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BEST PRACTICES IN IMPLEMENTING A PROJECT MANAGEMENT OFFICE: A SYSTEMATIC REVIEW OF THE LITERATURE

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ABSTRACT

Highlights: Project management office (PMO) is structurally configured in a particular way to adapt to the peculiarities of each organization and its strategic objectives, in order to promote project management practices. The purpose of this article is to explore the best practices for project management office implementation. A systematic literature review was conducted using 104 documents published between 2000 and 2018. The research allowed the identification of PMO's data, such as functions, models, best practices in implementation, challenges to implementation, and success factors.
Goal: The purpose of this article is to explore the best practices for project management office implementation.
Design/Methodology/Approach: A systematic literature review was conducted using 104 documents published between 2000 and 2018.
Results: The research allowed the identification of PMO's data, such as functions, models, best practices in implementation, challenges to implementation, and success factors.
Limitations of the investigation: Other factors related to PMO, such as the implementation phases, maturity models, process groups, and organizational variables that affect PMO.
Practical implications: It is observed that there are relevant issues in PMO implementation structuring that are not consolidated, making it difficult for organizations to base their implementation on the available theoretical frameworks.
Originality/value: As a result, it became evident that there is a lack of standardization of those characteristics related to the PMO; and that the so-called "best practices" require more academic studies before they can be established.

Keywords: Project Management Office; Implementation; Best practices; Literature review; PMO.

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1. INTRODUCTION

Starting in the mid-1990s, companies began to face the challenges of managing several projects simultaneously. It is precisely in that scenario that the Project Management Office (PMO) emerges, aiming to provide methods, tools and techniques for the proper management of projects (Czekay, 2012). Studies by Dai and Wells (2004) show that, since 1994, PMOs have started to become popular and their implementation in organizations has increased significantly since then. The PMO is defined by the PMBOK Guide (PMI, 2017, p. 48) as "an organizational structure that standardizes project-related governance processes, and facilitates the sharing of resources, methodologies, tools, and techniques."

PMO can be implemented to make more efficient use of resources, reduce the risk of project failures and increase project success rate (Kutsch et al., 2015), and to restructure processes, departments and projects (Correia et al., 2018). The PMO implementation also enables process integration to companies, as well as informing top management of their project portfolio status, besides seeking to compete in the market through successful projects (Czekay, 2012). In the implementation of the PMO, one of the main objectives is the implementation of the best practices, and the repetition of projects allows the learning of new lessons and the establishment of the best practices, leading to a more efficient delivery of projects (Philbin, 2016).

Notwithstanding the benefits of PMO implementation, there is still no common understanding on what drives the success of such organizational structure (Spalek, 2013), which still faces a lack of acknowledgment of its contribution, repeatedly forcing PMOs to justify their existence (Kutsch et al., 2015). There is no empirical evidence that the PMO is associated with an organizational competency of project management and the PMO is questioned about its value within an organization (Khalema et al., 2015). In addition, there is no consensus method to define the importance of a PMO (van der Linde and Steyn, 2016). Moreover, due to their unstable nature, PMOs do not deliver the expected benefits in the long run (Bredillet et al., 2018).

In the face of the gap between benefits resulting from the implementation of a PMO and the perceived value by the organization to which it belongs, the work here presented carries out a systematic review of the literature on best practices in PMO implementation by striving to answer three research questions:

1) What practices for implementing a PMO are addressed in the literature?
2) According to the literature, what are the best practices for implementing a PMO?
3) What analysis does literature carry out regarding the implementation of a PMO?

Thus, after a systematic review, it was possible to identify the functions, models, best practices in implementation, implementation challenges, and PMO success factors. Thereby, in view of the singularities of the organizations that implement the PMO, it is verified that the organizational structure presents considerable variability in its characteristics. And because of those particularities, it is unreasonable to establish "best practices" for such different organizations.

Literature review

According to PMI (2017, p. 4)PMI (2017, p. 4), "project is a temporary endeavor undertaken to create a unique product, service, or result". Due to the complexity, the indispensability of managing, in an integrated way, the different disciplines present in the projects, such as scope, cost, time, and risk, for example, and constant cultural, technological, political, economic, and social changes, it is increasingly necessary to carry out effective project management. To Kerzner (2011, p. 3), project management "is the planning, organization, direction, and control of company resources for a relatively short-term objective that has been established to complete specific goals and objectives".

With increasing market competitiveness, characterized by increased competition and innovation rates of products and services, organizations have been dealing with increasingly numerous and strategically important projects. Therefore, in order to increase both the number and the strategic importance of the projects, many organizations have implemented the PMO (Hobbs et al., 2008), which has the role of helping organizations to plan, implement and monitor projects so their goals can be achieved (Ferreira et al., 2017). In addition, according to Andersen et al. (2007), PMOs have been established by organizations to take on responsibilities and coordinate functions and activities related to the project.

In their study based on the literary review, Spelta and Albertin (2012) present a summary of reasons for either or not creating PMOs and affirm that there are studies in the literature that show improvements in success rates in project management through the PMO. However, other studies indicate the opposite, even not recommending the creation of PMO in certain cases (Spelta and Albertin, 2012). Table 1 presents the reasons for and against PMO implementation.

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Table 1. Reasons Pro and Against the PMO Implementation

PMO Implementation	
Pro	**Against**
Improves project management	No evidence of project performance gains
Reduces number of problem projects	Increased work overload without compensation benefits
Improves quality and customer satisfaction	Increased bureaucracy
Leads to more efficient use of resources in a multi-project environment	Stable environment without major projects to implement
Need to implement strategic projects	It creates conflict between sectors in organizations, creates resentment and causes loss of talent for project management
Attention to best project management practices	Project management methods and results are unsatisfactory
Better control of project status and communication	
Facilitates the transfer of project management knowledge across the organization	

Source: The authors, 2019 (adapted from Spelta and Albertin, 2012)

Method

Literature review is usually an initial step in a research. It allows the researcher to map previously developed and existing expertise in an area (Mian et al., 2005). In this sense, the Systematic Bibliographic Review (RBS) is presented as the main technical procedure for carrying out the research (Costa and Toledo, 2016). RBS is a specific research methodology, formally developed to survey and evaluate available evidence related to a particular research topic, which is a specific problem, topic, area or phenomenon of interest (Biolchini et al., 2005; Brereton et al., 2007).

Systematic review occurs by formulating a question clearly, using systematic and explicit methods to identify, select, and critically evaluate relevant research. In addition, the data from these studies are collected, analyzed and included in the review (Moher et al., 2015). In this sense, RBS is composed of three main phases: planning, execution and analysis of results (Mian et al., 2005). In the planning phase, the objectives of the review and its protocol are defined (Costa and Toledo, 2016). The stage of execution involves the initial identification, selection and evaluation of the studies according to the criteria established in the previous phase (Mian et al., 2005). In the third and last phase, the data of the selected studies are analyzed and synthesized (Biolchini et al., 2005).

In order to be more specific and operational, this research was based on the approach that subdivides RBS into five phases: problem formulation, data collection, data evaluation, data analysis and interpretation, and conclusion and presentation (Biolchini et al., 2005).

Problem Formulation

This stage refers to what type of evidence should be included in the review; then it is necessary to create definitions that can determine studies that are relevant and irrelevant to the specific subject under investigation (Biolchini et al., 2005). Specifying the research questions is the most critical element in the systematic review, because it is at this stage that the data to be extracted in the primary study is determined (Brereton et al., 2007).

Therefore, the main objective of the review was to identify works published in different languages that address the best practices in the implementation of a PMO, based on the PMBOK guidelines, in public and/or private organizations, without limiting the sectors in which they are inserted and regardless of size. The research questions were presented in the Introduction section.

Data Collection

In this step, one determines which procedures will be established to find relevant evidence defined in the previous step, including the determination of the sources that can provide potentially important studies to include in the research (Biolchini et al., 2005). Therefore, the first step in bibliographic searching is the selection of the database according to the research protocol (Thomé et al., 2016).

The most widespread databases that are frequently used for searching the literature are Web of Science (WOS) and Scopus. However, Scopus covers a superior number of journals of recent articles (Aghaei Chadegani et al., 2013). Scielo and Scopus databases contain more works related to the subjects studied, including those related to production engineering, management, and administration (Costa and Toledo, 2016); therefore, these two bases were used in this research.

In addition, the keywords and their synonyms have been defined: PMO, project management office, implantation, implementation, performance, output, impact, best practice, good practice, management practice. The searches were conducted in May 2018.

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At this stage, 252 papers, written in different languages, with the terms or part of the terms searched in the titles, abstracts or keywords were found. Of this total, 228 publications were found after initial research in the Scopus database, identifying 111 duplicate publications, leaving only 117 papers. In the Scielo database, the surveys generated 24 publications as results, 11 of which were duplicates, leaving only 13 publications. At a different moment, the searches of both databases were related. And of a total of 130 publications, five were identified in both databases, remaining 125 works. Table 2 summarizes the data collection from the systematic review of the literature.

Table 2. Summary of systematic literature review data collection

Scielo database - search criteria	Results
(ti:(PMO OR project management office)) AND (implementation OR implantation)	4
(ti:(PMO or project management office)) AND (performance or output)	3
(ti:(PMO OR project management office)) AND (impact)	1
(ti:(PMO OR project management office)) AND (influence)	1
(ti:(PMO OR project management office)) AND (result OR outcame OR effect)	2
(ti:(PMO OR project management office)) AND (good practices) OR (best practices) OR (management practices)	13
Total	24
Duplicates	11
Non-duplicates	13
Scopus database - search criteria	Results
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (implementation OR implantation))	21
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (output OR performance))	26
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (impact))	10
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (influence))	9
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (result OR outcame OR effect))	43
(TITLE (PMO OR project AND management AND office) AND TITLE-ABS-KEY (best OR good OR management OR practices OR practice))	119
Total	228
Duplicates	111
Non-duplicates	117
Comparasion between databases: Scielo and Scopus	Results
Total	130
Duplicates	5
Non-duplicates	125

Source: The authors, 2019

Data evaluation

In the third stage, qualitative criteria are applied to delimit studies that can be considered valid from those that should be considered invalid. At this stage, the guidelines for the extraction of information from the primary research reports are determined (Biolchini et al., 2005).

In order to extract relevant data for systematic review purposes, a spreadsheet was created with the publications selected in the previous stage, containing: title, name of the author (s), year of publication, abstract, keywords, publication source, type of document, original language, number of times the publication was cited, affiliation of the author (s), country of publication, type of publication, publication approach, type of organization addressed at work, and industry sector covered in the publication.

Darling and Whitty (2016) carried out an extensive bibliographical review of the academic and non-academic literature in English. As a result, they claim that definitions for describing PMO have evolved over time. Although the earliest reference to a project office refers to the improvement of agriculture in the UK in the early nineteenth century, the first edition of the PMBOK does not mention the PMO and, only in the 2nd edition of the PMBOK, published in 2000, the theme was addressed in two phrases (Darling and Whitty, 2016), stating that PMO exists in a variety of forms and has a variety of functions (PMI, 2000). Facing this fact, the year 2000 was defined as a milestone for this research. In this second phase, of the 125-remaining works, publications prior to the year 2000 were excluded, 9 in total, leaving 116 works.

After the inspectional reading on these 116 publications (Adler and Van Doren, 1972), 12 were excluded. Of these, three are publications by the Federal Register, an official US government newspaper that contains routine publications and public notifications of government agencies. Two are honorable mentions published in the same edition of a magazine, and do not meet the scientific criteria stricto sensu, as stated by the editors of the magazine. The remainders do not correspond to the universe under study. Thus, 104 works remained.

Data analysis, interpretation, conclusion and presentation

As mentioned in this section, the adopted approach divides RBS into five phases (Biolchini et al., 2005), and the last two steps of the method are Data Analysis and Interpretation, and Conclusion and Presentation. The fourth phase will be presented in the Discussion section, subdivided into two subsections, with the following titles: Quantitative Synthesis and Best Practices Synthesis, respectively. The fifth and final step will be presented in the Conclusion section.

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Discussion

In this section, the fourth step of the systematic review addressed, and the analysis and interpretation of data are presented. In this phase, the procedures to be applied for the collected data are defined, so that the synthesis of valid studies becomes a relevant point, allowing generalizations to be made about the subject addressed (Biolchini et al., 2005). Although there is no universal recipe for the analysis phase, data such as years of publication, periodicals, authors, and study characteristics, relevant to the synthesis, are common elements in the systematic review of the qualitative and quantitative literature (Thomé et al., 2016).

Quantitative synthesis

In this subsection, the quantitative summaries of the 104 documents selected are presented. Of this sample, 55 are articles, 34 are conference papers, six are chapters of books, four are reviews, two are notes, one is a letter, one is a short survey, and one is an article that was accepted by a journal and is available as an online version and has not yet been made available in print.

Figure 1 shows the evolution of publications per year. This research only addresses publications from the year 2000 onwards. However, the first publications identified were published in 2002. In the years 2000, 2001 and 2003 no studies were published. As of 2012 (included), there was an annual increase in publications, a peak in 2013 and 2015, with 69 papers published in this period, corresponding to 66.35% of the total and an average of nine publications per year.

Regarding the languages of the documents, 90, 86.54%, are in English, 10 publications were written in Portuguese, representing 9.61% of the sample, two are in Spanish, one document was originally written in Bosnian and one in German.

Regarding the genres of publications, 78 are empirical and 26 are theoretical. According to their approaches, 56 publications are qualitative and 48 qualitative-quantitative. As to the classification of publications according to their respective country, it was adopted as a criterion that the country of publication is the country of the institution to which the authors of the works are associated. This way, a publication with more than one author associated to institutions from different countries will be classified as related to more than one country. Thus, despite the sample of 104 papers, 121 countries are related, since three publications are allocated to three different countries, and 11 publications are attributed to two different countries. The United States, Canada, Brazil, Australia, and the United Kingdom stand out for having 24, 19, 18, eight and six papers, respectively, corresponding to 61.98% of the sample. Germany, China, Iran, and Sweden have four published works each.

In relation to the sources of publications, the International Journal of Project Management and Project Management Journal published 10 and five papers, respectively. The periodicals Gestão & Produção and Production are also of high relevance because they published four papers each. These four journals are responsible for 22.11% of publications in the sample.

The organizations addressed in the universe of published works are also categorized. Of these, 39 are publications dealing with private organizations, 13 papers are aimed at public organizations and eight are carried out in public and private organizations. In 24 publications, the authors did not specify the organizations involved in their studies. The re-

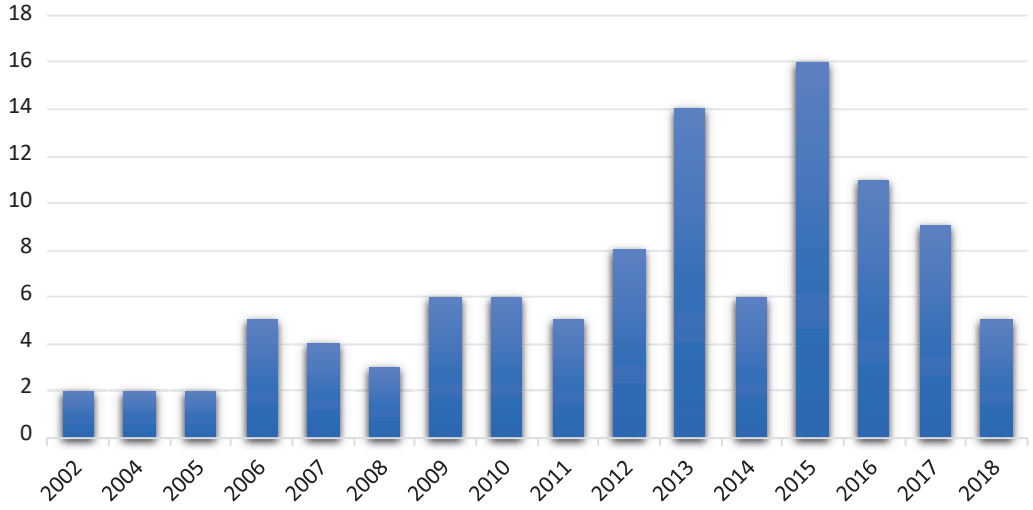

Figure 1. Publications per year
Source: The authors, 2019

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maining 20 are theoretical publications in which this type of categorization of organizations is not applicable.

The latest quantitative analysis portrays the industry sectors covered in the publications. Of the total of 104 works, the most relevant sectors are information technology (IT), technology, health and construction, which have, respectively, 12, eight, seven and five works based on these sectors, corresponding to 30.77% of the sample. In addition, 16 papers were based on more than one sector of the industry and are therefore classified as diverse. Another 20 publications have a strictly theoretical approach, in which this classification by sectors is not applicable. In 12 papers, the authors do not specify in which industry sector they base their studies.

Best Practices Synthesis

As previously described in section Data evaluation, after the inspectional reading (Adler and Van Doren, 1972), 104 papers were selected for quantitative synthesis. At this same reading stage for qualitative synthesis, 19 publications were selected by the authors because their studies stood out in the presentation of PMO best practices, including, but not limited to, the definition and identification of functions, services, typologies, models, and challenges related to the im-

Table 3. Publications of qualitative synthesis

Author	Source of publications	Language	Country	Type of document	Classification	Approach	Type of organization	Industry sector
Dai e Wells (2004)	International Journal of Project Management	English	United States	Article	Empirical	Quantitative / Qualitative	Public and private	Various
Hill (2004)	Information Systems Management	English	United States	Article	Theoretical	Qualitative	Not applicable	Not applicable
Martins et al. (2005)	Production	Brazilian Portuguese	Brazil	Article	Empirical	Qualitative	Private	Telecommunication
Desouza e Evaristo (2006)	International Journal of Project Management	English	United States	Article	Empirical	Qualitative	Non-specified	Information Technology
Desta et al. (2006)	Journal of Engineering, Design and Technology	English	South Africa	Article	Empirical	Quantitative / Qualitative	Non-specified	Construction
Andersen et al. (2007)	Journal of Management in Engineering	English	Norway	Article	Empirical	Qualitative	Public and private	Various
Singh et al. (2009)	European Journal of Information Systems	English	United States	Article	Empirical	Quantitative / Qualitative	Non-specified	Information Technology
Wang e Liu (2010)	2010 International Conference on E--Product E-Service and E-Entertainment, ICEEE 2010	English	China	Conference paper	Theoretical	Qualitative	Private	Construction
Alves et al. (2013)	Production	Brazilian Portuguese	Brazil	Article	Empirical	Quantitative / Qualitative	Non-specified	Various
Spalek (2013)	Engineering Economics	English	Poland	Article	Empirical	Quantitative / Qualitative	Non-specified	Non-specified
Jalal e Koosha (2015)	International Journal of Project Management	English	Iran	Article	Empirical	Quantitative / Qualitative	Public and private	Construction
Darling e Whitty (2016)	International Journal of Managing Projects in Business	English	Australia	Article	Theoretical	Qualitative	Not applicable	Not applicable
Monteiro et al. (2016)	Procedia Computer Science	English	Portugal	Conference paper	Theoretical	Quantitative / Qualitative	Not applicable	Not applicable
Szalay et al. (2017)	Procedia Engineering	English	Hungary	Conference paper	Theoretical	Qualitative	Private	Not applicable

Source: The authors, 2019

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plementation of PMOs, in addition to PMO's best practices and success factors. In the next step, an analytical reading (Adler and Van Doren, 1972) was carried out on these 19 documents. From this total, five did not present the qualitative syntheses of the object of this research, leaving 14 publications, presented in Table 3. In these 14 final publications, the authors performed the syntopical reading (Adler and Van Doren, 1972) and, through them, the functions, models, implementation best practices, implementation challenges and PMO success factors were synthesized; they are presented in the following subsections.

Based on the suggestion of Moher et al. (2015), a flowchart adapted from the PRISMA (preferred reporting items for systematic reviews and meta-analyses) protocol, which exposes the document selection used in this research, is presented in Figure 2. This recommendation aims to help the authors to perform better reporting of systematic reviews and meta-analyzes (Moher et al., 2015).

PMO Functions or Services

Functional characteristics are PMO's functions and duties that are expected to be performed in an organization (Jalal and Koosha, 2015). There is a wide variety of options, both in the form and in the functions performed by the PMO (Andersen et al., 2007; Aubry et al., 2010; Darling and Whitty, 2016; Desouza and Evaristo, 2006; Desta et al., 2006; Fernandes et al., 2018; Hobbs and Aubry, 2007; Jalal and Koosha, 2015; Kutsch et al., 2015; Monteiro et al., 2016; Singh et al., 2009; Spalek, 2013). Such expected functions and practices differ as much as the organizations to which the PMO belongs (Hobbs and Aubry, 2007; Darling and Whitty, 2016). However, Andersen et al. (2007) state that even in PMOs with different structures certain characteristics, responsibilities, and main tasks are very similar.

Szalay et al. (2017), in their exploratory study, present the typical PMO services. However, the authors emphasize that, in addition to these initial services, there are others that need to be investigated. In an exploratory and descrip-

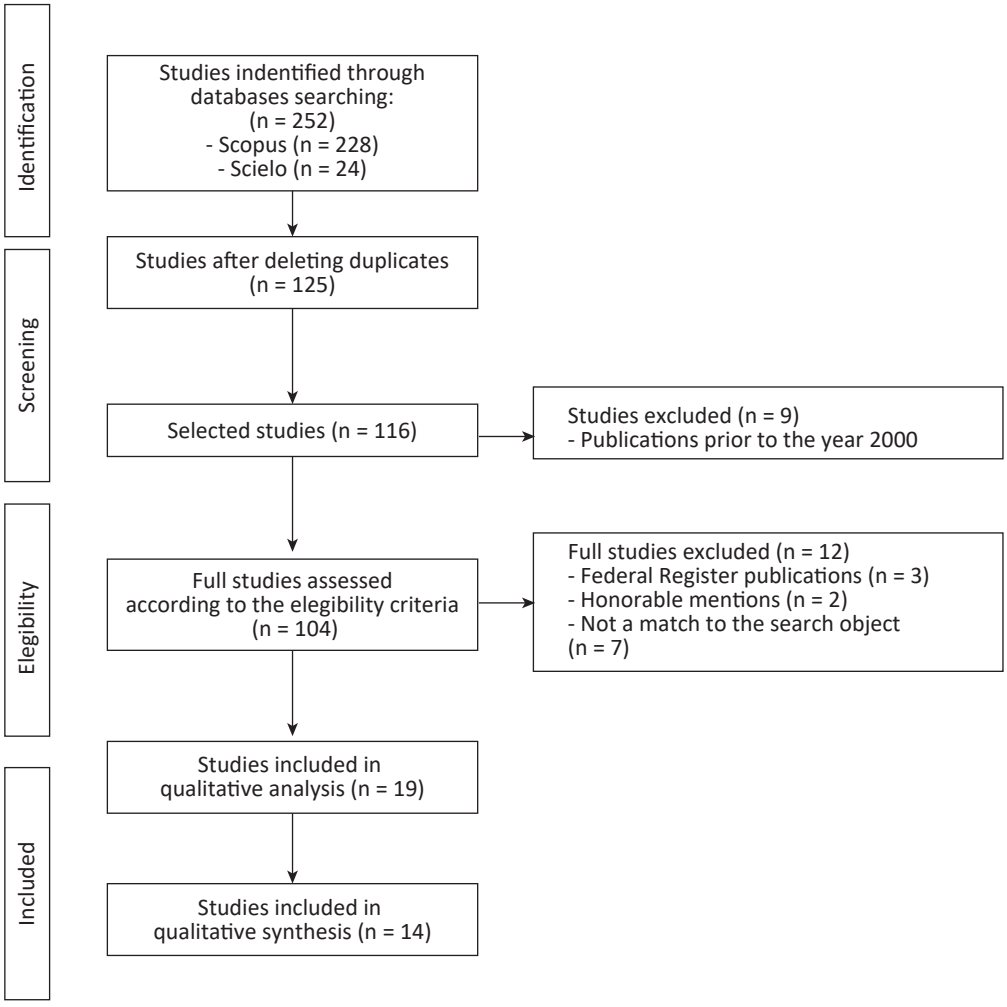

Figure 2. Flowchart adapted from the PRISMA protocol
Source: The authors, 2019

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tive study of PMOs, Desouza and Evaristo (2006) propose to segment the PMO functions into three levels: operational, tactical, and strategic. Despite this proposed subdivision, knowledge management is one of the main functions at all levels (Desouza and Evaristo, 2006). Andersen et al. (2007) presented the functions of successful PMOs by studying best practices for establishing, developing, and implementing PMOs.

In his studies, Hill (2004) proposes a PMO division in five stages, with the Basic PMO, stage 2, responsible for establishing a viable project management environment, including, but not limited to, the implementation of the 20 proposed PMO functions. Although this list contains 20 functions, it is emphasized that a PMO is unlikely to implement all these functions and that adaptations and adjustments will be necessary (Hill, 2004).

By focusing on variables in construction industry organizations related to PMO characteristics, based on the literature review, Jalal and Koosha (2015) identified and classified PMO functions. Desta et al. (2006) also identified PMO functions. In the empirical study conducted by Dai and Wells (2004), the establishment and use of PMOs were investigated over two years, and after reviewing the literature, the authors synthesized the PMO functions. Martins et al. (2005), in their empirical study, highlight the main functions of the PMO under implementation in a telecommunication company. Wang and Liu (2010) pointed out the main functions of the PMO when analyzing the management of multiple projects in enterprises of real estate companies. It is worth mentioning that, although not in the studied sample, the PMO functions presented by the PMI (2013a cited in Darling and Whitty, 2016; Spalek, 2013) and IPMA (2006 cited in Spalek, 2013) stand out for having been referenced in the analyzed studies; hence their inclusion by the authors of this research. The PMO functions cited and their respective authors are presented in Table 4. Although it is the oldest publication, Hill (2004) presents the most complete PMO list of functions, grouped in five blocks: practice management; infrastructure management; resource integration; technical support; and business alignment. As expected, the PMO functions presented by the different authors have great variability among them, mainly in relation to the level of detail. However, some functions are present in most studies: developing project management methodology, managing portfolios, and ensuring project quality.

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Table 4. PMO's Functions

PMO's Functions		Author(s)
Practical management	Project management methodology Project management tools Standards and metrics Project knowledge management	Hill (2004)
Infrastructure management	Project governance Assessment Organization and structure Facilities and equipment support	
Resource integration	Resource management Training and education Career development Staff development	
Technical support	Mentoring Planning support Project auditing Project recovery	
Business alignment	Project portfolio management Customer relationships Vendor / contractor relationships Business performance	
Develop and maintain standards and methods of project management		Dai and Wells (2004)
Develop and maintain historical project archives		
Provide administrative support to the project		
Provide human resources / personal assistance		
Provide project management consulting and mentoring		
Provide or organize project management training		
Develop and disseminate project management methodology		Martins et al. (2005)
Choose and implement project management tools		
Create and maintain project management database		
Manage Communication Plan		
Develop a project management culture in the organization		
Ensure alignment of projects with the organization's strategy		
Anticipate potential problems		
Operational level	Conducting project evaluations Integration of knowledge derived from projects Specialized knowledge on project management	Desouza and Evaristo (2006)
Tactical level	Constant monitoring of customer satisfaction Close integration between project initiatives Consistent quality of products and services generated by projects Knowledge sharing	
Strategic Level	Strategic objectives of the organization Strategic growth of the organization Efficient and effective knowledge management	
Support and establish standards and guidelines for managers of different projects and programs		IPMA (2006 cited in Spalek, 2013)
Collect project management data from the projects		
Consolidate data and report to some governing body		
Ensure that projects are aligned with the organization's strategy and vision		
Disseminate information		Desta et al. (2006)
Develop methodologies, standards and templates for PM		
Monitor and control project performance		
Document lessons learned on projects		
Allocate resources and coordinate between projects		
Conduct project KM activities		
Centralize project reporting		
Execute specialized tasks for project managers		
Support in corporate strategic planning		
Conduct project audits and follow-up		
Plan and implement continuous improvement strategies		
Manage customer interface		
Conduct guidance, training and PM education		
Manage one or more programs		
Formalize project selection through project portfolio management		
Conduct benchmarking in best PM practices		

PMO's Functions	Author(s)	PMO's Functions	Author(s)
Develop shared methodologies and processes for project management Train and develop skills in project management Propose new projects Ensure project quality	Andersen et al. (2007)	Develop project management methodologies Develop project management tools and software Know and manage lessons learned Train and develop competency in project management Mentoring and coaching in project management Act in the governance and development of human resources Monitor and control projects Manage portfolio Participate in strategic planning Act on the management client interfaces Act on supplier and contractor management interfaces	Jalal and Koosha (2015)
Develop and maintain the standards and procedures of the management processes of multiple projects Establish multiple project management planning Be responsible for the rational allocation and coordination of various project resources Perform management functions such as monitoring and coordination Provide support to project management	Wang and Liu (2010)		
Manage shared resources across all projects managed by PMO Identify and develop project management methodology, best practices and standards Guide advise, train and supervise Monitor compliance with project management standards, policies, procedures and models through project audits. Develop and manage policies, procedures, models and other shared documentation (organizational process assets) Coordinate communications across projects	PMI (2013a cited in Darling and Whitty, 2016; Spalek, 2013)	Portfolio management Governance Define standards, processes and models of methodologies Optimize resources Select, operate, manage and develop project management tools (software)	Szalay et al. (2017)

Source: The authors, 2019

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Models or types of PMO

Model or type of PMO is usually an organizational structure that supports the company's business strategy and development, describing the logic of how PMOs act and deliver value to the organization (Monteiro et al., 2016). As complex as organizations themselves, the attempt to group specific project management structures that cover PMOs is very difficult, if not impossible, due to the significant differences between PMOs (Aubry et al., 2008; Hobbs and Aubry, 2007). Many models have been proposed and constructed around the typology of the PMOs (Monteiro et al., 2016; Szalay et al., 2017). However, these authors argue that because PMOs are structurally configured differently in organizations, it becomes difficult to find a standard way to typify them. Additionally, Monteiro et al. (2016), who have been dedicated to researching PMO typologies, have identified that PMOs are characterized by variation in name, structure, assumed roles, and perceived value, and that the most common typologies have three to five types of PMO models. Although these studies were not part of the sample of this research, it is worth noting the PMO models proposed by the PMI (2013b, cited in Fernandes et al., 2018; Monteiro et al., 2016; and Szalay et al., 2017), Crawford (2001, cited in Andersen et al., 2007; and 2010, cited in Monteiro et al., 2016), and Rad et al. (2002, cited in Andersen et al., 2007). The authors inserted such models in the present research.

The PMO models cited and their respective authors are presented in Table 5. It should be noted that these summarized models corroborate the study of Monteiro et al. (2016), in which, after literature review, 47 PMO models were identified by 12 authors, and due to the similarities identified, they were reduced to 25 different types of PMO models.

Best practices in PMO implementation

The best practices in the implementation of a PMO generally contribute to the optimization of business processes and organizational results (Alves et al., 2013). PMI (2017) presents three PMO definitions; the Support PMO provides project best practices, besides providing templates, training and access to information and lessons learned from previous projects (PMI, 2017). In their studies, Abdi and Kaddoura (2011) point out that the objective of applying best practices is to achieve successful results. The sharing of best practices and the promotion of continuous improvement of processes are obtained from storing and managing the communication of lessons learned from projects (Morris, 2016).

In accordance with best practices, Desouza and Evaristo (2006) note that successful PMOs have very clear documents that prove their credibility and the lack of them can have serious consequences, such as a lack of clarity regarding the roles and responsibilities of the PMO. The description of such documents and their functions are shown in Table 6, which also summarizes the other best practices mentioned above, as well as their respective authors.

Despite the definitions and characteristics of best practices presented in this research, Darling and Whitty (2016) identified that PMO professionals refer to all book authors in the area as an academic community, even though the books read by such professionals are generally at a more basic level of knowledge and present the most focused solutions. The authors mentioned also found that few project managers have read scholarly papers with peer-reviewed research and that apparently there is no understanding regarding the difference between scientific research in the field of management and in a business book. By saying that they are following "best practices", PMO practitioners are actually adopting the practices described in business books and professional association guides (Darling and Whitty, 2016). Essentially, Hobbs and Aubry (2010) argue that best practices significantly require more studies for their establishment. Such conclusion is corroborated by this research, considering the few publications on the subject found in the literature review.

Challenges to the implementation of PMO

The empirical studies dedicated to the implementation of the PMO suggest that the establishment of this structure is a difficult challenge for most organizations and there is a high failure rate (Singh et al., 2009). These challenges have a potential negative impact associated with a higher probability of project failure (Salamah and Alnaji, 2014). Therefore, academic works usually explore PMO roles, functions and services, but tend not to highlight or discuss the tensions and challenges inherent in these roles (McKay et al., 2013). This information is corroborated by Singh et al. (2009), who argue that, although anecdotal evidence suggests that implementation of PMOs can be quite difficult, few studies are dedicated to addressing the challenges involved in the task and to how organizations can overcome them.

Spalek (2013) was able to identify the challenges of PMOs that were closed more than a year after their creation and of PMOs that had been in operation for two years or more and were still operating. Desta et al. (2006) found in their research the challenges to establish and maintain PMO capacity. When researching an IT and software development organization, Salamah and Alnaji (2014) identified the main challenges of the PMO. It is important to highlight the study by Singh et al. (2009) in which the 13 main challenges in the implementation of PMO were identified and classified using the Delphi method. The list of these challenges indicated in each author's study is presented in Table 7, which demons-

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Table 5. PMO Models

PMO Models	Author	PMO Models	Author
Project control office or project office Unit projec toffice Strategic project management office	**Crawford (2001 cited by Andersen et al., 2007; 2010 cited by Monteiro et al., 2016)**	**Support Control Coordination**	**Unger et al. (2012)**
PMO for individual projects or a program of related projects PMO at divisional level PMO at corporate level	**Rad et al. (2002 cited by Andersen et al., 2007)**	**Organizational Unit PMO / Business Unit PMO / Divisional PMO / Departmental PMO Project-specific PMO / Project Office / Program Office Project Support / Services / Controls Office or PMO Enterprise / Organization--wide / Strategic / Corporate / Portfolio / Global PMO Center of Excellence / Center of Competence**	**(PMI, 2013b cited by Fernandes et al., 2018; Monteiro et al., 2016; Szalay et al., 2017)**
Support Information Manager Knowledge Manager Coach	**Desouza and Evaristo (2006)**		

Source: The authors, 2019

Table 6. Best practices in PMO implementation

Best practices in PMO implementing	Author	Best practices in PMO implementing	Author
Facilitated collaborative work within the organization Developed Structure for the PMO Established vision and strategy for PMO Prepared plan for the PMO implementation project Implement training programs in project management Hire a consultant	Desta et al. (2006)	Obtain top management sponsorship Conduct pilot projects with the developed methodology Allocate senior and experienced professionals at PMO Generate the highest possible value in the shortest amount of time Integrate information systems and existing processes / procedures in the company Recognize implantation as a cultural change Understand, meet and share the needs and expectations of different stakeholders Elaborate and control the PMO deployment plan Keep deployment as simple as possible Establish incremental objectives, broken down into phases throughout the deployment Provide expert support project and not just resources Do not require services before providing Do not postpone start of implementation Do not reinvent the wheel - use lessons learned, knowledge and existing procedures Do not forget stakeholders	Alves et al. (2013)
PMO charter: essentially a documented roadmap that defines the key questions or issues to be addressed by the PMO as well as what it will deliver	Desouza and Evaristo (2006)		
PMO policy: necessary to establish sufficient uniformity or management and to enable effective project portfolio management			
PMO methodology: should adress the business needs of the organization and provide project managers with a framework of tools, processes and metrics			

Source: The authors, 2019

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Table 7. Challenges to PMO implementation

Challenges to PMO implementation		Author(s)
Ensure consistent application of defined processes Applicability of the PMO to all projects Acceptance of project manager Conflict over project management ownership Formal definition of the PMO role Adding bureaucracy to existing organizational structure Lack of adequate funding Advocating the change in formal PMO adoption Acceptance of senior management Demonstration of the success of PMO Unreasonable workload to PMO staffs Lack of PMO authority to achieve objectives Increased costs for the organization Non-supportive organizational culture The PMO did not fulfill mandatory requirements		Desta et al. (2006)
PMOs older than one year:	Lack of top management support Wide range of business transformation / change Inability to demonstrate added value	Spalek (2013)
PMOs older than 2 years:	Inability to demonstrate added value Lack of scope definition	

Challenges to PMO implementation	Author(s)
Rigid corporate culture and failure to manage organizational resistance to change Lack of experienced project managers and PMO leadership Lack of appropriate change management strategy Failure to design a PMO around the specific needs of a company Lack of commitment of stakeholders with common methodologies and tools for the PMO Poor definition and communication of the objectives and purposes of the PMO Lack of full support from top management and various stakeholders to the PMO Role, authority and responsibility of the PMO poorly defined or understood Lack of defined scope and size of PMO implementation Non-alignment of PMO implementation strategy with organizational strategy Difficulty evaluating the effectiveness of PMO in the organization Lack of training and communication on PMO implementation to all stakeholders Difficulty of PMO professionals with more experienced staff Change of project scope Conflict between project and department tasks Containment of resources Lack of resources utilization tracking system Shortage of resources	Singh et al. (2009) Salamah and Alnaji (2014)

Source: The authors, 2019

trates the lack of theoretical consensus on these challenges, thus evidencing the need for more empirical studies on this issue.

PMO's Factors of Success

Given the variety of structures and differences in terms of functions, size and applications within organizations, the only criterion for success, unique to all PMOs, is that their structure is aligned with the organization's corporate culture (Desouza and Evaristo, 2006). Andersen et al. (2007) state that the success of the PMO is related to the assurance of PMO authority and also to the support of top management, as well as meeting the organization's true needs. Alves et al. (2013), when quoting Bullen and Rockart (1981), say that critical success factors (CSF) are some key activity areas, and through the favorable results of these factors, the projects achieve their objectives. However, the concept of best practice (discussed in section Best practices in PMO implementation) is adopted to minimize the determinism of CSF (Alves et al., 2013).

Additionally, Desta et al. (2006) identified that the main factors for PMO success were those that, when absent, contributed to failure. Andersen et al. (2007), through a benchmarking study, identified the most important factors for PMO success that should be emphasized or avoided. Alves et al. (2013) present in their research what factors of success are, and their applications oriented to Project, to the PMO and to the value of the business. All the success factors here mentioned and their respective authors are presented in Table 8. The variety found in the literature review evidences the theoretical non-uniformity on the issue.

2. CONCLUSION

The recent and progressive advance of services and activities related to information age and its inherent intricacies, along with the fact that the beginning of the expansion of this sector occurred at the same time the PMO began to consolidate in the mid-1990s, have made the information technology into a relevant and broad field for PMO deployment. Consequently, many studies have this industry sector as a research universe.

Regarding the first research question, the study identified that, due to organizations' particularities, which vary in strategy, processes, and available resources, the lack of standardization in defining the functions adopted by the PMO was evidenced, in the same way that it is difficult to establish generic PMO models, due to its structure characteristic, which is to always seek strategic alignment with the organizations it belongs to.

In view of the second question, it was observed that, due to the variability in PMO characteristics and its host organizations, it is hardly plausible to establish "best practices" for such different structures, with such peculiar objectives. It should be noted that part of the community of project management professionals, by using the term "best practices", is often adopting definitions addressed in business books without academic criteria and rigor. Therefore, for the establishment of these "best practices", it is necessary to publish more academic studies on the subject.

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Table 8. PMO Success Factors

PMO Success Factors	Author(s)		PMO Success Factors	Author(s)
Organizational culture favorable to the PMO Clear process for managing projects and collecting acquired knowledge Easy access of staff to PMO resources	Desta et al. (2006)	Project Oriented	Reduction of cost deviations Reduction of delays Improvement in meeting functional requirements Improvement of meeting technical specifications Increased customer satisfaction	
Ensure top management support Cover the organization's true needs Have service-oriented PMO staff, but avoid having them as secretaries to the projects Allow PMO services to be free for projects Design the PMO based on its goals and needs Allow time for PMO progression Create some distance and independence from the projects, so that the PMO is a support tool and not a resource PMO team with senior project managers Do not develop the PMO in a bureaucratic control unit Focus on improved project management practices; If possible, find a sponsor to support or run the PMO implementation process	Andersen et al. (2007)	PMO Oriented	Efficiency in the development and maintenance of standards and methods of project management Efficiency in providing administrative support (software assistance, web maintenance sites, reporting) Efficiency in developing and maintaining historical project archives (centralized collection and storage of project information) Efficiency in providing project management consulting Efficiency in providing training (project management, software) Efficiency in the direct management of projects delegated to the PMO Stakeholder satisfaction in the implementation of the PMO	Alves et al. (2013)
		Business Value Oriented	Increase in the number of completed projects Greater reach of business objectives by the organization in a given period Improvement on internal rate of return (IRR) of projects	

Source: The authors, 2019

In relation to the third and final research question, the research showed, in a similar way, that there are also many success factors linked to the PMO, always varying according to the perspective observed and initial characteristics and objectives defined in PMO implementation. Although the studies analyzed prove that PMOs still have a high failure rate, it has also been observed that there are few empirical studies dedicated to understanding challenges related to PMO implementation, as well as the proposal of alternatives to overcome those challenges.

Despite such inability to standardize, this research was able to build a consolidation of the main characteristics inherent to PMO implementation mentioned in literature in the last 18 years, since the year 2000. However, it is observed that there are relevant issues in the PMO implementation structuring that are not consolidated, making it difficult for organizations to base their implementation on the available theoretical frameworks.

As suggestions for future research, it would be interesting to review literature on other factors related to PMO, such as the implementation phases, maturity models, process groups, and organizational variables that affect PMO, emerging issues observed in conducting this research, in addition to intensifying empirical studies on structuring, such as best practices and the challenges of PMO implementation.

Conflict of interest statement

The authors declare that there is no conflict of interest.

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