e-ISSN: 2236-0972
https://doi.org/10.5585/gep.v14i2.23651
Received: 19 Jan. 2023
Approved: 07 Apr. 2023
Editor in Chief: Luciano Ferreira da Silva
Scientfic Editor: Flavio Santino Bizarrias
Scientfic Editor: Renato Penha

PROJECT MANAGER COMPETENCIES ASSOCIATED WITH THE PROJECTS' SUCCESS IN THE PUBLIC SECTOR

COMPETÊNCIAS DO GERENTE DE PROJETOS ASSOCIADAS AO SUCESSO DOS PROJETOS NO SETOR PÚBLICO

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Abstract
Although project management is widely used in the public sector, many projects still fail even when project management tools and practices are employed. Several studies show that a project's success depends partly on the project manager's competencies; however, there is little empirical research on this subject in the public sector. This study aims to analyze the significant characteristics linked with the competencies of the public sector project manager and outlines a profile of these professional competencies characteristics that can lead to the success of projects. Through empirical research conducted with 77 project managers from 32 public organizations in Brazil, this study examined the relationship between project managers' competencies and the likelihood that projects will succeed. Using factor analysis and logistic regression, we looked at factors like time, cost, quality, and scope to determine their relationship to the likelihood that projects will succeed. The findings highlight the importance of project management knowledge, communication abilities, attitudes relating to motivation, trust, and emotional intelligence, and most traits defining project managers in the public sector. The employee's length of service was the single factor that had a negative impact on the project's outcomes. This study contributes to the current knowledge of project managers' competencies in the public sector, showing the main characteristics a successful project manager needs to have and can help direct efforts in selecting a more suitable professional, contributing to the reduction of the turnover of the workforce and the consequent loss of knowledge of the organization.

Keywords: Competencies. Public sector. Project. Project manager. Management. Manager.

Resumo
Embora o gerenciamento de projetos seja amplamente utilizado no setor público, muitos projetos ainda falham mesmo quando ferramentas e práticas de gerenciamento de projetos são empregadas. Vários estudos mostram que o sucesso de um projeto depende em parte das competências do gerente de projeto; no entanto, há pouca pesquisa empírica sobre esse assunto no setor público. Este estudo tem como objetivo analisar as características significativas ligadas às competências do gerente de projetos do setor público e traçar um perfil das características dessas competências profissionais que podem levar ao sucesso dos projetos. Por meio de pesquisa empírica realizada com 77 gerentes de projetos de 32 organizações públicas no Brasil, este estudo examinou a relação entre as competências dos gerentes de projetos e a probabilidade de sucesso dos projetos. Usando análise fatorial e regressão logística, foram analisados fatores como tempo, custo, qualidade e escopo para determinar sua relação com a probabilidade de sucesso dos projetos. Os resultados destacam a importância do conhecimento em gerenciamento de projetos, habilidades de comunicação, atitudes relacionadas à motivação, confiança e inteligência emocional e a maioria das características que definem os gerentes de projetos no setor público. O tempo de serviço do funcionário foi o único fator que impactou negativamente os resultados do projeto. Este estudo contribui para o conhecimento atual das competências dos gerentes de projetos do setor público, mostrando as principais características que um gerente de projetos de sucesso precisa ter e pode ajudar a direcionar esforços na seleção de um profissional mais adequado, contribuindo para a redução da rotatividade da força de trabalho e a consequente perda de conhecimento da organização.

Palavras-chave: Competências. Setor público. Projeto. Gestor de projeto. Gerenciamento. Gerente.

Cite como
American Psychological Association (APA)

Dias, T. L., Oliveira, B. S., Carneiro, T. C. J., Moura, R. L. & Lima, S. S. (maio/ago.). Project manager competencies associated with the projects' success in the public sector. *Revista de Gestão e Projetos (GeP)*, *14*(2), 31-54. https://doi.org/10.5585/gep.v14i2.23651.

1 Introduction

The Brazilian government adopted a management role (New public management) following the State Administrative Reform in 1995, attempting to handle public instruments in the same manner that private services are managed for efficiency (Denhardt & Catlaw, 2017). Public organizations have also been concerned with organizational alignment, establishing the vision, mission, values, and strategic objectives by incorporating methods used in the commercial sector, such as strategic planning (Mahura & Birollo, 2021). Projects are an essential part of the public organization's strategy and are also influenced by the new public management role.

Projects are short-term efforts made to provide a distinctive good, service, or outcome, according to PMI (2018), enabling some of the execution and operationalization of these commitments. Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements (PMI, 2018). Project management helps meet public organizations' strategic planning, increasing the chances of the project's success (Moura, Carneiro & Oliveira, 2020).

Project management requires a professional capable of overcoming resistance due to the organizational culture, mainly in public projects in which the alignment of interests, cultural divergences, and communication difficulties are almost always present (Moura, 2017). This professional is assigned the project manager title and the person allocated by the performing organization to lead the team responsible for achieving the objectives (PMI, 2018). Since projects vary depending on the organizational context, the profile of the project managers must also be adapted to each organization and the type of project; for that, they must present specific competencies (Müller & Turner, 2007).

Although interest in using project management techniques and tools is increasing in the public sector, many projects fail to achieve their goals. The most cited reasons for failure are lack of definition, excess scope change, user involvement, and lack of resources (PMsurvey, 2014). Project manager competencies are also associated with project performance (Bredin & Söderlund, 2013; Kerzner, 2017; Müller & Turner, 2007; Takey & Carvalho, 2015; Alvarenga *et al*., 2019). The literature brings that the project managers' competence is a factor in the successful delivery of projects, and the project managers need to have competency in areas that have the most impact on successful outcomes (Crawford, 2000).

Competency is a range of characteristics, behaviors, and traits required for effective job performance (Abraham *et al*., 2001). Competent project managers consistently apply their project management knowledge and personal behaviors to increase the likelihood of delivering project requirements (PMCD.3, 2017). Moradi *et al*. (2020) adopted the definition of competency means the capability to use skills, knowledge, and personal characteristics that enhance the efficiency and effectiveness of project managers in their job performance and subsequently increase the likelihood of project success.

This study takes the view that the competencies of a professional are in three dimensions: knowledge, Skills, and Attitudes (Durand, 2006; Lundy & Morin, 2013; Moura, Carneiro & Oliveira, 2020), with the assumption that these competencies are essential to increase the project manager's performance and, consequently, the success of the projects. Based in this context, this paper seeks to contribute to the theme through the following research question: ***Which competencies that impact project success characterize the public sector project manager?***

This empirical, exploratory, and quantitative study explores the competencies of the civil servant responsible for managing projects in the public sector and outlines a profile of competencies characteristic of this professional that increase the likelihood of project success, made possible through a survey of leaders or project managers who work in the public sector in Brazil.

The contribution of this work is twofold. First, our study fills the literature gap by describing the main competencies of successful project managers for public organizations. Second, as a practical contribution, this study aims to reveal the skills of this professional that can help direct efforts in selecting a more suitable professional to manage public projects, contributing to the reduction of the turnover of the workforce and the consequent loss of knowledge from the public organization.

This article is divided as follows, first, the theoretical foundation with the main concepts and hypothesis of the work; second, the methodology where the methods used are described; then, the results are presented, and analysis of the results and the discussions about the findings, and finally, the final considerations.

2 Theoretical foundation

2.1 The project manager

The project manager is the person allocated to lead the team responsible for achieving the project objectives (PMI, 2018). Organizations assign the Project Manager responsible for the conduct and delivery of their projects. Its attributions include coordinating and integrating activities in various technical and functional lines and managing stakeholder communications. The activities assigned to the project manager go beyond the limits of the functional sectors of the organization and therefore require coordination and integration efforts. To ensure this integration, the project manager needs to have communication and interpersonal skills, negotiation skills combined with an understanding of the organization's culture, familiarity with the operations of each organization sector, and knowing the technology used. (Kerzner, 2017; PMI, 2018).

Pinto (2000) states that project managers do not usually have sufficient status or authority to, for example, conduct performance evaluations for team members (generally reporting to a functional manager). Without the authority to punish or reward, they can use human skills (non-technical) such as bargaining, influence, conflict management, and negotiation to secure the resources needed to achieve project success. Such skills can be more or less developed (and applied) depending on the project environment and the organization, which confirms the statement by PMI (2018) that the understanding and application of knowledge, tools, and techniques recognized as good practices are not sufficient for effective project management, requiring the project manager to have other skills.

2.2 Project success

The definition of project success has changed over time. Success criteria had evolved (Kerzner, 2020) from the 1960s when they were considered only technical aspects, through the iron triangle in the 1970s (time-cost-scope-quality), customer satisfaction in the 1980s, organizational impacts in the 1990s (O'Brochta, 2002; Ika, 2009) to the most recent criteria that consider social and environmental impacts (Kerzner, 2017).

Muller and Turner (2007) recorded the definition of success from several project managers. Meeting requirements, budget, and time is the most common definition, followed by meeting user requirements, achieving the project's purpose, achieving customer satisfaction

with project results, and doing new business with the customer. The three dimensions of time, cost, and quality/performance are still considered central to measuring the success of a project, although other authors agree that the performance of a project goes beyond these, such as customer satisfaction; business success; and achieving strategic objectives (Papke-Shields; Beise & Quan, 2010).

De Wit (1988) and Cooke-Davies (2002) distinguish the success criteria into two broad categories: project success and project management success. Freeman and Beale (1992) argue that the criteria with greater subjectivity, such as organizational impacts and perception of stakeholder satisfaction, are related to project success. The technical aspects related to the iron triangle would be measurement criteria related to the success of project management. The Iron Triangle, also known as the Triple Constraint, is a central concept in project management research and practice that depicts the relationship between key performance criteria. It represents the criteria for measuring the success of a project, namely whether the project is delivered on time, within budget and performance, or in scope. Although it was initially created with three factors, over the years, researchers understood that an agreed-upon level of quality was a fourth factor that should be added to it (Pollack *et al*., 2018).

More recent research has proposed different ways of measuring project management success according to the main project time horizons: *ex-ante* when building the project's Business Case, Project during project execution, and *ex-post* after completion (Varajão *et al*., 2022). In public projects, Volden and Welde (2022) argue that success should be measured through six factors: Operational – Efficiency, Tactical – Effectiveness, and strategic – relevance, impacts, cost-effectiveness, and sustainability.

Even though success is a generic concept, it is commonly operationalized by the iron triangle that is still used as a reference in many project management studies to measure the project's operational performance (Volden & Welde, 2022). Our analysis considers *ex-post* factors proposed in the iron triangle and the project's success as a whole; it is assumed that success in project management has a positive relationship with the alignment of resources to achieve objectives (Hyväri, 2006). The importance of this definition becomes more evident when the role of the project manager is mentioned, which is the person responsible for achieving the objectives and the consequent success of the project (PMI, 2018).

2.3 Project management in the public sector

Recognition of the benefits of project management in the public sector is not recent. Stuckenbruck and Zomorrodian (1987) already stated that project management emerges as a potential revitalization of inefficient management practices in developing countries. However, poorly qualified adoption is firmly rejected. The application of project management is recommended only when certain technical, political, and environmental conditions are satisfied. Moreover, they will only work if incorporated into the organization in a way adapted to its local values and culture.

Vargas (2005) compares projects in the private and public sectors that include differences in the influence of laws (that can add constraints to the project by limiting the project manager's decision range), availability of resources, objectives, risks, and bureaucracy, among others. In addition, the reduced planning horizon due to the term of office and annual budget and the expenditure of energy to ensure the transparency of knowledge affect the execution of projects in the public sector (Barcaui, 2012).

The public sector's political aspect also influences the project outcome. The public sector operates in an environment with a high conflict of objectives and results, involving many stakeholders with varied interests who may demand concessions for political interests, leaving technical aspects in the background (Wirick, 2009). In Brazil, the works of Furtado, Fortunato, and Teixeira (2011) and Santos and Costa (2013) point out several obstacles to the implementation of project management, mainly in public organizations, such as:

- The absence of culture in project management - that is being incorporated after the new public management;
- Interpersonal relationships – with multiples interests;
- Hierarchy, the rigidity of the bidding law - that includes less flexibility compared with the private sector;
- and administrative discontinuity - with election cycles.

2.4 Competency

The concept of competency is widely used; however, there is no universally accepted definition (Takey & Carvalho, 2015), with interpretations and definitions as numerous as they differ (Coelho Jr., 2003; Hondeghem; Horton & Scheepers, 2006). Despite the differences in definitions, the term "competence" converges to "[...] the set of Knowledge, Skills, and

Attitudes expressed by professional performance, within a given organizational context and prepared to act in unforeseen situations" (Sanchez, 2004). Zarifian (2001, p. 72) defines competence as "[...] a practical understanding of situations that is supported by acquired knowledge and transforms them as the diversity of situations increases".

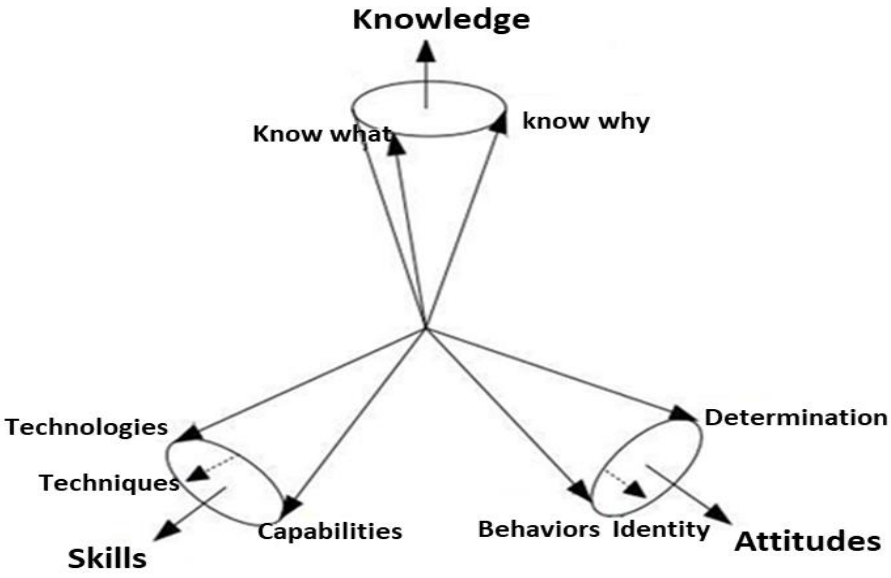
Le Boterf (2003) reinforces the idea that competencies are always contextualized. The professional's knowledge and skills do not assume competency status unless they are communicated, exchanged, and recognized by a group. The professional is defined by the work and the tasks to be performed. He/She is characterized more by the activity of "managing." This "knowing how to manage" can be broken down into "knowledge." However, competency results not only from "knowing how to act" but also from "wanting to act" and "being able to act" (Le Boterf, 2003, p. 160). These factors can be developed, encouraged, and facilitated by their promoters.

Durand (2006) defines competence as combining, grouping, and integrating resources into customer products and services through internal management processes. It presents the decomposition of the competence concept into three "key dimensions" to identify the types of competence promoters (idealization, organization, and motivation) within organizations and how to promote this potential. Durand's (2006) study is based on the competence-based view. This theory states that an organization can perform better than another if it can mobilize its resources more efficiently or effectively; it is only possible if the organization has specific competencies which must be stimulated (Freiling, 2004). For this, Durand (2006) reinforces that, in addition to the importance given to management processes, the concepts of identity, shared vision, and organizational structure are also necessary for "organizational alchemy," that is, the union of resources in an intangible and essential way (hard to explain and not easily imitated).

Figure 1 illustrates the dimensions presented by Durand (2006) and their components:

Figure 1.

The three dimensions of competence



Source: Adapted from Durand, 2006.

The Knowledge dimension corresponds to structured sets of assimilated information that make it possible to understand the world, obviously with partial and contradictory interpretations. Knowledge encompasses access to data, transforming them into adequate information, and integrating them into pre-existing schemas that continually evolve (Durand, 2006; Moura, Carneiro, & Diniz, 2017).

Knowledge is represented by the composition of two generic axes: knowing what and knowing why. "Know what" has an intuitive character in the sense of being the basis for action. It is the strategic path of an organization. "Knowing why" justifies the role of skills (Knowing how) and also involves a strategic understanding of why it is relevant to follow the strategic path that "knowing what" suggests (Durand, 2006; Moura, Carneiro, & Diniz, 2017).

The Skills dimension corresponds to the ability to act concretely according to pre-defined objectives or processes. Skills do not exclude knowledge but do not require a complete understanding of how they work when applied practically. Skills, therefore, relate partly to empiricism and tacitivity (Durand, 2006; Moura, Carneiro, & Diniz, 2017). According to Pires (2005), skills are related to knowing how to do something or making productive use of knowledge. In his previous experiences, the individual can seek knowledge, whether of facts or principles or appropriate techniques, to examine and solve any problem.

The Attitudes dimension is related to the attitudes taken by the professional focusing on achieving the objectives of their attributions. It essentially deals with the individual's motivation (will, commitment, determination), and his pro-activity in mobilizing his resources for application in the situation he faces (Durand, 2006; Moura, Carneiro & Diniz, 2017). Attitudes combine the behavioral dimension (knowing how to behave), the organization's culture or identity, and the idea of determination; commitment. It is the notion of culture and identity responsible for "organizational alchemy," that is, the intrinsic ability of an organization to hold together all its parts (organizational structure and motivation of human resources) (Durand, 2006; Moura, Carneiro, & Diniz, 2017).

2.4 Project manager competency

Project manager competence is a field of research with many related studies. Different studies analyze, for example, the relationship between the profile of the project manager and the success of projects (Lampel, 2001; Brill; Bishop & Walker, 2006, Fisher, 2011; Luţaş *et al*., 2020; Alvarenga *et al*., 2019); others compare functional managers and project managers. Projects in terms of profile attributes and experiences (El-Sabaa, 2001), and also identify the areas of knowledge and the profile required for the project manager in areas such as civil construction (Edum-Fotwe & Mccaffer, 2000; Lampel 2001).

However, there is still a gap in research in the public sector; few studies have explored the skills of these professionals in this sector. As other studies have already proven that the manager's skills and projects impact project success in private companies, this study assumes that the project manager's skills in the public sector also impact project success and that some of these competencies stand out in achieving the goals, rising the following hypothesis: **H_1: The public sector project manager's competencies impact the projects' success.**

3 Materials and methods

The research is explanatory "a central concern to identify the factors that determine or contribute to the occurrence of phenomena," according to Gil (2008), and adopts bibliographic procedures in the construction of the theoretical framework by consulting only publications in scientific journals, and theses or dissertations to obtain the scientific basis for the use of variables. The data collection follow by applying a questionnaire-type instrument to evaluate the adopted variables. Therefore, this study adopted a quantitative approach based on a survey

(Creswell, 2010) that uses a sample of the population and project managers in public organizations.

The factorial technique was used to analyze possible relationships between independent variables. The purpose of factor analysis was to look for or identify non-observable factors or latent constructs that may explain the intercorrelation between variables. Assuming that the variables of a group are highly correlated with each other and have low correlations with variables of another group, it is possible to condense the information contained in each group into a smaller set of variables (factors) without considerable loss of data (Fávero *et al*., 2009).

3.1 Data collection

Data collection was carried out through an online questionnaire divided into four parts. The initial three parts are questions about the Project Manager's knowledge, skills, and attitudes. The fourth and last part of the questionnaire consists of questions about the success in project management of the previous three projects under the lens of cost, quality, scope, and time.

The leading professional competencies of the project manager were extracted from the 49 variables (Appendix A) described in the study carried out by Moura, Carneiro, and Oliveira (2020) that corresponded to each question of the questionnaire applied in this study. Adjustments were made to the public sector, such as: as "business" was associated with "Public Service" —questions as: 2.7. I know: The company's business was replaced by: 2.7. I know: the public organization mission; 1.4. Time working at the company (or acting autonomously) by: 1.4. Time working in the Public Service as shown in Appendix A.

Personality questions were not considered, as they were not variables explored in this study, to reduce the number of questions in the questionnaire. A 5-point Likert scale was used. The four performance-related questions used a numerical scale from 0 to 3, representing the number of projects completed considering the last three projects.

The Global Performance of the projects was calculated based on the measurement pillars: cost, time, scope, and quality. The calculation sums the performance results across the four survey lenses, forming a scale from 0 to 12, where 12 indicates 100% success (total) and zero no success.

The survey was carried out with civil servants who worked in project management in Brazil. Responses were obtained from 77 project leaders or managers from 32 public organizations. Preferably, organizations that already had a project management office (PMO)

in place were sought. This area's implementation suggests greater organization project management maturity (Prado & Archibald, 2014), and greater project manager recognition and performance.

Through factor analysis, the variables related to competencies were grouped into smaller factors that could explain the success of the projects without considerable loss of information (Fávero *et al*., 2009). Subsequently, these factors were used in logistic regression analysis, seeking to identify their relationship with the probability of success of the projects in the dimensions of time, cost, quality, scope, and the project as a whole.

4 Results

Sociodemographic variables from part 1 (Appendix A) of the questionnaire were used to describe the sample. Table 1 presents the frequency distribution of these variables, considering the total values. It is observed that the predominant age group is between 41 and 50 years old, with little difference between the age groups between 31 and 35 years old and 36 to 40 years old. It is also not possible to observe a significant predominance of one of the genders in the sample, which had the participation of 45 men and 32 women.

Most respondents have some specialization (44 observations), 14 have only a complete undergraduate degree, and 19 have a master's and doctorate. As for the time of operation of the organization, it is not possible to point out a significant predominance since the most extensive range is between 2 and 5 years, with 21 answers, followed by those with more than 15 years of experience, with 20 observations. As for the experience of professionals as project managers, most respondents have between 2 and 5 years, with 23 responses, followed by those with 5 to 10 years of experience, with 17 observations.

Certification in project management was not significantly observed in the sample. Most respondents (49 observations) do not have any certification in this area. Of those with some certification, seven respondents have had it between 2 and 5 years, followed by those with certification between 5 and 10 years and between 10 and 15 years.

Table 1.

Descriptive Analysis Of Sociodemographic Variables

Variable	Category	Total	
		n	%
Age	26 to 30 years	9	12%
	31 to 35 years	16	21%
	36 to 40 years	17	22%
	41 to 50 years	21	27%
	51 to 55 years	7	9%
	56 to 60 years	6	8%
	Over 60 years	1	1%
	Total	77	100%
Gender	Female	32	42%
	Male	45	58%
	Total	77	100%
Education	Complete higher education	14	18%
	Graduate / Specialization	44	57%
	Master's degree	17	22%
	Doctorate degree	2	3%
	Total	77	100%
Time working in the organization	Less than 1 year	6	8%
	between 1 and 2 years	3	4%
	between 2,1 and 5 years	21	27%
	between 5,1 and 10 years	18	23%
	between 10,1 and 15 years	9	12%
	Over 15 years	20	26%
	Total	77	100%
Time working as a project manager	Menos de 1 year	7	9%
	between 1 and 2 years	11	14%
	between 2,1 and 5 years	23	30%
	between 5,1 and 10 years	17	22%
	between 10,1 and 15 years	9	12%
	Over 15 years	10	13%
	Total	77	100%
Time holding certification in project management	Less than 1 year	49	64%
	between 1 and 2 years	3	4%
	between 2,1 and 5 years	4	5%
	between 5,1 and 10 years	7	9%
	between 10,1 and 15 years	6	8%
	Over 15 years	6	8%
	Less than 1 year	2	3%
	Total	77	100%

Source: Authors (2023).

This section presents a horizontal analysis of the Odds Ratio (Table 2), or odds ratio obtained for the variables in the elaborate logistic regression models. The results obtained for the sample were compared and discussed concerning the selected theoretical framework.

Table 2.

Odds Ratio Of Significant Variables In Each Model

Independent Variable in the Model	Time	Cost	Quality	Scope	Project
Time working in the organization – more than five years	-		-	0.181	-
Time as Project Manager – more than five years	-	3.408	-	6.509	-
Knowledge about projects communication skills	3.200	-	3.774	-	2.774
Attitudes of confidence, motivation, and emotional intelligence	-	6.307	-	4.865	5.251

Source: Authors (2023).

Table 3 retrieves the description of the variables considered significant in the models and similar works that were used as a reference.

Table 3.

Description Of Significant Variables In Logistic Regression Models

Variables	Description	Authors
Time working in the organization	More than five years working in the same organization. Reflects knowledge about the internal structure of the organization, its processes, and organizational culture	Edum-Fotwe & McCaffer (2000); Brill, Bishop & Walker (2006); El-Sabaa & McCaffer (2001)
Time as a project manager	More than five years as a project manager, not necessarily in the same organization. Suggests knowledge of processes related to project management, standard in most projects, most of the time	Edum-Fotwe & McCaffer (2000); Brill, Bishop & Walker (2006); El-Sabaa & McCaffer (2001)
Knowledge about projects	Knowledge in: project estimation, project management techniques, and tools; knowledge of the domain (area) of the project; your mission/goals; your measures of success; and knowledge in proposal writing.	Lampel (2001), Edum-Fotwe & McCaffer (2000), Brill, Bishop & Walker (2006)
Communication skills	Have good verbal communication; print shop; communicate effectively; listen effectively; and demonstrate verbal expression.	El-Sabaa (2001); Fisher (2011); Brill, Bishop & walker (2006); CBO (2015); Edum-Fotwe & McCaffer (2001)
Attitudes of confidence, motivation, and emotional intelligence	Act building trust; motivate and enthusiasm; be ethical, persistent, and act with emotional intelligence.	Fisher (2011); Brill, Bishop & Walker (2006); El-Sabaa (2001); Thomas & Mengel(2008)

Source: Authors (2023).

5 Analysis of results

In the analyzed sample, the professional's performance in the same organization for more than five years contributed negatively to the chances of success in fulfilling the project's deliverables (scope), and it was not significant in the other four models (Time, Cost, Quality, and Project). The result differs from the results obtained by Fisher (2011) and Lampel (2001), who claim that professional experience contributes to the project's success since specific skills are developed with experience.

This difference may be caused by the difference in the sample since the reference works were based on other countries and private sector organizations. Due to the stability of employment in the public service, there may be a greater tendency to accommodate the individual, favored by the protectionist nature of labor legislation that inhibits the professional's entrepreneurial spirit (Vieira *et al.*, 2011). Thus, it can be assumed that this result comes from

professional motivation loss after working in the organization for a long time. With this, the professional no longer has the same commitment as his initial period.

The variable related to the time of experience as a project manager was one of the factors with statistical significance in two of the five models analyzed, contributing positively to the project's success regarding the fulfillment of the initial budget (cost) and the completion of the project scope. This result suggests that the professional's practical experience in applying project management concepts contributes to their performance and consequently to the project's success, in line with the statements of Fisher (2011) and Lampel (2001) statements.

Edum-Fotwe and McCaffer (2000) point out that competencies developed through experience are perceived as having a more significant contribution than those obtained through formal training (specialization courses or business training). However, given the diversity of functions assigned to a project manager (PMSurvey.org, 2014), it is necessary to emphasize that experience can only develop those competencies compatible with the professional's performance. Due to the public sector's typical organizational structure, a project manager may not have control (authority or responsibility) over all aspects of the project. For example, constraints imposed by laws and rigid public hierarchies can limit the project manager's decisions.

The factor related to knowledge about projects did not show statistical significance in any of the four dimensions of project success, but it was significant in the model that analyzes the project's success as a whole. The logistic regression method does not guarantee that all the selected variables are sufficient to explain all the variability of the response variables. This result suggests, therefore, that knowledge in project management contributes globally to the success of projects, possibly in some dimension not explicitly covered in this research, in agreement with the statement by Brill, Bishop, and Walker (2006) that the emphasis on time, cost and quality views should be expanded.

The factor related to communication skills in the analyzed sample contributes positively to an increase in the chances of success in meeting the time and the project's quality specifications. This positive relationship with project success is also found in El-Sabaa (2001), Fisher (2011), and Brill, Bishop, and Walker (2006). The PMI (2018) states that communication greatly influences how projects are conducted, and it is seen as one of the biggest reasons for the success or failure of a project. The results of the PMSurvey survey (PMSurvey.org, 2014) also state that poor communication is a primary reason for project failure. Thus, the ability to

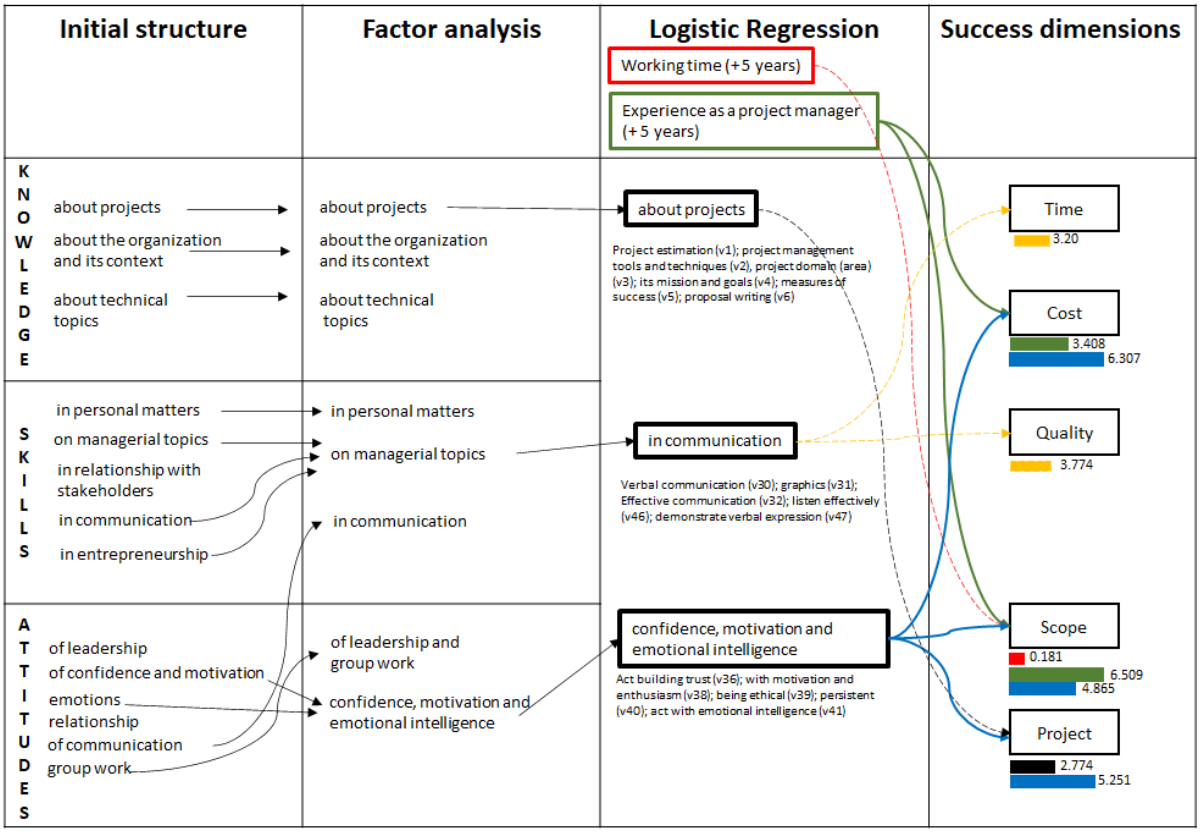
communicate effectively (Edum-Fotwe & Mccaffer, 2000; Fisher, 2011) is essential for the project manager.

The factor related to attitudes of trust, motivation, and emotional intelligence was statistically significant in three models: cost compliance, scope fulfillment, and success of the project as a whole. Among the factors related to the dimensions of competence, it is the one that presented significance in the most significant number of models and also with the highest values and, consequently, the most significant impact on the probability of success of the projects. Fisher (2011) states that trust between team members should be built to promote mutual loyalty, delegating tasks and making members assume additional responsibilities. It is necessary to know the personal motivations of everyone involved in the project to encourage and inspire motivation.

Figure 2 illustrates the data analysis steps, the final relationship between competencies, and the triple constraint's success dimensions. The column "Initial structure" presents the themes in which the variables were grouped based on the competence dimensions. The column "Factor analysis" explains the new configuration after applying the criteria of this statistical analysis technique, resulting in a smaller number of factors. The column "Logistics regression" shows only the statistically significant factors for the dimensions of success analyzed, in addition to the categorical variables related to the professional's time working in the same organization and previous experience as a project manager. Finally, the column "dimensions of success" presents each factor's odds ratio within the dimensions analyzed.

Figure 2.

Summary Of The Evolution Of The Research Stages



Source: Authors (2023)

In this way, we can point out that the public sector project manager's competencies impact the projects' success. The public sector project manager's competencies affect the success of projects, but differently in each success criterion.

5 Final considerations

This research aimed to identify the competencies that characterize the project manager in the public sector. The influence of competencies on the probability of success of managed projects was analyzed to achieve this objective. To help define competencies, Durand's (2006) proposal of decomposition into observable dimensions - knowledge, skills, and attitudes - was used, which suggests ways to promote these dimensions and relates the contribution of competencies to the coordinated development of the organization.

The results showed that the competencies that characterize the project manager in the public sector are: knowledge of project management, communication skills, and attitudes of

confidence, motivation, and emotional intelligence, all contributing positively to increasing the chance of success of projects in the analyzed dimensions. Experience as a project manager was also significant to the project's success. All these results agree with similar works used in the theoretical framework. In our study, the only variable that showed a negative relationship with the project's success was the professional's time in the same organization, which suggests that the professional's commitment decreased compared to its initial period. It is possible to affirm that the presence of these competencies in professionals contributes positively to the success of projects. Therefore, the results of this research can contribute as a basis for defining project managers' selection criteria, increasing the chances of project success in the dimensions of the triple constraint.

A limitation of this study is that the project success test was done only with *ex-post* factors variables, which limits the conclusions and does not allow a broader view of how competencies can influence other success criteria. Future studies can be carried out with a broader view of project success criteria to explore which competencies influence which success criteria.

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Appendix A

Part 1: Socio demographic variables	
1.1 Age	
1.2 Genre	
1.3 Schooling	
1.4 Time working in the Public Sector	
1.5 Time working as a Project Manager	
1.6 How long have you had project management certification	
Part 2: Variables on Project Manager Knowledge	**Variables**
2.1 I know about: Project Estimates	V_1
2.2 I know: Project management techniques and tools	V_2
2.3 I know about: The domain of the projects I work on (for example, working on a civil project, I know the civil area)	V_3
2.4 I know: The mission of the project I am working on	V_4
2.5 I know: The measures of success of the project I work on	V_5
2.6 I know about: Proposal writing	V_6
2.7 I know: The public organization mission.	V_7
2.8 I know: The partners involved in the project	V_8
2.9 I am knowledgeable about: The decision-making process outside the organization (external decisions that may influence the project)	V_9
2.10 I am knowledgeable about: The politics and culture in the country where the project is being developed	V_{10}
2.11 I know: The technology assets being applied to the project	V_{11}
2.12 I know: Multidisciplinary topics (i.e., from all areas involved in the project)	V_{12}
2.13 I know: The use of computational tools to support the project I am working on	V_{13}
Part 3: Variables on Project Manager Skills	**Variables**
3.1 I have skills to learn	V_{14}
3.2 I have skills to create and innovate	V_{15}
3.3 I have analytical reasoning skills	V_{16}
3.4 I can reason logically	V_{17}
3.5 I have skills to adapt to changes	V_{18}
3.6 I have skills to manage tasks effectively	V_{19}
3.7 I have skills to conduct meetings	V_{20}
3.8 I have negotiation and persuasion skills	V_{21}
3.9 I have delegating skills	V_{22}
3.10 I have problem-oriented skills	V_{23}
3.11 I have goal-oriented skills	V_{24}
3.12 I have customer-focused skills	V_{25}
3.13 I can assess complex situations	V_{26}
3.14 I have skills to recognize a problem	V_{27}
3.15 I have skills to apply the law (laws) in contracts	V_{28}
3.16 I can visualize the project's relationship with industry and the community	V_{29}
3.17 I can communicate verbally	V_{30}
3.18 I have skills to communicate graphically	V_{31}

3.19 I have skills to communicate effectively	V_{32}
3.20 I have skills to detect and develop opportunities	V_{33}
Part 4: Variables on Project Manager Attitudes/Behaviors	**Variables**
4.1 I act to avoid and resolve disputes and conflicts	V_{34}
4.2 I work building teams	V_{35}
4.3 I act building trust	V_{36}
4.4 I influence others	V_{37}
4.5 I act with motivation and enthusiasm	V_{38}
4.6 I act conducting business ethically	V_{39}
4.7 I'm persistent	V_{40}
4.8 I act with emotional intelligence (I manage my emotions well)	V_{41}
4.9 I have high self-esteem	V_{42}
4.10 I act in building organizational relationships	V_{43}
4.11 I interact with other areas	V_{44}
4.12 I work on building interpersonal relationships	V_{45}
4.13 I listen effectively	V_{46}
4.14 I have good verbal expression	V_{47}
4.15 I work in a team	V_{48}
4.16 I share credit for the success of the project	V_{49}
Part 5: Variables on Project Performance	**Variables**
5.1 Of the last three projects I managed, how many were delivered on time	
5.2 Of the last three projects I managed, how many were delivered within the initially established cost	
5.3 Of the last three projects I managed, how many achieved the required quality objectives	
5.4 Of the last three projects I managed, how many delivered 100% of the required scope	
Part 6: historical and organizational context	
6.2 How long ago did you manage the last completed project	
6.3 Regarding the last three projects managed, how many had a Project Management Office (PMO) structure in the organization	
6.4 Regarding the last three managed projects, what is the team selection structure for the project	
6.5 Regarding the projects you have already managed, mention some POSITIVE factors for their success	
6.6 Regarding the projects you have already managed, mention some NEGATIVE factors for their success	
6.7 Considering not only the previous items related to the competence of a project manager, mention the ones you deem most relevant for the success of the projects	

Source: Moura, Carneiro & Oliveira (2020).