avoiding them to reduce their negative effects on IT PP (Reich, Gemino, & Sauer, 2008). Information system projects have evidenced effective knowledge management related to the creation of high-quality software in the design and code review phase (Foote & Halawi, 2018).

Human resources management must focus on team-building development, transformational leadership and effective communication (Bhoola & Giangreco, 2018). Members of a project must effectively socialize with internal and external members in order to ensure smooth inclusion of, and better contribution to, projects affecting their results (Bhoola & Giangreco, 2018). Human resources management help projecting managers to positively apply project performance monitoring over project results by creating clear monitoring systems involving the whole team (Naqvi et al., 2011). Project status monitoring through meetings makes it easier to broaden knowledge on project status and agents' accomplishments - such a knowledge discourages agents from carrying out loafing and poorly–focused activities (Mahaney & Lederer, 2010).

Communication management must promote deeper communication levels and lead to higher levels of IT planning sophistication to increase the quality of IT plans and top management participation in the selection of IT investments (Kearns & Sabherwal, 2007). Project managers must pay attention to communication, and use it as tool to support conflict solving, to monitor project performance and to pay attention on customers' needs (Gantman & Fedorowicz, 2016). Attention on communication enhances the perceived project results (Gantman & Fedorowicz, 2016). Communication management is identified through managers

and customers' practices as part of the top five critical success factors in small and mid-sized IT companies (Singh, 2018).

Formal contracts are an important instrument for project governance, since they are the way organizations adopt to control and compensate partners (MacCormack & Mishra, 2015). Partners play an important role in many projects, since their activities have direct impact on project results, mainly when it comes to costs and quality (MacCormack & Mishra, 2015). These authors found that choices between fixed price and flexible contracts should be very well analyzed - the choice for flexible contracts in mistaking project scenarios is associated with cost increase. Vendor contract schemas have moderate effect on the association between partnership quality and project performance (Wei et al., 2018). These authors stated that knowledge protection contracts have negative effect on partnership quality.

Based on the literature, adopting a project management methodology has some impact on ITPP. Formalized project management methodologies means standardizing project activities affecting the whole project (Wells, 2012). According to Wells (2012), project management office contributions to project results are not perceived by everyone in the company in the same way. Project Management Body of Knowledge (PMBOK) can contribute to project success by establishing principles to be reached by IT information system projects (Hidding & Nicholas, 2017). There is a gap between PMMs' perceived contribution at strategic and organizational levels in comparison to benefits perceived at project and operational levels. Project management methodology contribution to ITPP is more clearly perceived at strategic level than at operational level in organizations (Wells, 2012).

2.2.4.3 Project performance

This section presents how IT PPs are measured, it is structured into two different dimensions: the first one regards the project management performance dimension and the second concerns project outcome performance.

2.2.4.3.1 Project management performance

Project management performance refers to accomplishing planned numbers regarding time, scope and cost constraints. Meeting projects' goals is another factor used to measure project management performance (Pimchangthong & Boonjing, 2017; González-Benito et al., 2017).

Based on the literature, project costs are measured according to two different perspectives: one regards how to reduce project costs, increase project efficiency and payoff (Lisburn & Baxter, 1994; Plaza, 2016; Spalek, 2014); the other concerns measuring project success or performance by adopting cost compliance as variable for this construct (Sicotte & Langley, 2000; Keil et al., 2013; Reich et al., 2014; Gu et al., 2014). Avoiding cost overrun must be one of project managers' primary concerns (Naqvi et al., 2011). Several variables could have impact on PP, but, based on prior research, cost is identified as one of the variables most likely influencing it (Keil et al., 2013).

Scope management is part of triple constraints applicable to projects, since these areas are the primary functions of project management (Naqvi et al., 2011). Some studies have suggested that project scope influences the outcome from efforts to develop an IT project; so, the larger the project, the more likely for it to face performance issues (Keil et al., 2013). Fulfilling the scope, customers and organizations' needs are an important metric to be followed during IT project conduction (Naqvi et al., 2011).

Project completion in time is part of the concept applied to successfully implement a project; it can also be used to measure project results (Ram et al., 2013). It is a critical factor for projects, but there are many factors likely influencing it; therefore, they should be evaluated and tested (MacCormack & Mishra, 2015). Delayed project delivery is among the main causes of customers' dissatisfaction and complaints (Naqvi et al., 2011). Variable "completion in time" must be taken into consideration and investigated when project performance is analyzed (Sarif et al., 2016).

2.2.4.3.2 Project outcome performance

The performance of IT project products describes the quality generated by the development process applied to an IT project and how the software is delivered to users (Reich et al., 2014). Product performance refers to the quality of the developed system, and it

must include considerations about benefits brough by the delivered product (Gemino et al., 2008). Based on the literature, this variable is used to validate reliable outcomes of a given project when it comes to fulfilling functional requirements (Liu & Deng, 2015).

Project outcome performance was associated with different product aspects deriving from the project itself and with their impact on organizations. The quality of an IT product is measured through its adherence to pre-defined criteria, mainly through how software are performing in terms of time-response, easiness to use and number of users in organizations (Heim et al., 2012; Reich et al., 2014; MacCormack & Mishra, 2015). Software success implies positive effects of software using on companies' outcomes (González-Benito et al., 2017). Companies expect to be benefited from software implementation, including improved performance indicators (González-Benito et al., 2017). Market share increment is an important dimension to be evaluated - projects can favor organization due to sales growth.

2.2.4.4 Project performance attributes and correlations

Based on Figure 19, it is possible identifying all attributes adopted by researchers to measure project performance. Figure 20 shows the correlations between project performance attributes (outcomes) and antecedent attributes (incomes) observed in the present literature review. It enabled finding the existing research on the project management field and on the impact of project performance attributes.

Incomes \ Outcomes	Cost	Product Performance	Projects' Objective	Quality	Stakeholders' Expectation	Stakeholders' Satisfaction	Scope	Time
Contract Management	x	x				x		
Environmental Pressure						x		x
Formal Training	x							
HR Management	x			x			x	x
Intellectual Capital	x							
IT Tool	x		x	x	x			x
Knowledge Management	x	x	x	x	x	x	x	x
Managing conflicts	x							
PM Maturity	x							
PMO						x		
Project Manager competence	x		x	x		x	x	x
Project selection	x							x
Project Sponsorship						x		
Risk Management	x	x	x	x	x		x	x
Stakeholder Management					x	x		

Figure 20 - Attributes relations matrix

2.2.5 CONCLUSIONS

The project management literature is deeply focused on results and on correlating activities and events during projects' life cycle to performance or success. The present literature review made it possible seeing project performance and project success as synonyms, in many cases. Some studies regard project success and adopt the iron triangle (scope, time and cost) as dependent variable (Ram et al., 2013; Sarif et al., 2016; Engelbrecht et al., 2017), whereas others concern project performance and adopt the same iron triangle as dependent variable (Sicotte & Langley, 2000; Keil et al., 2013; Liu & Deng, 2015). IT PP does not dependent on the iron triangle as the only variable to be measured. The literature has bought other dimensions and other variables to be measured by means of identifying and differentiating project management performance and the performance of a given product developed during the project.

The fact of being a systematic review is a limitation of the present study, since project management performance or studies on success were its starting points. Although it was the aim of the study, such an aim can bring biases along such as studies with no direct effect on performance. The adoption of the herein addressed dimensions allowed broadening the view over projects and over their impact on organizations. Future studies can develop frameworks to help better understanding events that have different impact on both project management performance and product performance.

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2.3 STUDY 3: EFFECTS OF STAKEHOLDERS' MANAGEMENT ON INFORMATION TECHNOLOGY PROJECT RESULTS

2.3.1 INTRODUCTION

Over the years, researchers have been conducting studies to analyze factors affecting project performance (PP) based on different aspects (Lisburn & Baxter, 1994; Reich et al., 2008; Wells, 2012; Carvalho et al., 2015; Engelbrecht et al., 2017; Lu et al., 2019). Enhancing the performance of Information Technology (IT) projects is essential for both industries and the academia, mainly for the project management field (Haq et al., 2019). Despite the relevance of this topic, and researchers and practitioners' significant effort to reach the expected project performance (PP), many IT projects still fail or underperform due to different reasons (Johnson, 2018).

Project management (PM) is crucial to reach higher PP levels, since it encourages project teams to develop common strategies, cooperation, straightforward processes and the ability to adapt to both changes and new demands (Auinger et al., 2013). Project managers must cover multidisciplinary topics in order to drive projects based on different aspects and technologies and to be ready to put the project in place by applying such aspects and techniques. Multidisciplinary aspects are expressed by bodies of knowledge, best practices, and empirical evidences, as well as by the collection of practitioners' opinions (IPMA, 2016; Project Management Institute, 2017; Axelos, 2017).

More and more, companies are aware that they need to reconsider stakeholders' management and find ways to make them engage to projects in order to avoid potentially costly conflicts and societal exposure, as well as to get company or product legitimacy, or, yet, to avoid legal challenges (Provasnek et al., 2018). Organizations can collaborate to different groups, such as customers, representatives, non-governmental organizations, among others, in order to develop new products and ideas, to collectively create or refine software, to manage their reputation, among other reasons (Desai, 2018). The mechanisms to reach such a collaboration process include partnerships, dialogue, employees' volunteering, social media communication, among others (Davila et al., 2018). The collaborative engagement by external stakeholders opens room for the opportunity to develop organizations' legitimacy and to

assess how they balance their search for innovation in terms of how to keep stakeholders informed and of risks related to such anexternal search (Desai, 2018). Stakeholders' engagement (SE) means having them involved in projects' planning, on decision-making and on product implementation to reduce conflicts, establish clear priorities and gain market advantages (Mok et al., 2015). Companies and project managers can decide to encourage stakeholders to engage to their strategy in different ways, depending on what they need to get from this relationship.

Project managers and teams often face the challenge of deciding which stakeholders should be encouraged to engage to the project, or not. Mitchell et al. (1997) developed a framework to classify stakeholders based on their power, legitimacy and on companies' urgency and results. This classification system was called stakeholder salience (SS). Many researchers have tested SS after its launching, as well as how to achieve performance improvement based on other aspects, such as corporate social accountability, human resources' ethics, ecosystem impacts, among others, rather than just on better financial results (Bec et al., 2019; Hersel et al., 2019; Neville et al., 2011; Phiri et al., 2019). This framework was also applied to the project management field to reach positive power, legitimacy and project results' urgency , as well as to measure the impact of it on stakeholders (Hellström et al., 2013; Turkulainen et al., 2015; Nguyen et al., 2019).

The literature on stakeholders' management association with other PM activities and on positive effects of PM improvement due to stakeholders' engagement to projects still highlights a gap in knowledge on this field. The first aim of the current study was to fill this gap by analyzing the direct effects of PM activities on PP in order to validate the positive association between them. Another aim of the study lied on contributing to the stakeholders' theory by testing improvements in the PM/PP association when stakeholders are engaged to projects and whether salient stakeholders can positively contribute to such an association.

The present study is an attempt to contribute to the analysis on SE action impacts on project results. Contributions are twofold, they contribute to integrate actions taken by practitioners to the literature by providing theoretical understanding on stakeholders' management, mainly SE, and on its influence on IT PP. Although there are previous studies about SE in projects (Missonier & Loufrani-Fedida, 2014; Butt et al., 2016), they focus on project management practices and do not provide theoretical discussions and contributions. They can further contribute to validate the effects of stakeholder management and previously tested relationships, such as project management moderation relationships and customers' satisfaction (Standing et al., 2006; Toor & Ogunlana, 2010; Aubry & Brunet, 2016; Güngör &

Gözlü, 2017; Singh, 2018). The current study was based on testing the moderate effect of SE and SS on project management results and their effects on product outcomes. When it comes to implication to practitioners, it tested the project management activities affecting SE actions in order to contribute to positive incentive actions to enhance these activities.

This article also addresses the theoretical background, the developed hypotheses and theoretically proposed framework. Study method, data analysis techniques and findings are also approached. The theoretical and managerial implications, limitations and future research suggestions are presented in the conclusion section.

2.3.2 LITERATURE REVIEW

The aim of the present study was to help better understanding SE and SS effects on IT project results. Based on general consensus, project performance is a multidimensional construct; however, there is no consensus on the dimensions better representing project performance (Engelbrecht et al., 2017). Therefore, it is essential defining how project results are measured and the project results dimensions to be adopted in this research. Next, project management activities, SE and SS concepts and how these concepts are adopted in business SE contexts - and narrowed to projects' context - are presented.

2.3.2.1 Project performance

Many studies introduce different ways to measure PP (Shenhar et al., 2001; Sewchurran & Barron, 2008; Handzic et al., 2016; Pimchangthong & Boonjing, 2017). The traditional PP assessment lies on measuring how project results adhere to planning by being within the following three dimensions: budget, schedule and specifications (J. K. Pinto & Prescott, 1988; Karlsen et al., 2005; Bakker et al., 2010; Engelbrecht et al., 2017), which are known as the 'Triple Constraint' or 'Iron Triangle' (Engelbrecht et al., 2017). This traditional way of assessing PP has been challenged since the late 1990s. Atkinson (1999) argues that the iron triangle is not enough to measure project performance and that successful iron triangle outcomes can hide project issues, depending on project complexity. Project performance measurements only based on iron triangle elements are inadequate, because they exclude

measurements taken of outcome-related elements such as value, adequacy and use (Sewchurran & Barron, 2008).

The project management literature has been introducing new ways to measure PP and new dimensions to be included in it. Besides the Iron-triangle criterion, alternative models must include key performance indicators or financial-based indicators like IRR or NPV evaluation model (Pimchangthong & Boonjing, 2017). Shenrar and Dvir (2007) proposed five PP dimensions, namely: iron triangle, impact on customers, on team members, business impact and preparation for the future. The IT project literature also presents criteria deriving from the software project. Some results, such as performance, easy to use, adoption by users and compliance with functional requirements must be measured after software implementation (Karlsen et al., 2005; Gemino et al., 2008; S. Liu, 2016). It is important stating that the literature on new ways to measure PP does not reject the adoption of the triple constraint. Many researchers still use it to measure PP (Keil et al., 2013; Ram et al., 2013; Engelbrecht et al., 2017).

The concept of project performance can be divided into two different concepts: project management performance and product performance (Reich et al., 2014). Project management performance refers to reaching planned triple constraint strategies and product performance concerns fulfilling project outcome needs (Pimchangthong & Boonjing, 2017; González-Benito et al., 2017). Product in IT projects points out quality rates accomplished due to IT project development processes and to how a given software is delivered to users (Reich et al., 2014). Project management performance measurements allow following all project lifecycles. Product performance refers to the post-project time and to the performance of project outcomes (Keil et al., 2013). Both project management performance and product performance were herein adopted as part of the dependent variable PP, since the adoption of these two dimensions can help better understanding the effect of dependent and moderator variables on project lifecycles and on the performance of project outcome in order to achieve a more extensive analysis of correlations.

2.3.2.2 Project Management Activities

Systematic PM can be seen as a method, toolkit and model applicable to tthe structured sequence of a given process in order to institutionalize standard practices (Carvalho et al., 2015). Defining a standard process enables team members to follow a common goal by

running similar or distinct activities in projects. Project management is a multidisciplinary strategy that needs a holistic approach to integrate activities from initial planning to project conclusion (Auinger et al., 2013).

2.3.2.2.1 Project Communication Management

Communication processes evolve at least two agents, namely: sender and receiver, based on shared media, to transfer information between individuals (M. B. Pinto & Pinto, 1990). The receiver, in organizational context, can be one or several people composing workgroups or, yet, the entire organization (Baguley, 1994). Communication is the route allowing individuals to build trust and collaborative work values in organizations (Yap et al., 2017). Although agents are defined as communication senders and receivers, effective communication is not unidirectional and must flow both ways: receivers must transmit feedback on the received information (Gopal et al., 2002). Getting communication feedback helps understanding how well information has been transmitted and received, as well as identifying barriers to be eliminated (Ejohwomu et al., 2017). Good communication is not only used to transmit information but also to interpret signals among parts by reflecting their feelings, such as enthusiasm, optimism and acceptance or, even, their bad feelings (Jarvenpaa & Leidner, 1999).

Communication plays a pivotal role in projects. Project communication management (CM) involves planning and performing activities to make information development, distribution, reception and understanding easier (Yap et al., 2017). Communication planning and performing must start at initial project stages in order to inform about project objectives, requirements and priorities, and about constraints to be known by everyone in the project team (Cheung et al., 2013). Communication is not only accountable for leaderships, team members must understand the communication networks and use them to openly and supportively send and receive information and messages from everyone (Hsu et al., 2012). Effective CM planning encourages the collaboration culture and promotes team members' participation in decision-making and project learning (Yap et al., 2017). Communication systems applied to project conduction must mix formal and informal, written and verbal communication, as well as synchronize and coordinate team members (Turner & Müller, 2004). Furthermore, formal and informal communication is essential in project conduction. Formal communication can encourage formal relationships among team members. Informal

communication, which lies on lack of rigid rules and guidelines, can lead to confidence and trust (Cheung et al., 2013). Efficiently and effectively communicating to the right people, at the right time, in the right format to promote project success is CM's most important goal (Yap et al., 2017)

Defining how often communication occurs is challenging to CM planning. Project managers must find and define communication frequency in each defined structure, and balance informal communication among internal teams and between internal teams and external members (Hsu et al., 2012). Controlling formal communication and interactions between team members and external members is essential to reduce uncertainty and improve project quality (Kannabiran & Sankaran, 2011). Project managers must define the frequency of communication with stakeholders in order to give comfort to external members regarding project progress and decision-making (Bond-Barnard et al., 2013). Frequent communication leads to inter-organizational and trust relationships in projects, and it accounts for more information and raises new ideas and solutions, as well as helps problem solving (Cheung et al., 2013). Appropriate communication processes significantly contribute to project success (Yap et al., 2017); thus, it opens room for hypothesis 1:

H1 - Project communication management has positive effect on Project Performance.

2.3.2.2.2 Human Resources Management

Human resources management (HRM) practices have been deeply assessed in the last decades and their effective application is associated with past and current success and with achieving goals in many organizations (Khan & Rasheed, 2015). Reaching HRM-related outputs, such as to positively contribute to organizational outcomes, low turnover rates, high cost-effectiveness, low absence rates and high job performance due to fully using employees' potential, are expected to happen (Paauwe, 2009). Oftentimes, companies deal with changes in business environment, and it can demand new human resources skills and require the development of smooth human resources operations (Ahmadian Fard Fini et al., 2018). Based on the literature, HRM is a practical approach for companies to define recruiting, selection, training, development, career planning, performance evaluation, employees' participation on companies' activities and compensation system structures (Khan & Rasheed, 2015).

Given the features of a time-limited activity within project contexts - which regard employees' dispersion after the job is finished -, it is demanding to have a well-prepared and expert team to take the necessary actions (G. Chen et al., 2004). Projects' time-limited features lead to work environments that pose additional pressure over employees, and it sometimes brings uncertainty and fluctuating workloads that demand multiple roles to be played (Zwikael & Unger-Aviram, 2010). HRM practices sharpen teams' future perspectives and allows supporting individuals' needs, as well as developing a secure and supportive environment for everyone's participation, and dismissing uncertainty about having a job after the project is over (Popaitoon & Siengthai, 2014). Most projects require members from different disciplines to work together towards a common goal. These different backgrounds challenge companies and project managers to develop a cohesive team (Zwikael & Unger-Aviram, 2010). HRM requires well-designed planning to deal with employment security, job design and description, clear communication, teamwork stimulus, among other activities within project contexts, in order to deal with such potential issues (Bhoola & Giangreco, 2018).

Several studies have investigated the association between HRM and PP (G. Chen et al., 2004; Lin, 2011; Khan & Rasheed, 2015; Demirkesen & Ozorhon, 2017; Bhoola & Giangreco, 2018; Popaitoon & Siengthai, 2014). However, the effects of such an association remain unclear, but there are empirical evidences of HRM effects as activity moderator correlated to PP (Imran et al., 2011; Popaitoon & Siengthai, 2014; Zhu & Cheung, 2017). Some other studies address HRM as a factor mediated by other activities (Paauwe, 2009; Khan & Rasheed, 2015; Ahmadian Fard Fini et al., 2018). HRM practices are related to knowledge construction and to the contributions of positive effects on project innovation and performance. They play the role of encouraging knowledge acquisition and its sharing with members in the project team (Swart & Kinnie, 2010). A model is herein proposed to specify the positive effect of HRM activities on PP, which leads to hypothesis 2:

H2 - Human resource management projects have positive effect on Project Performance.

2.3.2.2.3 Risk Management

Project risk refers to any condition capable of posing serious threat to competition for any project objective (Keil et al., 2013); however, risks may not be only related to adverse events. Opportunities can come up and have positive impacts on project objectives or, yet, bring extra gains to them. Project managers must be ready to identify these events and profit on them (Yim et al., 2015). Different processes and sources can account for project risks. Analyzing and understanding risk events can help project teams and managers to be aware of possible threats and to be ready to apply countermeasures to reduce risks or their impact (De Bakker et al., 2011). Risks can derive from organizational environments, work processes and people, within project contexts. Overall, these factors are connected to the generation of the aforementioned events (Boehm, 1991), consequently, project managers are challenged to analyze risk factors associated with a given project and to track their origin and root causes (Chen et al., 2018).

Project risk management is defined as a set of coordinated activities focusing on risk identification, assess and prioritization. These procedures must be followed by economic evaluations to develop a viable plan to minimize, monitor, and control the likelihood of risk events to happen and to have impact on the project (Zhang, 2007; Li et al., 2008; Bakker et al., 2010). Project managers must follow holistic approaches to manage risks, they need to gather as much information as possible, from different sources, and organize it into manageable data (Yim et al., 2015). Successful risk management demands support from the top management in companies, which must provide the needed training to the project team, give authority to project managers, and support technical and financial decisions (Zhao et al., 2013). Although project risk management lies on evaluating and monitoring events likely threatening project objectives, effective risk management must be the target of all organization levels, as well as be based on a common risk-language (Shayan et al., 2019).

Risk management processes must systematically identify, evaluate, and mitigate risks in order to improve the likelihood of project success (Maytorena et al., 2007). They are a step-by-step procedure that must start from risk recognition and identification, effective assessment of the likelihood of risk occurrence and impact, decision-making about risk mitigation, control and management (Rasul et al., 2019). Risk identification must start at initial project stages and aim at finding possible risks caused by stakeholders, aligning information and recording any detail likely capable of helping to improve data accuracy

(Gibson Jr et al., 2006). Risk assessment activities enable identifying risk events and defining priorities and responses to decisions regarding mitigation, transferring or acceptance, as well as financial decisions (Perrenoud et al., 2017). The implementation of preemptive project management strategies reduces the likelihood of facing risk events and their negative impact on project results (Yim et al., 2015). This statement leads to hypothesis 3:

H3 - Project risk management has positive effect on Project Performance.

2.3.2.2.4 Quality Management

Quality is expressed through scope, organization structure and adaptation speed at organizational level, depending on business needs and capabilities (Milunovic & Filipovic, 2013). Quality management refers to all business functions in a given organization and leads all departments and people to common goals concerning improvements in processes, products and relations (Bergman & Klefsjö, 2010). Quality management activities help enhancing the quality of products, producing and reducing losses and rework, minimizing production costs and saving time (Orwig & Brennan, 2000). Quality management includes helping and guiding companies and individuals in the production chain in order to improve their potential, create clear objectives, map improvement and cooperation opportunities, and reflect on organizational performance (Lagrosen & Lagrosen, 2012).

Project quality planning deals with defining quality standards suitable for project goals and limits, and with determining how to meet such standards. (Cao, 2018). Project managers must plan project quality management to command, coordinate and control project activities in order to meet the expected project quality (Chang & Ishii, 2013). Requirements of project quality management planning shall not be limited to the complexity of process design, to dynamics among project team members, as well as to product features and operation standards in order to reach the final product (Flyvbjerg, 2014). Project quality management must follow a set of standards and templates adopted for daily activities performed by team members (Milunovic & Filipovic, 2013). Quality standards set to the project do not necessarily have to follow organizational quality management standards. Sometimes, projects can introduce quality management practices in the organization, change standards or their focus at project level (Dahlgaard-Park, 2011). Project quality management actions control all project activities, define how to perform them in a cost-effective way, follow customers'

needs and stakeholders' expectations, in order to have direct impact on project performance (Lu et al., 2019). This statement leads to hypothesis 4:

H4 - Project quality management has positive effect on Project Performance.

2.3.2.3 Stakeholders' Engagement

According to the stakeholder theory (Freeman, 1984), developing a relationship with stakeholders means companies' acknowledgment that consumers' must be heard and their needs must be addressed. The stakeholder theory deals with how to manage different stakeholders by taking into account decision-making processes in a given company (Lehtinen et al., 2019). Companies encourage stakeholders' engagement to positively involve them in the search for consent, control, cooperation, accountability, trust, fairness or enhanced corporate governance (Greenwood, 2007). The idea of engagement in business relationships is not new, it has been calling the attention of several practitioners since the last decade (Brodie et al., 2011) - the number of studies on SE activity practitioners has been increasing, since then. The interest in SE has been growing among researchers who have been applying this theory to different contexts, such as social corporate accountability, governance, shareholders' management, among others (Desai, 2018; Dobele et al., 2014; Morsing & Schultz, 2006; Sarkis et al., 2010; Vollero et al., 2019). Engagement activities give stakeholders and companies the opportunity to learn about each other's interests, opinions and needs, which results in benefits for one of them, or for both (Provasnek et al., 2018).

Many interpretations about the concept of engagement have emerged in the literature. Engagement addresses connection, attachment, participation and social structure forms that have been featured as the transient state observed within broader relevant engagement processes that have developed over time (Brodie et al., 2011). The concept of engagement in business is attachedto partnership, i.e., companies develop partnering activities to build bridges to common goals (Provasnek et al., 2018).

The SE practice consists of activities set by an organization to positively involve stakeholders in the search for consent, cooperation, control, accountability and trust, or to enhance corporate governance (Greenwood, 2007). SE activities give companies and stakeholders the opportunity to learn about each other's interests, to address potentially negative impacts and even to bring benefits for one of them, or for both (Provasnek et al.,

2018). Contemporary businesses must find stakeholders' rational engagement by prioritizing and balancing most salient stakeholders' interests and requirements to ensure attainment to companies' goals (Lehtinen et al., 2019). Companies encourage external groups' engagement in order to access useful and previously unavailable information, since it would allow them to refine their internal routines and procedures, to improve their products and to expand their knowledge repository (Desai, 2018). Relevant actors must become salient to companies and take focal places in the organization to achieve SE effectivess (Davila et al., 2018). Finally, the role of SE is defined by institutional perspectives aimed at organizational reputation and legitimacy (Lehtinen et al., 2019)

Stakeholders get engaged through different manners based on a non-symmetric position. They play different roles at different power levels and can have different interests; therefore, dialogue will not always favor them all (Voinov & Bousquet, 2010). There are many methods to encourage stakeholders' engagement, for example employees' work councils, customers' focus groups, newsletters, among others - companies change the ways and degrees to which they try SE (Eskerod et al., 2015). However, routines or procedures defined by companies are not the most important factors regarding SE, actually, the genuine participation of stakeholders would make them get engaged in an interactive mode, which allows information to flow both directions, from company to stakeholders, and from them to the company (Voinov & Bousquet, 2010).

SE is also important in project contexts because stakeholders must get engaged as soon as possible. This engagement is essential for stakeholders' analysis and decision-making (Missonier & Loufrani-Fedida, 2014). Project managers must encourage stakeholders' engagement in order to get to know their requirements, needs, wishes and concerns (Eskerod & Vaagaasar, 2014). SE is a proactive strategy applied to develop active dialogue; early SE shifts external stakeholders' opposition into a neutral one and provides the mechanism to enhance favorable stakeholders' participation (Aaltonen et al., 2015). Stakeholders have to define their expectations about the project, so project managers can understand their views - which must be managed throughout project lifecycle (Sewchurran & Barron, 2008).

Hypothesis 5a (H5a): Stakeholders' engagement to projects increases the positive effect of project communication management on project performance.

Hypothesis 5b (H5b): Stakeholders' engagement to projects increases the positive effect of project human resource management on project performance.

Hypothesis 5c (H5c): Stakeholders' engagement to projects increases the positive effect of project risk management on project performance.

Hypothesis 5d (H5d): Stakeholders' engagement to projects increases the positive effect of project quality management on project performance.

2.3.2.4 Stakeholder Salience

The number of stakeholders can significantly increase depending on project range and impact. Project managers are challenged to decide who may be invited to collaborate to the project, or not. Stakeholders with different expectations and interests in company environments are among the challenges to be overcome in order to address the needs of corporate executives based on proper stakeholders' management (Elias, 2016). When companies nominate new representatives for stakeholders' networks or environments, the chosen ones bring along their backgrounds and expertise in order to collaborate; however, they also have their own needs, expectations and interests, although they think they will be beneficial to the organization or to the group of stakeholders they represent (ElWakeel & Andersen, 2019). The stakeholder theory presents concepts and frameworks to identify, classify and categorize stakeholders by understanding their motivations and likely behaviors, and by developing a stakeholder management plan (Aaltonen et al., 2008). Project managers may apply procedural approaches to evaluate stakeholders, understand their demand dynamics and background, and interactions to deal with heterogeneity (Chow & Leiringer, 2020).

Project managers face the challenge of meeting stakeholders' needs and concerns. However, they need to balance their decisions and claims based on project purposes, limitations and constraints, since it is not possible meeting the claims of all stakeholers (Aaltonen et al., 2015). Each stakeholder plays different roles in any given project. When project managers analyzee stakeholders, their roles and claims, they must evaluate the impact of these stakeholders based on their different attributes (Olander, 2007). Project managers can evaluate stakeholders at a single point in time, or overtime, and use multidimensional data to analyze projects' impact on stakeholders and their respective impact on projects' goals (Abdollahi et al., 2019).

Mitchell et al. (1997) presented a stakeholder classification model called "stakeholder salience model" to help project managers making decisions about which stakeholders to involve in the project, or not, and about the claims to be addressed, or not. Salience is the degree to which managers give priority to competing stakeholders. (Mitchell et al., 1997). Mitchell et al. (1997) classify stakeholders in this model based on their power, legitimacy and

urgency attributes. Stakeholders get powerfull from their ability to mobilize political and social forces and to control key resources to project conduction, as well as from their capacity to withdraw their wishes concerning these resources (Aaltonen et al., 2015; Mojtahedi & Oo, 2017). Power lies on stakeholders' ability to provide material, financial and symbolic resources, or to exert their power to fulfill their wishes (Turkulainen et al., 2015). Legitimacy is the overall perception that actions taken by a person or by an entity are proper, desirable or appropriate based on a system of defined values, standards and beliefs (Mitchell et al., 1997). Legitimacy gives stakeholders the opportunity to identify some beneficial or harmful risks in their organization (Mojtahedi & Oo, 2017). The urgency of stakeholders refers to the degree to which they claim for immediate attention (Mitchell et al., 1997). The evaluation of their attributes helps project managers to choose their stakeholdersbased on the claims of competing stakeholders (Shen & Yang, 2010; Vos et al., 2016; Yu et al., 2019). The efficient capture and analysis of multiple links within a network of stakeholders, their dependence and influence define stakeholder salience variability. This salience has direct effect on projects (Chow & Leiringer, 2020); thus, adopting the attributes proposed by Mitchell (1997) means developing hypothesis 6.

Hypothesis 6a (H6a) - The more salient the stakeholders, the more positive the effect of project communication management on project performance

Hypothesis 6b (H6b): The more salient the stakeholders, the more positive the effect of project human resource management on project performance

Hypothesis 6c (H6c): The more salient the stakeholders, the more positive the effect of project risk management on project performance

Hypothesis 6d (H6d): The more salient the stakeholders, the more positive the effect of quality management on project performance

Figure 21 shows the conceptual framework applied to analyze factors positively influencing project performance. It gathers all aforementioned hypotheses and presents four project management activities that can have positive impact on project performance, namely: (i) communication management; (ii) human resources management; (iii) risk management; and (iv) quality management. These frameworks also introduce stakeholders' engagement as positive moderator based on four previous relations. It also depicts the positive salient stakeholders' moderation in all associations between project management activity and project performance.

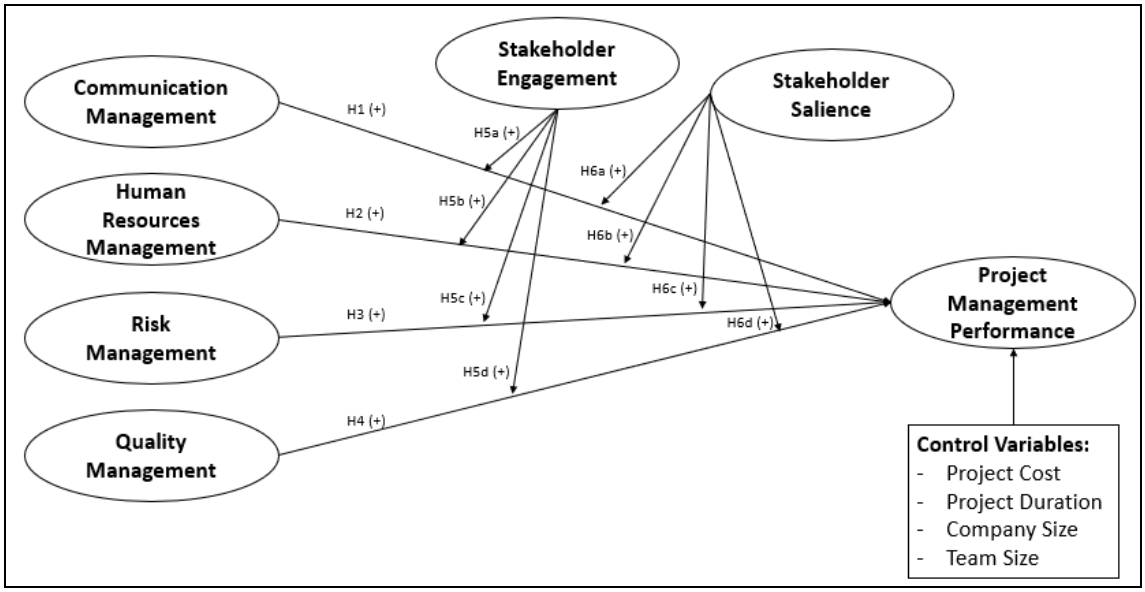

Figure 21 - Study 3: Conceptual Framework

2.3.3 METHOD

The present research followed an explanatory design (Creswell, 2013) to explain project performance based on the application of project management activities and on the stakeholder theory. A survey model was adopted to collect quantitative data of IT professionals in charge of any finished IT software project.

2.3.3.1 Data collection

IT project professionals were the target of the present study. An online survey was opened in English, Spanish and Portuguese versions at mid 2020. Different ways were used to ask professionals to participate in and answer the survey. Different social media were used at the first research phase to introduce the survey and request online respondents to answer it. Online groups of project management practitioners were contacted at the second research phase; mass messages requesting answers to the survey were sent out. LinkedIn was used to identify project managers in the third, and last, research phase; direct messages were sent to each participant to explain the purpose of the research and to ask for their responses. After five months, 519 answers, from participants in 13 countries, were collected. Figure 22 shows

the number of respondents per country. They were asked to fill out the online questionnaire and to complete the survey. Appendix B shows the applied questionnaire.

Country	Answers
Brazil	75.34%
United States	13.49%
Canada	2.12%
Mexico	2.12%
Argentina	1.93%
Belgium	0.96%
Chile	0.96%
Portugal	0.96%
Uruguay	0.58%
Arab Emirates	0.58%
Colombia	0.58%
Netherlands	0.19%
South Africa	0.19%

Figure 22 - Respondents per country

2.3.3.2 Database analysis

The collected data were subjected to preliminary statistical outlier, multicollinearity, homoscedasticity and normality analyses, prior to the main analysis. It was done in order to ensure that the statistical assumptions necessary for multivariate analysis were met.

2.3.3.2.1 Multivariate Outlier analysis

The Mahalanobis distance criterion for outlier detection was used in the analysis. It refers to the distance of a case from the centroid of the remaining cases whose centroid is the point created at the intersection of the means of all variables (Tabachnick et al., 2007). Statistical multivariate outlier is a case presenting strange score combinations of two or more variables that distort the statistics (Tabachnick et al., 2007). After this criterion was applied, 11 responses were discarded due to evidences of multivariate outliers. All database analyses were carried out with 508 valid responses.

2.3.3.2.2 Multicollinearity analysis

Variance Inflation Factors (VIF) were used to detect multicollinearity. VIF must record value below 10 to validate lack of multicollinearity (Hair et al., 2016). Table 1 shows the VIF results recorded for all variables in the present study - all of them were below 10, so there was no multicollinearity in the collected data.

Table 1 - Collinearity statistics

Model		Unstandardized Coefficients		Unstandardized Coefficients	t	Sig.	Collinearity statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(constant)	3.843	.454		8.459	.000		
	PP1	.081	.038	.115	2.125	.034	.483	2.072
	PP2	-.236	.044	-.336	-5.386	.000	.361	2.769
	PP3	-.052	.058	-.059	-.901	.368	.325	3.074
	PP4	.232	.057	.254	4.097	.000	.366	2.730
	PP5	.166	.066	.186	2.528	.012	.260	3.850
	PP6	-.234	.072	-.240	-3.242	.001	.256	3.912
	PP7	-.050	.050	-.064	-1.009	.314	.348	2.877
	PP8	.027	.054	.028	.498	.619	.446	2.243
	CM1	-.357	.058	-.379	-6.187	.000	.375	2.667
	CM2	.130	.055	.149	2.378	.018	.357	2.805
	CM3	-.078	.045	-.098	-1.740	.083	.439	2.277
	CM4	-.105	.043	-.116	-2.433	.015	.614	1.628
	SE1	-.058	.062	-.059	-.928	.354	.346	2.894
	SE2	-.039	.065	-.041	-.607	.544	.314	3.185
	SE3	.029	.085	.026	.337	.736	.232	4.307
	SE4	-.053	.052	-.052	-1.030	.304	.554	1.805
	SS1	.224	.063	.231	3.572	.000	.335	2.982
	SS2	.049	.048	.056	1.012	.312	.462	2.166
	SS3	-.070	.078	-.049	-.886	.376	.463	2.161
	HR1	.020	.040	.028	.508	.611	.454	2.201
	HR2	-.071	.050	-.085	-1.424	.155	.394	2.540
	HR3	.132	.070	.134	1.899	.058	.284	3.521
	HR4	-.123	.049	-.146	-2.502	.013	.414	2.413
	RM1	.326	.046	.497	7.121	.000	.288	3.468
	RM2	-.171	.048	-.205	-3.546	.000	.420	2.382
	RM3	-.069	.036	-.098	-1.917	.056	.543	1.843
	RM4	.112	.048	.145	2.346	.019	.365	2.738
	QM1	-.025	.043	-.033	-.585	.559	.435	2.299
	QM2	.148	.050	.157	2.946	.003	.495	2.020
	QM3	-.076	.051	-.086	-1.485	.138	.421	2.377
	QM4	.067	.042	.091	1.586	.113	.426	2.347
	QM5	-.022	.052	-.025	-.426	.670	.402	2.486

2.3.3.2.3 Homoscedascity analysis

Homoscedasticity is a situation whose variance in a criterion variable seems constant over a range of predictor variables (Hair et al., 2016). Levene´s test was used to validate variable homoscedasticity. Table 2 shows Levene´s test results; three variables (CM2, SE1, QM5) presented slight heteroscedasticity (p>0.10). However, they were kept in the analysis because they did not belong to the same construct.

Table 2 - Variance homogeneity test

	Levene statistics	df1	df2	Sig.
CM1	6.013	4	503	.000
CM2	.645	4	503	.631
CM3	2.850	4	503	.023
CM4	1.966	4	503	.099
SE1	.382	4	503	.821
SE2	2.314	4	503	.056
SE3	3.492	4	503	.008
SE4	5.412	4	503	.000
SS1	7.315	4	503	.000
SS2	4.859	4	503	.001
SS3	16.794	4	503	.000
HR1	4.711	4	503	.001
HR2	8.840	4	503	.000
HR3	7.258	4	503	.000
HR4	3.724	4	503	.005
RM1	5.223	4	503	.000
RM2	2.038	4	503	.088
RM3	3.138	4	503	.014
RM4	8.109	4	503	.000
QM1	11.632	4	503	.000
QM2	7.106	4	503	.000
QM3	3.192	4	503	.013
QM4	12.283	4	503	.000
QM5	1.931	4	503	.104

2.3.3.2.4 Normality analysis

The Kolmogorov–Smirnov statistic was used to check data normality for dependent variables. Table 3 shows results calculated for research sample. All observations recorded $p < 0.5$, which determines the model's non-standard distribution it means that data significantly differed from a normal distribution (Field, 2013).

Table 3 - One-sample Kolmogorov-Smirnov test

		PP1	PP2	PP3	PP4	PP5	PP6	PP7	PP8
N		508	508	508	508	508	508	508	508
Normal Parameters[a,b]	Mean	3.73	4.31	5.34	5.31	5.19	5.65	4.91	4.90
	Std. Deviation	1.940	1.942	1.557	1.492	1.531	1.403	1.748	1.428
Most Exterme Differences	Absolute	.230	.192	.256	.225	.233	.276	.211	.256
	Positive	.162	.125	.143	.129	.129	.168	.119	.149
	Negative	-.230	-.192	-.256	-.225	-.233	-.276	-.211	-.256
Kolmogorov-Smirnov Z		.230	.192	.256	.225	.233	.276	.211	.256
Asymp. Sig. (2-tailed)		,000[c]	,000[c]	,000[c]	,000[c]	,000[c]	,000[c]	,000[c]	,000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

The PLS method was adopted to develop structural equation modeling (SEM) due to the non-normality of the dependent construct. The analysis was run in IBM SPSS v.21 and SmartPLS 2.0.M3 software (Ringle et al., 2015).

2.3.4 RESULTS

2.3.4.1 Univariate analysis

This section analyzes data of each construct and the distribution of responses given to each variable.

2.3.4.1.1 Control Variables

There were four questions about project features. Figure 23 shows the questions about each one of them.

Variable	Project characteristics
CVD	The time duration of the project was
CVC	The total cost of the project was
CVS	The company size where the project was implemented
CVT	The total number of team members that worked on the project

Scale: CVD: 1 - up to 1 month; 2 - between 1 and 3 months;3 - between 3 and 6 months; 4 - between 6 and 12 months;5 - greater than 1 year
CVC: 1 - less than 20 thousand dollars; 2 - between 20 and 50 thousand dollars; 3 - between 50 and 100 thousand dollar; 4 - between 100 and 500 thousand dollars; 5 - greater than 500 thousand dollars
CVS: 1 - up to 100 employees; 2 - between 100 and 500 employees; 3 - between 500 and 1000 employees;4 - between 1000 and 5000 employees; 5 - more than 5000 employees
CVT: 1 - up to 10 team members; 2 - between 10 and 20 team members; 3 - between 20 and 40 team members; 4 - between 40 and 75 team members; 5 more than 75 team members

Figure 23 - Control variables' questions

Figure 24 shows the rating of responses about control variables. Mean project time duration ranged from 6 to 12 months, rates recorded for projects below 3 months were lower. Most responses regarded long-term projects. Most responses on project costs ranged from 20 to 500 thousand dollars. The median size of companies where projects were perfomed in ranged from 1 to 5 thousand employees. Based on these responses, approximately 50% of projects were conducted in more comprehensible environments comprising thousands of potential project stakeholders. The median size of project teams ranged from 10 to 20 members, most responses regarded project teams encompassing up to 40 members.

According to the collected data, mean project features regarded project duration ranging from 6 to 12 months, project cost from 50 and 100 thousand dollars, project teams with 10 to 20 members and projects ran in companies having from 1 to 5 thousand employees.

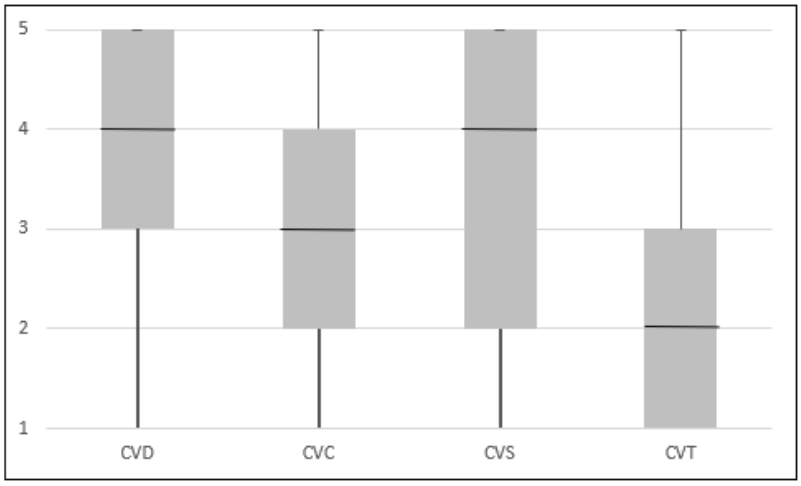

Figure 24 - Rating of control variables

2.3.4.1.2 Project Performance (PP)

Eight questions about project management performance and product performance were developed to evaluate project performance. Figure 25 shows the questions about this topic. Variables PP1, PP2, and PP3 regarded questions about project management performance, and variables PP4 to PP8 concerned questions on product performance.

Variable	Project performance
PP1	Project were completed on time.
PP2	Project met budget requirements.
PP3	Project met scope
PP4	The system's intended functional requirements were met.
PP5	The overall quality of the developed application is high.
PP6	The application developed is reliable.
PP7	The system meets user expectations with respect to response time.
PP8	The application is easy to maintain.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 25 - Project performance questions

Figure 26 shows the rating of responses recorded for project performance. Time performance was a neutral question, it recorded median 4. Responses about budget were positive; projects met the planned costs. Answers given to scope, fulfillment of functional requirements and overall quality were positive; they recorded median 6. Product reliability was the most positive question, it recorded median 6. Product time response and easiness to be maintained were also positive questions, they recorded median 5. Overall, respondents

answered the questions based on projects that have had positive performance and met the iron triangle requirements - products have met users' expectations and needs.

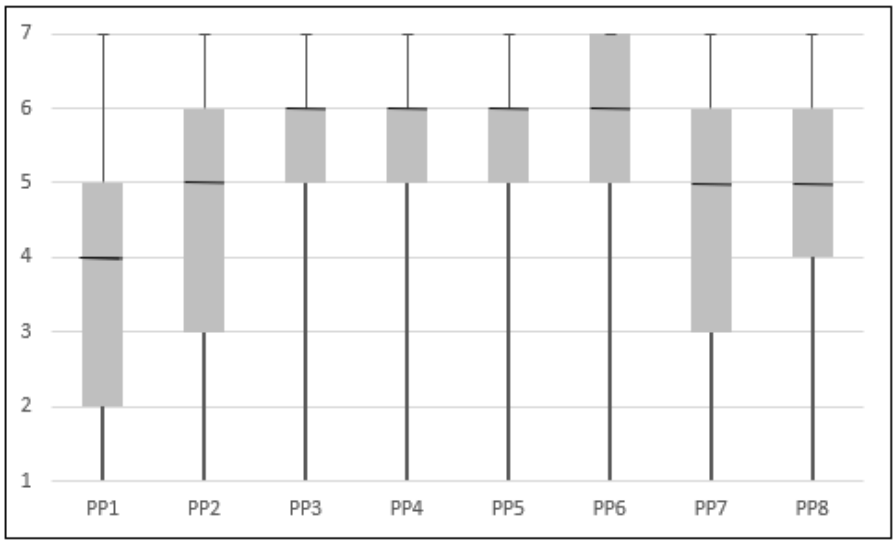

Figure 26 - Project performance rating

2.3.4.1.3 Human Resources Management (RH)

There were four questions about human resources management activities. Figure 27 shows the questions about each one of them.

Variable	Human resources activities
HR1	Project team had a good career planning provided by leadership.
HR2	Members of the project team were allowed to make many decision.
HR3	Opportunities were given to the project team to suggest improvements related to how things should be done.
HR4	The leaders often asked to the project team to participate in decision-making.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 27 - Human resource management questions

Figure 28 shows the rating of responses given to human resources management. Career planning by leaderships was a negative question; it recorded median 3. Team members' permission to make decisions about projects was a positive question; it recorded median 5. Permission to suggest project improvements was the most positive question; it recorded median 6. Leaders asking team members to participate in decision-making was also a positive question; it recorded median 5. The set of responses has emerged as positive when

it comes to team members' participation in the project, in different ways (HR2, HR3, and HR4), but it was negative in terms of leaderships' ability to develop team members' career plans.

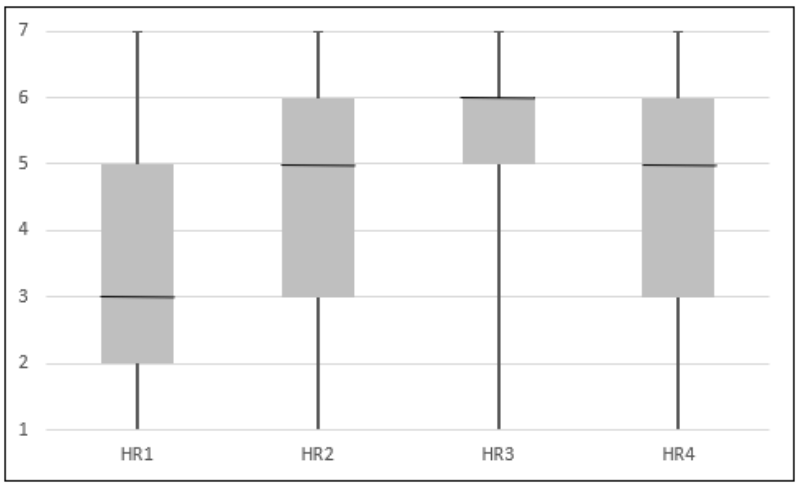

Figure 28 - Human resources management rating

2.3.4.1.4 Project Communication Management (CM)

There were four questions about communication management activities. Figure 29 shows the questions about each one of them.

Variable	Communication management activities
CM1	The extent of communication between internal project parties is often optimal
CM2	The extent of communication between external project parties is often optimal
CM3	I rarely experienced conflicts and disputes between project parties resulting from lack of communication.
CM4	Communication issues or conflicts were rarely caused by errors or defects in the project documents.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 29 - Communication management questions

The set of responses about communication management was positive, all variables recorded median 5. Figure 30 shows the response rating recorded for communication management. This set of responses shows regular and positive communication in project conduction among internal teams, and between internal and external stakeholders.

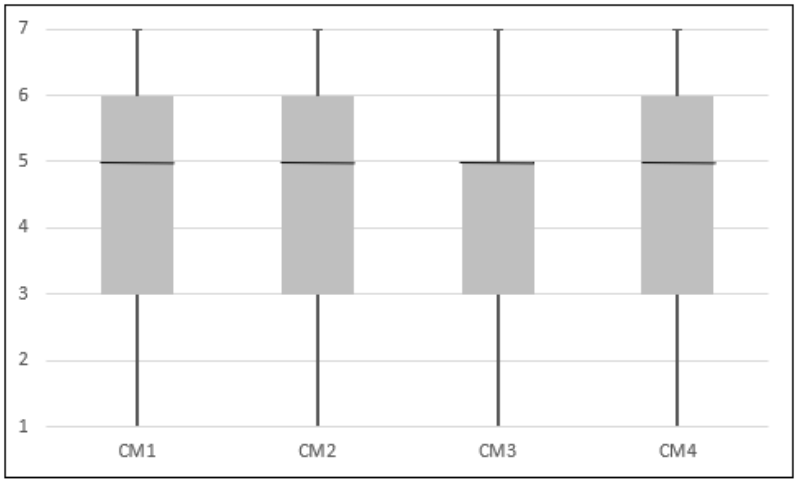

Figure 30 - Communication management rating

2.3.4.1.5 Risk Management (RM)

There were four questions about risk management activities. Figure 31 shows the questions about each one of them.

Variable	Risk management activities
RM1	The project had a risk management procedure.
RM2	Significant threats were identified.
RM3	Buffers were included on time and cost to absorb uncertainty.
RM4	Change request were registered and their impact on project were evaluated.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 31 - Risk management questions

The rating of responses for risk management is shown in Figure 32. There was neutral rate for projects that counted on risk management procedures and for the adoption of buffers, including time and cost to absorb uncertainties; both questions recorded median 4. Threat identification and change requests' impact evaluation were positive questions; they recorded median 5. This data set shows that risk registration and evaluation are the most common activities, even when risk management procedures are not in place.

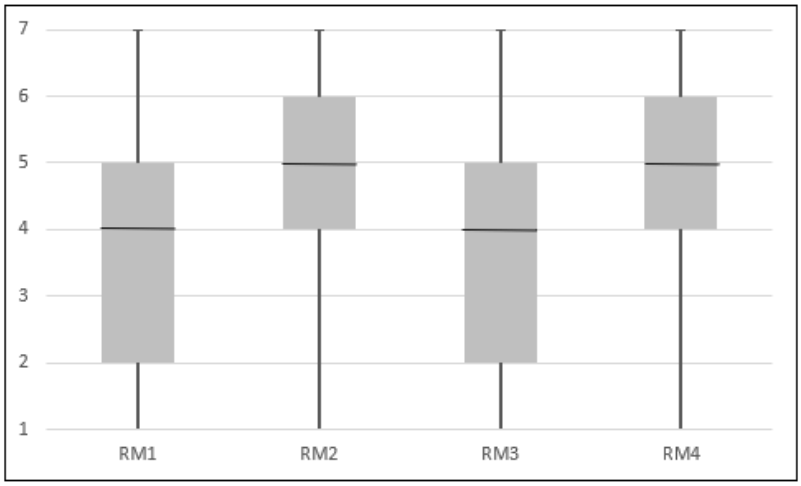

Figure 32 - Risk management rating

2.3.4.1.6 Quality Management (QM)

There were five questions about quality management activities. Figure 33 shows the questions about each one of them.

Variable	Quality management activities
QM1	The project followed quality standards, a well-written working process and detailed construction steps.
QM2	This project routinely carried out tests of various detection, including construction process and the completed parts.
QM3	The project followed continuous control and improvements in the development/implementation process.
QM4	The project quality diary were updated frequently.
QM5	The quality activities of this project could solve problems effectively.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 33 - Risk management questions

The rating of responses recorded for quality management activities is shown in Figure 34. The written quality standards had positive rate, they recorded median 5. Test routines were the most positive questions, they recorded median 5. Continuous improvement process was the most positive project activity, it recorded median 5. Daily quality update was neutral, it recorded - median 4. Quality activities to help solving problems recorded positive rate - median 5.

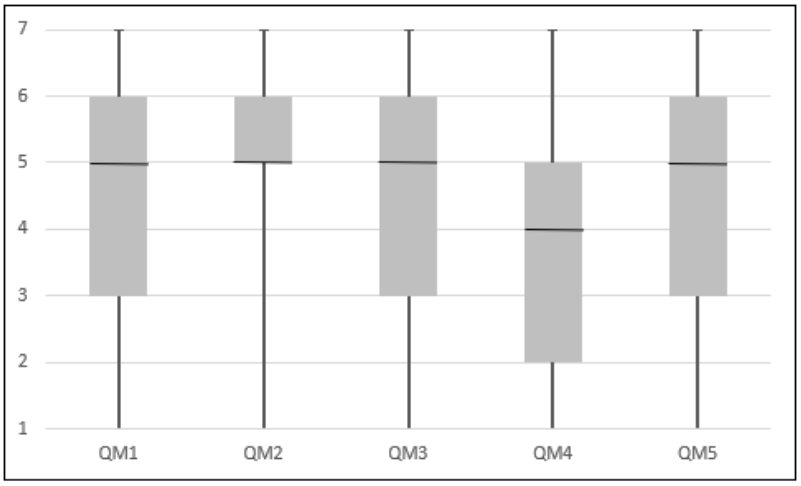

Figure 34 - Quality management rating

2.3.4.1.7 Stakeholders' Engagement (SE)

There were four questions about stakeholders' engagement activities. Figure 35 shows the questions about each one of them.

Variable	Stakeholder engagement activities
SE1	Project promoted positive relationships among the stakeholders.
SE2	Appropriate strategies were applied to manage/engage different stakeholders.
SE3	Communicating with stakeholders was properly and frequently.
SE4	People external to the project team were involved in re-define (refine) project mission.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 35 - Stakeholder engagement questions

Responses about stakeholders' engagement formed a set of positive ratings. Figure 36 shows the responses to stakeholders' engagement activities. Positive relationships among stakeholders recorded the most positive rating - median 6. Appropriate strategies to encourage the engagement of different stakeholders, communication frequency with stakeholders and participation of external people in project-mission definition were positive questions, they recorded median 5.

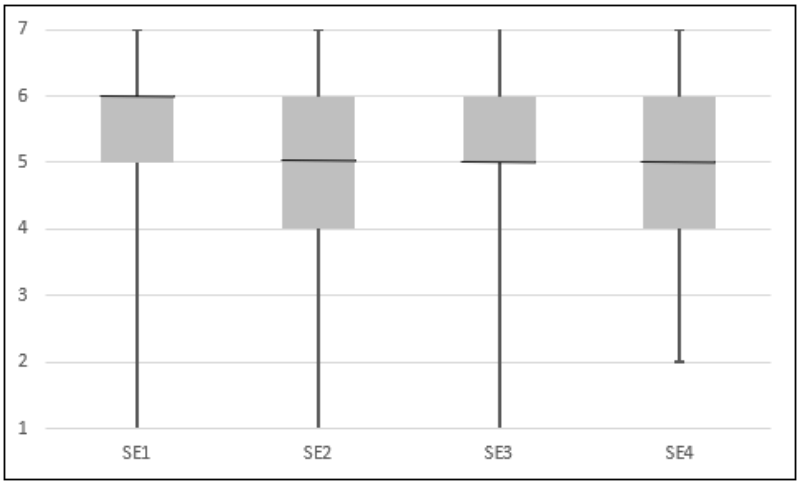

Figure 36 - Stakeholder engagement rating

2.3.4.1.8 Stakeholder Salience (SS)

There were three questions about stakeholder salience qualification regarding legitimacy, power and urgency attributes. Figure 37 shows the questions about each one of them.

Variable	Stakeholder salience qualification
SS1	People external to the project team engaged in the project were considered as desirable or appropriate.
SS2	People external to the project team engaged in the project were considered as able to apply social influence to obtain its will.
SS3	People external to the project team engaged in the project were considered as pressing and requiring immediate attention.
Scale: 1 - Completely disagree; 2 - Mostly disagree; 3 - Slightlyt disagree; 4 - Neither agree nor disagree; 5 - Slightly agree; 6 - Mostly agree; 7 - Completely agree	

Figure 37 - Stakeholder salience questions

Responses about the three attributes of stakeholders were positive, they recorded median 5. Stakeholders' legitimacy and urgency did not get any response 1 (completely disagree). Stakeholders' urgency concentrated responses in 4 and 5. This set of responses shows positive qualification for salient stakeholders' engagement to project activities.

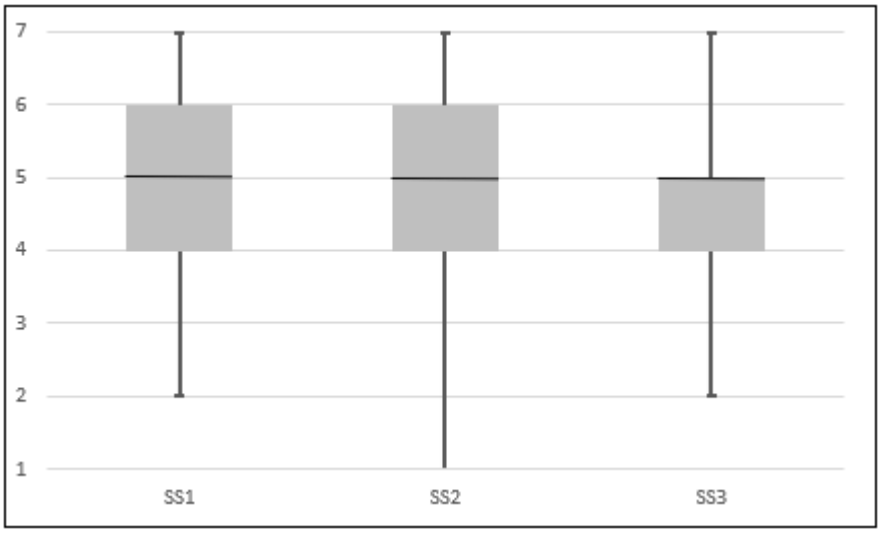

Figure 38 - Stakeholder salience rating

2.3.4.2 Measurement model analysis

2.3.4.2.1 Test applied to control variables

Model tests started with the statistical validation of control variables through bootstrapping, which can be used in PLS path modeling to provide confidence intervals for all estimated parameters by building statistical inference basis (Henseler et al., 2009). Student's *t*-test was carried out through the bootstrapping technique by successively resampling the original data through replacements in order to determine the model sample (Hair et al., 2016). The SmartPLS 2.0.M3 software was used to assess 503 cases, with 503 repetition samples, to determine the path coefficients for control and dependent variables applied to Student *t*-test observation - t-value represents the real difference between groups, it took into account the standard error (Figure 39). Table 4 shows the recorded results.

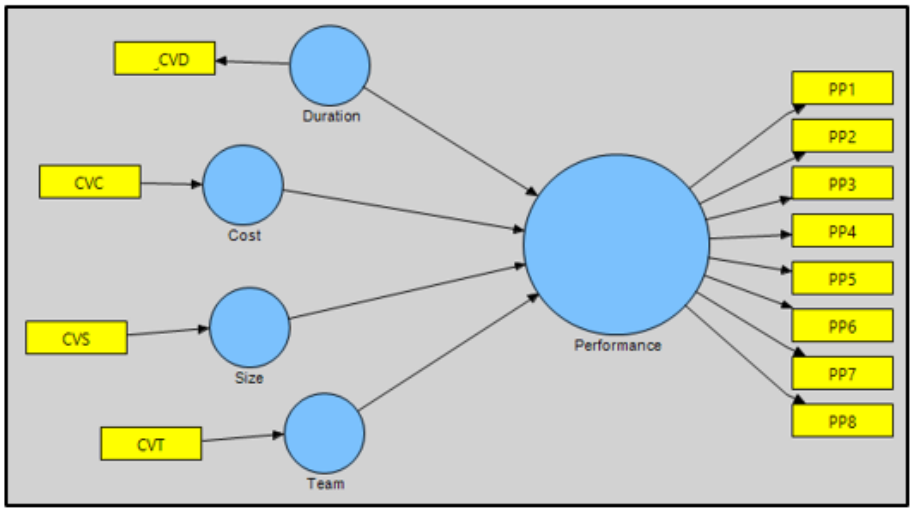

Figure 39 - Control variables in SmartPLS

The *t*-test showed significance for three control variables. Project total cost had significant impact (t-value=2.782) on process performance, and it suggested that higher planned costs have positive effect on project results. The size of the company where the project is conducted also represented significant impact (t-value=2.643) on project performance. This relationship suggested that bigger companies' resource environments have better effect on project performance than smaller companies. The number of members working in a project had important significance (t-value=10.619) in project performance. However, the relationship was negative, and it meant that the increasing number of people working in a project can affect project performance. Project duration did not have significant impact on project performance.

Table 4 - Control variables t-value

Structural path	Original Sample	Sample Mean	Std. Deviation	Std. Error	T Statistics	Sig
Cost-> Performance	0.168	0.172	0.060	0.060	2.782	***
Duration -> Performance	0.010	0.009	0.049	0.049	0.209	
Size -> Performance	0.124	0.125	0.047	0.047	2.643	***
Team -> Performance	-0.439	-0.444	0.041	0.041	10.619	***

Note: Critical limits for infinite sample t test (>=120)
1.65 = *p*-Value<0.10*
1.96 = *p*-Value<0.05**
2.53 = *p*-Value<0.01***

Because duration did not have significant impact on the dependent variable, all other statistical analyses were performed through the adjusted model. Figure 40 shows the adjusted conceptual framework applied to analyze control variables: project cost, company size and team size.

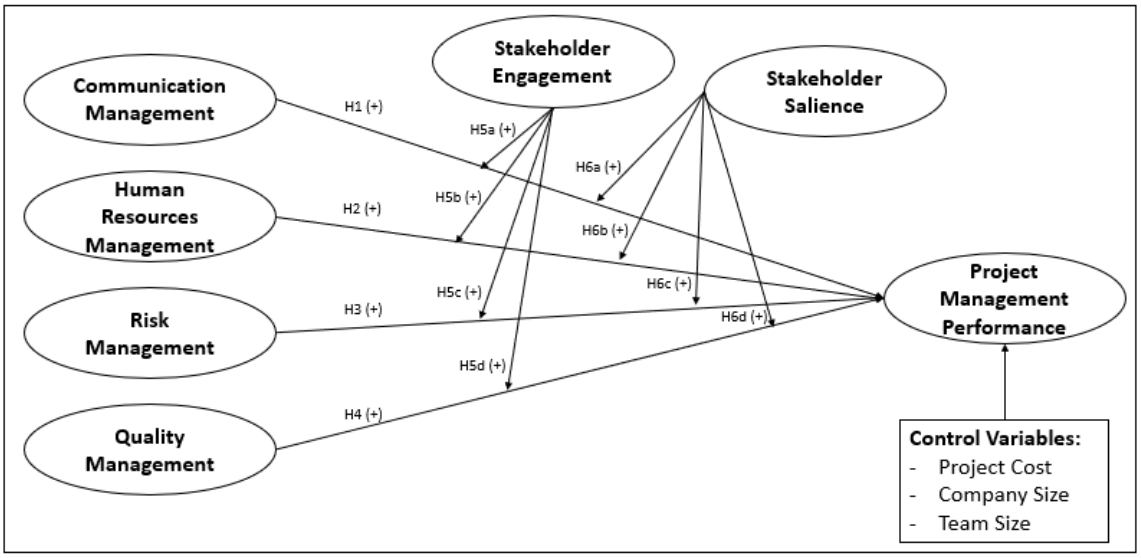

Figure 40 - Adjusted conceptual Framework

2.3.4.2.2 Main path analysis

The model analyses in this section were performed with variables directly related to the dependent variable; they excluded the moderation effect. The two-stage PLS approach allowed estimating the main effects of the PLS model at stage 1 and the interaction with moderator variables in the model at stage 2 (Henseler & Fassott, 2010). The tests were performed in SmartPLS 2.0.M3 software based on the model shown in Figure 41.

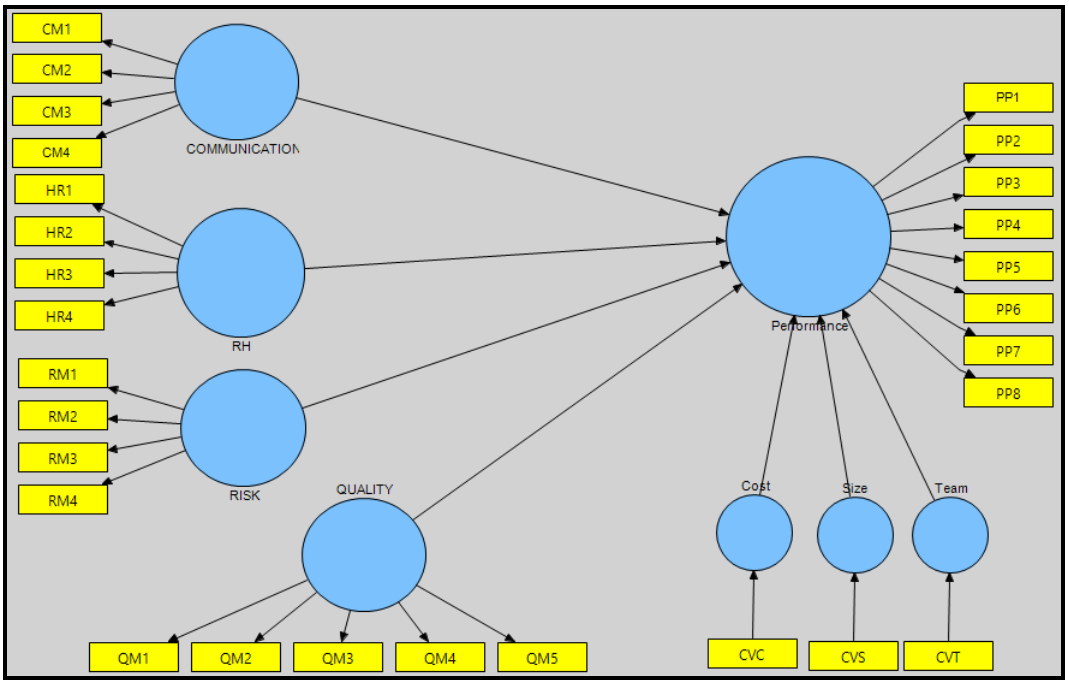

Figure 41 - Main path model - SmartPLS

The first step in this phase regarded the convergent validity analysis, which lied on evaluating the degree to which two measurements applied to the same concept relate to each other (Hair et al., 2016). The convergent validity of all reflectively modeled first-order constructs was evaluated by means of examining the item-to-construct loaded to validate lack loading factors <0.5 (Hair et al., 2016).Only variable CM4 was excluded after this analysis was performed due to load=0.295. Moreover, convergent validity was performed based on the Average Variance Extracted (AVE) analysis, which should record values higher than 0.5 (Hair et al., 2016).

According to the first AVE analysis, there was the need of in-depth understanding construct project performance at observed result of 0.483. Thus, the indicator recording the smallest loading factor of the construct (PP1=0.500) was excluded from the calculations. A second-round of calculations was performed and the construct “risk management” recorded 0.494. The smallest loading factor in the construct was excluded from the calculations, RM=0.606. The model was run again to recheck the convergent analysis. The minimum requirement of 0.5 for AVE was met in the final model measurement and reached the expected convergent validity, as shown in Table 5.

Table 5 - AVE

	AVE	Communication	Performance	Quality	Human Resources	Risk
Communication	0.611	**0.781***				
Performance	0.520	0.587	**0.721***			
Quality	0.526	0.470	0.520	**0.725***		
Human Resources	0.542	0.336	0.339	0.505	**0.736***	
Risk	0.540	0.500	0.464	0.592	0.465	**0.735***

***AVE square root

Once the pre-set criteria for confirming model convergent validity were met, the next step lied on ensuring model discriminant validity, which refers to the degree to which one construct in the model is differentiated from other constructs in the same model (Hair et al., 2016). The discriminant validity was evaluated through the square root of AVE, which must be higher than the correlation between the construct and the other constructs (Fornell & Larcker, 1981). The square root of the AVE in the model was greater than correlations between the construct, and this finding suggested discriminant validity. The bold numbers in Table 4 diagonally report the square roots of AVE - off-diagonal numbers are correlations among constructs. Thereby, the main path model explained 48.4% variance in project performance based on Pearson's determination coefficients: r2=0.484 (Cohen, 1988).

Evaluations assessed the main structural path model by following the structural equation for analysis modeling. A resampling technique was performed based on Student's *t*-test carried out through the bootstrapping technique (Hair et al., 2016). In total, 503 cases, with 503 repetitions, were used in the Student *t*-test - the t value represented a real difference between groups and the standard error was taken into account. Values were significant at t=1.96 (Hair et al., 2016). Table 6 shows the results.

Table 6 - Validation of the main path hypothesis

Hypothesis	Structural path	Original Sample	Sample Mean	Std. Deviation	Std. Error	T Statistics	Sig
H1	Communication-> Performance	0.340	0.337	0.043	0.043	7.929	***
H2	Human Resources -> Performance	-0.043	-0.037	0.039	0.039	1.120	
H3	Risk -> Performance	0.174	0.172	0.056	0.056	3.100	***
H4	Quality -> Performance	0.229	0.231	0.059	0.059	3.890	***
	Size -> Performance	0.077	0.076	0.036	0.036	2.140	**
	Team -> Performance	-0.291	-0.293	0.035	0.035	8.298	***
	Cost -> Performance	0.089	0.089	0.039	0.039	2.301	**

Note: Critical limits for infinite sample t test (>=120)
1.65 = *p* -Value<0.10*
1.96 = *p* -Value<0.05**
2.53 = *p* -Value<0.01***

According to the Student's t=7.929 and p<0.001, the communication construct had positive effect on performance. Thus, the analysis of risk effects on performance was significantly positive: Student's t=3.100 and p<0.001. There was significant and positive impact of quality: Student's t=3.890 and p<0.001. Human resources' effect on performance was not significant: Student's t=1.120 and p>0.10.

2.3.4.2.3 Full model analysis

The following analyses were tested and the full model was validated. Stage 2 of the PLS effects lied on estimating interactions among moderator variables in the model (Henseler & Fassott, 2010). The tests were performed in SmartPLS 2.0.M3 software based the model, as shown in Figure 42.

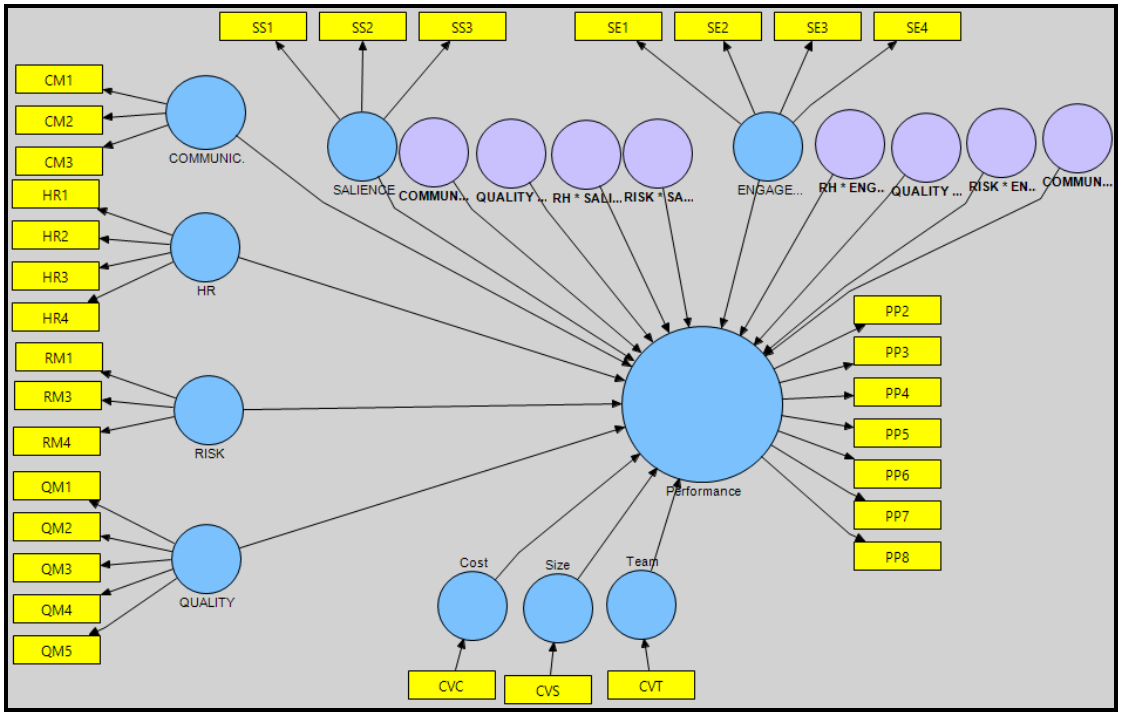

Figure 42 - Full model SmartPLS

Evaluations of the structural full model followed the structural equation of the modeling analysis. The Student's t-test carried out through the bootstrapping technique was used in the study as resampling technique. In total, 503 cases, with 503 repetitions, were used

in the Student t-test - t value represented a real difference between groups and took into account the standard error. Table 7 shows the results.

Table 7 - Validation of the full path hypothesis

Hypothesis	Structural path	Original Sample	Sample Mean	Std. Deviation	Std. Error	T Statistics	Sig
	Communication-> Performance	0.181	0.197	0.241	0.241	0.751	
	Human Resources -> Performance	0.209	0.222	0.187	0.187	1.120	
	Risk -> Performance	0.186	0.190	0.174	0.174	1.073	
	Quality -> Performance	0.216	0.212	0.288	0.288	0.748	
H5a	Communication*Engagement-> Performance	0.114	0.127	0.366	0.366	0.313	
H5b	Human Resources*Engagement-> Performance	0.799	0.763	0.244	0.244	3.272	***
H5c	Risk*Engagement-> Performance	-1.799	-1.800	0.264	0.264	6.812	***
H5d	Quality*Engagement-> Performance	0.362	0.370	0.446	0.446	0.812	
H6a	Communication*Salience-> Performance	-0.166	-0.194	0.363	0.363	0.458	
H6b	Human Resources*Salience-> Performance	-1.068	-1.048	0.311	0.311	3.430	***
H6c	Risk*Salience-> Performance	1.524	1.517	0.313	0.313	4.869	***
H6d	Quality*Salience-> Performance	-0.312	-0.317	0.408	0.408	0.765	
	Size -> Performance	0.068	0.064	0.034	0.034	1.973	**
	Team -> Performance	-0.314	-0.311	0.036	0.036	8.613	***
	Cost -> Performance	0.145	0.148	0.037	0.037	3.887	***

Note: Critical limits for infinite sample t test (>=120)
1.65 = *p-Value* <0.10*
1.96 = *p-Value* <0.05**
2.53 = *p-Value* <0.01***

The t-test values were relevant because they reached values higher than the given relevance level; this finding was indicative of causal relationship between some constructs. Based on this analysis, there was positive effect of human resources management on performance when it was moderated by stakeholder's engagement, according to the Student's t-test results (3.272). There was significant effect of risk management on performance moderated by stakeholders' engagement, but such an effect was negative based on the Student's t-test (6.812). Stakeholder's engagement had positive effect when it moderated the effect of risk management on project performance, based on the Student's t-test (4.869). Thus, there was significant human resources management effect on performance when it was moderated by stakeholders' engagement, based on the Student's t-test (3.430), although the effect was negative. Moderator effects on other associations were not significant, based on the Student's t-test <1.650. The total effect of project performance variation explained 62.1% of project performance variance, based on Pearson's determination coefficient: r2=0.621 (Cohen, 1988). According to Cohen (1988), the minimum value for variance explanation or Pearson's determination coefficient (R2) must be N=0.26; this number is endorsed by Hair et al.(2016).

Based on this parameter, R2 recorded for latent variables (dimensions or first-order constructs) in the proposed model was high.

2.3.5 DISCUSSIONS

The aim of the current study was to validate stakeholder's participation in projects as a positive practice to enhance project performance. Performance analyses should go beyond revenue rates and companies should address additional aspects of performance measurements (Freeman et al., 2020). The herein measured projects were assessed based on the financial perspective, as well as on how good and adequate products generated by them were. Product performance questions in the survey (Appendix A) asked respondents to analyze IT system delivery according to reliability, ease of use, functional requirements, response time and quality aspects (Diegmann et al., 2017).

The first relation test assessed the positive effect of communication management on project performance (H1) and its results have supported the hypothesis about it, which recorded significance $p<0.01$. This finding is in compliance with the study by Lindhard and Larsen (2016), according to whom, communication is one of the key factors for project performance in project construction. They extended the validation of communication effects on project performance construction (Lindhard & Larsen, 2016; Xia et al., 2016) to IT projects. The current results extend the validation of the study by Hsu et al. (2012), who have validated communication effects on team performance, but who have not assessed their impact on project performance. Respondents have observed effective communication with internal and external teams as common practice (Figure 10), and such a profile corroborated the research by Yap et al. (2017), who found lack of communication as a factor influencing design changes in projects. Some challenges are faced at the time to validate the positive effects of communication on IT projects; Kannabiran and Sankaran (2011) have tested such an association and did not find significant results. The same happened in the present study, since it was not possible recording any significant validation to communication management effects on project performance moderated by engaged stakeholders. This outcome did not support H5a. Moderation by salient stakeholders also did not support H6a. The combination of communication effects and salient stakeholders was tested in previous studies (Kuruppu et al., 2019; Uysal et al., 2018), although not in project contexts. Stakeholders' engagement was

validated in the tourism context (Bec et al., 2019; Agacevic & Xu, 2020), but, yet, not in project management context.

Human resources' management recorded intriguing results in the model. Popaitoon & Siengthai (2014) tested human resources' management effects on long and short-term project performance in the automotive industry. They adopted the IT context scale but did not find significant HR effect on PP, and this finding did not support H2. On the one hand, the mean answer by respondents about career planning (Figure 8) slightly disagreed with the statement of having career planning for team members. The question about team accountability and participation simulations was positive and in compliance with affirmative answers. The lack of leadership by project managers (Afzal et al., 2018; Bhoola & Giangreco, 2018) and of top management support were common explanations for the non-significant results regarding H2 confirmation (Rosacker & Olson, 2008). Lack of either project management leadership or top management support can encourage team members to be autonomous and make decisions on their own; however, such a non-supportive profile may lead to decisions that are not in compliance with project goals.

The complexity of human resources' project scenarios can be corroborated by moderated human resources' management path and project performance validation. When stakeholders' engagement moderates HR effects on PP, such a profile significantly supports H5b. Customers' engagement to activities can encourage positive participation and lead to potentially positive results (Vivek et al., 2012). This positive potential can be explored through project management performance, giving team member's autonomy and participation in decisions in compliance with both expectations of system users and project goals. Calvo and Calvo (2018) conducted a case study and suggested a framework based on adopting human resources and stakeholders' engagement practices to meet business strategies and fulfill employees' interest in order to improve operational performance. Although the present study has supported positive stakeholders' engagement moderation in HR and PP activities, the same did not happen with salient shareholders' moderation in HR and PP, since it was not significant (p>0.10) and did not support H6b. Based on this finding, the salience of stakeholders participating in HR activities was not significant concerning PP. Järlström et at. (2018) performed a case study based on the top management perspective and found that some stakeholders are more important than others depending on the HR management dimension; this finding pointed out the importance of the stakeholders' salience analysis. Thus, HR management effects on PP can be potentiated by stakeholders' engagement to its activities, but their salience did not present significant results.

H3 regards the hypothesis that risk management has positive effects on project performance. The present results have supported this hypothesis, which recorded significance of $p<0.01$. This finding corroborated the vast number of studies relating RM activities from different project performance dimensions. Carvalho and Rabechini Junior (2015) correlated the hard and soft sides of risk management dimensions to project success in a field study comprising 263 projects. It was possible evaluating the hard side of project risk management by adopting this risk management dimension approach. Some previous studies, similarly to the present one, have found evidences that efficient risk management leads to better project performance (Bakker et al., 2012; Oehmen et al., 2014; J. Y.-C. Liu & Chiu, 2016; Crispim et al., 2019; Rasul et al., 2019). According to respondents in the current survey, the mean answer (Figure 12) positively agreed with statements about RM activities being performed in projects. Thus, from the viewpoint of RM effects on PP validation-dimension, the present project presented results similar to those in previous research.

The contribution of the present RM project study lies on the role played by stakeholders in its activities. The moderation effect of stakeholder's engagement on RM and PP was the first hypothesis to be tested. SE moderation effect was highly significant, $p<0.01$, but negative, which meant that stakeholders' engagement to RM activity participation could lead to negative effects on PP. Effectively dealing with project risks is difficult and requires managerial interventions that go beyond simple analytical approaches (Thamhain, 2013), which may partially explain the aforementioned result. The simple stakeholders' engagement is not guarantee of better efficiency results. Wyk et al. (Wyk et al., 2008) conducted a case study in a utility company and found that stakeholders played a key role in risk identification activities; however, they also observed that the role played by experts is essential to reach more sophisticated RM methods. Stakeholders' classification can be substantiated by stakeholders' salience analysis (Mitchell et al., 1997). Salient stakeholders' moderation effects on the RM/PP association was herein tested and the result was significantly high $p<0.01$; this finding has supported H6c. Based on this outcome, the higher the stakeholders' salience in the project, the higher their contribution to RM. Stakeholders' motivation and reputation are essential to create a cooperative environment and to reach a good degree of contribution to IT projects (Vos et al., 2016). This observation opens room for important insights about how to make stakeholders and project team members' cooperate to RM. Engaged stakeholders were not enough to improve PP, and this finding was corroborated by the mean evaluation of respondents (Figure 12). Stakeholders evaluated based on salience

could be selected to contribute to plan and monitor risk threats and responses throughout the project.

Quality management results have confirmed the hypothesis about its positive effect on project performance, since the recorded results showed high significance (p<0.01) - this finding has supported H4. The mean positive agreement by respondents with QM activities (Figure 14) has confirmed that such activities have been performed in projects and have positive impact on PP. Lu et al. (2019) validated quality management effects on project performance construction due to individuals' practices and to process definition and conduction. Mature quality management leads to better results. Previous studies have analized the degree of QM maturity based on project management success in different fields (Shieh & Wu, 2002; Jung & Wang, 2006; Milunovic & Filipovic, 2013; Doneva et al., 2016). Stakeholders' engagement effects were herein assessed and results were not significant (p>0.10) and did not support H5d. The same result was recorded for stakeholders' salience, which recorded significance of p>0.10 and did not support H6d. These outcomes have shown that it is not possible validating stakeholders' contribution to QM activities in order to achieve better PP. Results of the tested hypotheses are shown in Figure 43

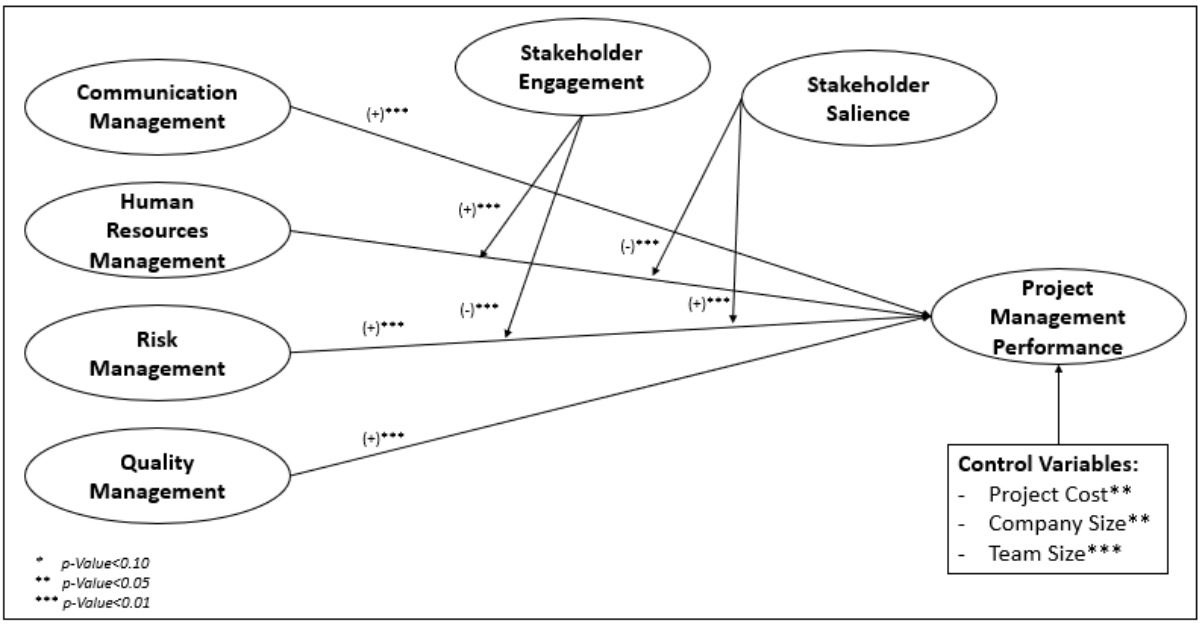

Figure 43 - Tested framework

2.3.6 CONCLUSIONS

2.3.6.1 Theoretical implications

The stakeholder theory often separates the theoretical from the real world of business. There are several challenges to be overcome in order to connect intellectual to practical work (Freeman et al., 2020). The current study has given important contributions to connect the SM theory to the practical IT project management world. This theory has been dealing with challenges to hear the voices and meet the different needs (sometimes conflicting) of many people based on different aspects and in compliance with company goals. Mitchel et al. (1997) provided a specific and measurable way to classify stakeholders by adding the degree of salience to the stakeholder theory and helped understanding how they can have a collaborative participation in projects. This theoretical classification was herein applied to classify stakeholders who have collaborated to projects by listing the highest salience degree: the higher their collaboration to project management activities, the higher the project performance. The current study has given important contributions to connect the SM theory to the practical world of IT project management.

First of all, it showed that stakeholders' engagement to project management activities is useful for IT projects and improves project performance. There was empirical evidence that effective project management - CM, RM, QM – in IT projects has significant and positive effect on PP. However, it was not possible finding significant evidence of HR effects on PP. Nevertheless, SE potentiates the HR/PP association, whose empirical results can be measured, as well. On the other hand, salient stakeholders may account for HR negative impact on PP. Therefore, depending on the SS, the highest salience is not always the best choice, since circumstantial needs can lead to negative results in projects, such as the case of HR management.

The most significant contribution of the current study concerns risk management. Similar to previous studies (Bakker et al., 2012; Oehmen et al., 2014; J. Y.-C. Liu & Chiu, 2016; Crispim et al., 2019; Rasul et al., 2019), the present one found evidences of positive association between RM and PP. Its contribution lies on the role played by stakeholders in RM. Significant threats may have strong impact on projects, and it must be evaluated, and require process management and project team's efforts (Keil et al., 2013). Based on the herein presented empirical evidence, stakeholders' engagement has negative impact on the RM/PP

association. But, the current research did not allow concluding that reducing SE is the best decision to reduce negative impacts. When stakeholders were classified based on their salience, there were empirical evidences about their positive contribution to the RM/PP association. Therefore, stakeholders must be evaluated before they participate in RM activities, which are essential for their positive contribution.

The present study added to the theory by helping to answer one of the many questions presented by Freeman et al (2020). How deep stakeholders' allocation and involvement in coproduction must go over time? (Freeman et al., 2020). The model presented in this conclusion (Figure 22) was validated by empirical evidences that the factual stakeholders' participation in project activities is important, but not enough for the success of a project, as a whole. Their engagement leads to better results in the short and long-term. Getting stakeholders engaged to contribute overtime can be beneficial for projects.

2.3.6.2 Managerial Implications

The present study provided significant insight about IT projects and on project practitioners and company leaderships' participation in formulating strategies to manage projects, to address IT users' needs and participation, as well as to improve project results. The concept of stakeholder theory will help developing a collaborative project environment and addressing specific roles played by stakeholders in projects to avoid conflicts between team members and external people (IT users).

Based on the current results, project managers and Top management support are fundamental in terms of human resources. Although team members need autonomy to make decisions, give opinions and participate in important decision-making, this autonomy is not effective without support from the higher management spheres. External people contribute to human resources when stakeholders are engaged to decision-making and RM results get positive to IT projects; however, salient stakeholders can lead to negative impacts. Project managers must support interactions between team members and stakeholders, since their urgent needs or high power can influence the results and turn positive contributions into negative ones.

Project managers and practitioners must apply RM practices to protect project from threats and to find and explore opportunities. RM is performed throughout the whole project,

but external help to identify and monitor risks is important. Reponses to risks are sometimes controversial, but well-prepared stakeholders give more positive contributions to such activities. Therefore, project managers must work very close to collaborate and identify the most and least prepared stakeholders among the salient ones to participate in each RM activity.

2.3.6.3 Limitations and future research suggestions

Results are limited to IT software project context. This limitation opens room for further studies to validate the theoretical or empirical model for specific business sectors, or for non-software or non-IT projects. There are other stakeholder classification models that can be used to classify them.

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APPENDIX B

Control Variables (CV)	**CVD**	The time duration of the project was	Gu et al 2014
	CVC	The total cost of the project was	
	CVS	The company size where the project was implemented	
	CVT	The total number of team members that worked on the project	
Project Performance (PP)	**PP1**	**Project were completed on time**	Gu et al 2014
	PP2	Project met budget requirements.	
	PP3	Project met scope	
Product Performance	**PP4**	The system's intended functional requirements were met.	Diegmann 2017
	PP5	The overall quality of the developed application is high.	
	PP6	The application developed is reliable.	
	PP7	The system meets user expectations with respect to response time.	
	PP8	The application is easy to maintain.	
Communication Management (CM)	**CM1**	The extent of communication between internal project parties is often optimal	Lindhard, S; Larsen, JK 2016
	CM2	The extent of communication between external project parties is often optimal	
	CM3	I rarely experienced conflicts and disputes between project parties resulting from lack of communication.	
	CM4	Communication issues or conflicts were rarely caused by errors or defects in the project documents.	
Human Resources	**HR1**	Project team had a good career planning provided by leadership.	Zhu, LY; Cheung, SO 2017
	HR2	Members of the project team were allowed to make many decision.	Popaitoon; Siengthai 2013
	HR3	Opportunities were given to the project team to suggest improvements related to how things should be done.	
	HR4	The leaders often asked to the project team to participate in decision-making.	
Risk Management	**RM1**	The project had a risk management procedure.	Liu et al. 2016 Ortiz et al. 2019
	RM2	Significant threats were identified.	
	RM3	Buffers were included on time and cost to absorb uncertainty.	
	RM4	Change request were registered and their impact on project were evaluated.	
Quality Management	**QM1**	The project followed quality standards, a well-written working process and detailed construction steps.	Lu et al. 2019
	QM2	This project routinely carried out tests of various detection, including construction process and the completed parts.	
	QM3	The project followed continuous control and improvements in the development/implementation process.	
	QM4	The project quality diary were updated frequently.	
	QM5	The quality activities of this project could solve problems effectively.	
Stakeholder Salience	**SS1**	People external to the project team engaged in the project were considered as desirable or appropriate.	Mojtahedi, M; Oo, BL 2017 Chen et al. 2019
	SS2	People external to the project team engaged in the project were considered as able to apply social influence to obtain its will.	
	SS3	People external to the project team engaged in the project were considered as pressing and requiring immediate attention.	
Stakeholder Engagement	**SE1**	Project promoted positive relationships among the stakeholders.	Molwus et al. 2019
	SE2	Appropriate strategies were applied to manage/engage different stakeholders.	
	SE3	Communicating with stakeholders was properly and frequently.	
	SE4	People external to the project team were involved in re-define (refine) project mission.	

3 DISCUSSIONS AND CONCLUSIONS

In this thesis, I investigated how efficient stakeholder management activities can enhance IT project performance. Several factors may affect project performance, project managers and top management team should identify them and influence positively (Hadad et al., 2013). I analyzed how stakeholder management activities on IT projects may affect the relations of project management activities of CM, HR, RM, and QM with PP, I used finished project software implementations as the context for this analysis.

The results of the three studies in chapter 2 indicate some insights about the application of stakeholder management in the project management field and how the performance of the project may be affected. Study 1 shown 20 years of stakeholders' management previous studies, how the publication in this area has been growing, and the main clusters of these studies. Study 2 reviews empirical studies about IT projects related to project performance, identifies several factors with empirical validation of affecting PP and, how the construct of PP has been measured. Study 3 applies stakeholder theory, specifically with stakeholder engagement and stakeholder salience, to analyze stakeholder managements' contribution to the relations among project management activities and project performance.

The conjoint results of these studies are valuable to the discussion of stakeholder management and stakeholder theory in the context of the project. First, the results of this thesis show that stakeholder management is a study that is in expansion for project management, and many of these studies has a practical approach with the possibility of further studies applying stakeholder theory. Stakeholder theory helps to solve problems, and the engagement of stakeholders brings useful solutions and results (Freeman et al., 2020). The application of stakeholder theory to solve problems on projects may not only impact project performance positively but also may create value for the company, employees, collaborators, and society as well.

Second, the results bring similarities between the constructs project performance and project success. Many of the studies applying one or another nomination are using the same variables to measure these constructs. The use of the iron triangle scope, time, and the cost is recurrent, but many years are not the only way to measure performance or success. More comprehensive researchers have been analyzing the results of the project activities, comparing

the project plan with project finish results, and the final product created, and how this product reaches the expected results.

This thesis has three main contributions. The first contribution regards the analyzes of previous studies. I showed the main clusters of stakeholder management and projects. Theses cluster shows the main topics of studies about this field with their more important studies and authors. From these clusters, it is possible to identify ways to future studies based on their combinations, limitations, and the application of stakeholders' theory for a theoretical perspective and solutions for challenges faced by companies and practitioners. I also have shown a review of what impacts project performance. This view allows future studies to explore new relations with a positive or negative effect on PP and expand this construct.

The second contribution has a theoretical approach regarding Stakeholder Theory. In study 3, I have applied stakeholder salience and stakeholder engagement to evaluate the contributions of stakeholders to IT projects. Stakeholder engagement allows to analyze the participation of stakeholders in the long-term and validate their involvement in different stages of an IT project. It was possible to find that this participation is not always positive and evaluate this participation is mandatory for companies. It was also possible to assess stakeholders according to their salience, and this classification showed positive and negative contributions. The more salient is not always, the more contributor to PP.

Finally, the third contribution regards a managerial contribution. The contributions come not only from the confirmations of the hypothesis presented in study 3 but also in the negative results. These results showed that when participating in RM activities, stakeholders may be a negative effect on the results. However, when the participation is analyzed by the salience of the stakeholders, the contribution is positive, showing that project managers and team members should evaluate stakeholders before requiring their involvement in RM activities. An important result was presented about HR, give autonomy to team members to participate, and making decisions showed positive results. The participation of stakeholders, in general, has also demonstrated a positive contribution to HR. The negative effects were presented when stakeholders were classified by salience, showing that delegation may have a negative impact on activities with more salient stakeholders. The conclusions are that support of top management and project manager are necessary when important stakeholders are involved in activities.

As a conjoint is important to highlight the original research question of this thesis, "how efficient stakeholder management activities can enhance IT project performance".

Although it was possible to validate all the proposed hypotheses, the construction for this thesis allows for evaluating many aspects of the contribution of stakeholders' management to enhance ITPP. Studying stakeholder management and stakeholder theory it is possible to conclude that there are positive contributions, and companies and project practitioners can explore them. This thesis showed previous studies with empirical validation of this contribution, and many of these studies are not attached to a theory and shows the approach of management guides. However, study 3 adopting the stakeholder theory could find empirical evidence of the positive contribution to IT PP. Therefore, it is possible to affirm that companies can adopt stakeholders theory and project management guides to enhance their results in IT Projects.

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