Criteria for sustainably implementing Project Management Offices (PMOs) in Federal Institutions of Higher Education (FIHES)

Critérios para a implementação sustentável de Escritórios de Gerenciamento de Projetos (EGPs) em Instituições Federais de Ensino Superior (IFES)

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Abstract
Many areas have emerged that specifically seek to plan and manage projects in educational institutions to create and achieve their established strategic planning objectives. This study sought to identify criteria for sustainably implementing Project Management Offices (PMOs) in Federal Institutions of Higher Education (FIHE). Actions were established related to: (a) identifying Brazilian FIHEs that have implemented PMOs; (b) surveying the macro steps used at these institutions for implementing PMOs, and the software and methodologies they used to do this; c) listing the main PMO attributions implemented at the FIHEs, and finally (d) assessing what these institutions think are the best PMO practices to sustainably replicate and implement PMOs at other institutions. We identified FIHEs that had implemented PMOs, along with the best practices and lessons learned that impacted sustainable growth for future PMOs using a survey. We also presented the main steps used by some institutions to structure the implementation and consolidate PMOs within institutional environments. The results contribute to reducing the knowledge gap on implementing PMOs in FIHEs and can direct further research in this area.
Keywords: Project Management Office (PMO); Federal Institutions of Higher Education (FIHEs).

Resumo
O surgimento de áreas voltadas especificamente para o planejamento e gerenciamento de projetos em instituições de ensino são decorrentes, principalmente, da criação de projetos como forma de realizar os objetivos estabelecidos no planejamento estratégico. Assim, esta pesquisa teve como objetivo geral identificar critérios para a implementação sustentável de Escritórios de Gerenciamento de Projetos (EGPs) em Instituições Federais de Ensino Superior (IFES). Para isso estabeleceu-se ações relacionadas a (a) Identificar IFES nacionais que possuem EGPs implementados; (b) Levantar as macro etapas utilizadas por essas instituições para a implantação dos EGPs, assim como a utilização de softwares e metodologias; c) Elencar as principais atribuições dos EGPs implementados nas IFES, e, por fim, (d) avaliar o que essas instituições consideram como sendo as melhores práticas de um EGP de modo a permitir a replicação em outras instituições e a implementação de forma sustentável. Como resultados, por meio de um levantamento tipo *Survey*, foram identificadas instituições nacionais com EGPs implementados e verificado junto a essas IFES, as melhores práticas e lições aprendidas que impactam no crescimento sustentável de futuros EGPs. Também foram apresentadas as principais etapas utilizadas por algumas instituições para estruturar a implantação e a consolidação do escritório de projetos no ambiente institucional. Os resultados obtidos contribuem para a diminuição de uma lacuna do conhecimento referente à implementação de EGPs em IFES e para direcionar novas pesquisas na área.
Palavras-Chaves: Escritório de Gerenciamento de Projetos (EGP); Instituições Federais de Ensino Superior (IFES).

1.   Introdução

Management models focused on priorities and objectives are even more essential in today's increasingly fast-changing environment. Project Management (PM) is a source of competitiveness, and in light of fast-changing environments, PM is becoming more specialized by developing agile, proactive, and sustainable processes (Oliveira, 2018).

A Project Management Office (PMO) is a structure within an organization that standardizes governance processes related to projects and facilitates sharing methodologies, tools, and resources (PMBOK, 2017). PMOs establish flexible, dynamic, and versatile departments that link strategic intentions with projects to ensure that results are satisfactorily achieved, and direct organizations towards achieving better performance (Darling & Whitty, 2016). PMOs contribute and deliver value in different ways, e.g., taking responsibility for carrying out projects (Linde & Steyn, 2016) or acting in public institutions, where PMOs add value, agility, and practicality to public affairs, especially in delivering goods or services with desirable quality standards (Pinto, 2016).

Organizational Project Management (OPM) is related to carrying out strategies and providing a framework that enables organizations to consistently and predictably carry out organizational strategies, resulting in better performance, better results, and sustainable competitive advantages (PMI, 2017). This study seeks to answer the following research question: Which criteria should be taken into consideration when implementing PMOs in FIHEs to make this process more sustainable, while also considering lessons learned from other institutions during their own PMO implementation experiences?

"Sustainable" is defined here as achieving consistent, long-lasting results, with conditions suitable for maintaining or preserving these results until improvements can be implemented.

Based on the research question, our objective was to identify criteria for sustainably implementing Project Management Offices (PMOs) in FIHEs and the specific objectives are as follows: (a) Identify Brazilian FIHEs that have implemented PMOs;
(b) Survey the macro steps used by these institutions for implementing PMOs, and the software programs and methodologies they used;
(c) List the main attributions of the PMOs implemented at the FIHEs, and (d) assess what these institutions think are the best PMO practices, so these can be sustainably replicated and implemented at other institutions.

The research was conducted using a survey, and this article is structured as follows: The first section presents the introduction, containing the research question and the objectives. The second section details the theoretical framework. The third section outlines the methodological procedures. The fourth section gives a discussion of the results. Last, the fifth section gives the research implications and final considerations.

2.   Theoretical framework

2.1.   Project Management Office (PMO)

Keeling and Branco (2019), adapting Pinto (2013), distinguished 27 PMO attributions (Table 1), ordered according to which functions are present, not indicating priority or importance.

Table 1. Services performed by PMOs

Report projects status to senior management and Manage customer interfaces.	Manage client interfaces	Monitor and control PMO performance
Monitor and control project performance	Allocate resources among projects	Provide mentoring for project managers
Implement and operate a project information system	Implement and manage a database of lessons learned	Identify, select, and prioritize new projects
Coordinate and integrate projects using a portfolio	Manage projects/programs benefits	Manage one or more programs/projects
Promote project management within the organization itself	Recruit, select, evaluate, and set salaries for project managers	Promote project management toolkit without standardizations
Participate in strategic planning	Develop and implement standard project management methodologies	Perform specialized tasks for project managers
Develop and maintain a project scoreboard	Develop staff competencies, and training	Conduct post-project management reviews (lessons learned)
Manage project documents files/assemblies	Provide senior management with advice	Implement and manage risk database

Source: Keeling and Branco (2019).

One main function of a PMO is to provide support to an institution in managing its projects, or completely and directly take on this responsibility. It has the same management domain as functional managers and strategically acts in the highest sector of an institution, sharing all decision-making power (Lima, Almeida, & Maia, 2015). PMOs contribute and deliver value in different ways, e.g., taking on responsibility for carrying out projects (Linde & Steyn, 2016).

A PMO Value Ring is one of the most widely used tools for creating, evaluating, managing to structure, and implementing PMOs (2021), based on benchmarking, and professional expertise from different countries. According to Pinto (2016), this tool is flexible in meeting organizational needs, aligns contributions from a strategic standpoint, and focuses on perceived value, which is essential for consolidating PMOs. The PMO Value Ring is supported by a PMO Value Ring software program, available from the PMO Global Alliance website (https://www.pmoga.world/pmovr). It contains a list of the most frequent PMO functions, which are highlighted in Table 2.

Table 2. PMO functions according to the PMO Value Ring

Manage people in projects	Support project planning	Manage projects or programs
Provide a strategic framework for benchmarking projects	Provide training and skill developments for projects	Promote project management within the organization
Provide project or program performance reports to senior management	Do specialized tasks for project managers	Mentor project managers
Monitor portfolio performance	Do project audit	Do benchmark
Manage organizational changes and transformations	Manage project or program benefits	Manage meetings on lessons learned

Monitor and control project performance	Support defining the project portfolio	Manage resource allocation among projects
Provide project management methodologies	Manage project interfaces with clients	Participate in strategic planning
Manage project Stakeholders	Provide decision-making advice to senior management in executives	Manage project documents
Manage the lessons learned database	Provide project management tools and information systems	

Source: PMO Global Alliance (2021).

Each PMO customer can express their needs in terms of expected benefits, since PMO functions need to generate value for customers and companies, which in this study are the top management and institutions, respectively. This step helps define priority functions that a PMO offers, taking expected customer benefits into account. A cause and effect relationship was established between functions and benefits, identifying the probabilities of certain expected benefits from each PMO function (PMO Global Alliance, 2015).

PMOs created to support project managers, teams, and management levels in functional and strategic issues across the organization constitute advancements in project management. The mission is to preserve an integrated vision of strategic planning throughout the value chain. According to this understanding, it is interesting to consider the advantages of implementing PMOs, since their activities can be diversified.

The initial phase of PMO implementation is the most important phase since the correct type of office needs to be chosen considering that the PMO will need to account for offering functions that meet institutional needs. Some PMO modalities and their respective definitions are shown in Table 3.

Table 3. Classification of types of PMOs

Author	Type	Main Characteristics
Crawford (2002); Carvalho and Rabechini Jr. (2011).	Level 1 - Project Control Office	Manage large and complex projects individually. Focus on administrative project aspects.
	Level 2 - Project Office Unit	Integrate all projects at the business unit level. Focus on resource management.
	Level 3 - Strategic Project Management Office	Select, prioritize, and integrate projects to meet organizational goals. Develop a methodology and store lessons learned
Carvalho and Rabechini Jr. (2011) adapted Dinsmore (1998)	Autonomous Project Team (APT)	Autonomous projects: The project management stays in the project itself. The organization does not provide support. All project management functions are performed by the project team itself.
	Project Support Office (PSO)	Technical and administrative support for scope changes and cost management. The project manager is responsible for success.
	Project Management Center for Excellence (PMCOE)	Disseminate project management practices. Empower members and convert non-believers. Do not take responsibility for project success.
	Program Management Office (PrgMO)	Comprises PMCOE functions and in some cases PSO functions. Functions depend on power, corporate

Author	Type	Main Characteristics
		priorities, and control. Takes responsibility for project success.
	Project Leader (CPO)	Manages the project portfolio. Conducts strategic planning. Implements and evaluates strategic projects. Manages high-level stakeholders.
Kerzner (2011)	Functional PO (Project Office)	Manage critical resources.
	Customer Group PO	Manage customers and customer communication.
	Corporate (or Strategic) PO	Focus on corporate and strategic issues.
Valeriano (2005)	PMO for Assignments	Project support, training, consulting methods, and standards. Project management.
	PMO according to structure	In-person, virtual, and mixed structures.
De Souza and Evaristo (2005)	Administrative	Administrative support. Focus on managing tasks, resources, etc.
	Intensive knowledge	Manage practical project improvements. Store lessons learned. Promote project maturity.
PMBOK (2013)	Support	Advisory role: provides models, practical improvements, training, information, and lessons learned (library). Low level of control.
	Controller	Control using various means, adopt project management structures or methodologies. Moderate level of control.
	Director	Completely takes on PMI. High level of control.

Source: Patah and Vimercati (2016).

Agile Project Management Offices (APMO) should also be mentioned. According to Cruz (2016, p. 122), "an APMO follows agile concepts and methods, keeping existing agile values and principles alive in both the agile manifesto and in methods and frameworks that reinforce the structured APMO foundation", in addition to meeting one or more characteristics (Table 2).

Institutions that are planning on implementing PMO must draft good organizational structural diagrams to decide on the type of PMO they will implement. They need to gather information on organizational managerial behavior, since this occurs in the functional sector (intermediate) until reaching the base of the pyramid, i.e., the operational sectors. Usually, institutions are divided into departments, and fall under the coordination of a peak structure, which is the general director in most cases, where the whole is divided into parts (Lima, Almeida, & Maia, 2015).

2.1. Implementing PMOs in FIHEs

Since the 1990s, trends in implementing PMOs at public and private institutions have been used as alternatives for modernization to promote efficiency in providing services. According to Medeiros et al. (2017), project management practices contribute to improving organizations, highlighting that FIHEs have sought to implement PMOs to optimize their results. According to this author, 50% of all public institutions involved in direct administration, and 67% involved in indirect administration have already implemented this structure, or similar structures, based on data from a PM survey released in 2014 on public institutions in general, constituting a significant increase in this practice.

FIHEs are complex organizations, and performance is measured in terms of teaching, research, and extension activities (Marcovitch, et al., 2017). Organizational management needs to be adequately aligned with academic and administrative complexity arising from multiple interests, objectives, and specific activities performed in different areas of knowledge.

At FIHEs, strategic approaches are carried out using the Institutional Development Plan (IDP) (Decree nº 9.235/2017) as a legal requirement. The IDP accounts for structures set forth to comply with institutionalized policies or programs, according to the academic organization of the institution. Implementing a PMO needs to be timely for the institution, and must be aligned with teaching, research, extension, and management activities.

It is noteworthy that some FIHEs have units that are accredited by the Brazilian Company for Research and Industrial Innovation (Embrapii), which according to the Ministry of Education (MEC, 2021), is a private non-profit institution, and its main mission is to contribute to developing innovation and competitiveness among Brazilian industries by meeting innovation demands in the productive sector. This institution accomplishes its objectives via projects, and it has PMOs at some organizational structures defined for these units.

A survey carried out by Moura and Serafim (2019), on Brazilian Federal Universities, sought to objectively quantify the existence of structured Project Management Offices that had been implemented at institutions, and 10 universities stated that they had PMOs. The results collected by this study are presented in Table 4.

Table 4. Federal Universities with implemented PMOs

Institution	PMO Data	Year Created	No. of People	Description
UFMT – Federal University of Mato Grosso	Project and Process Office linked to the Vice Dean	2016	5	Supports institutional management projects with or without financial support by directly monitoring or mentoring project coordinators.
UFCA - Federal University of Cariri	Project and Process Management Coordination – CGPP, associated with the Dean of Planning and Budgets.	2017	4	Manages strategic projects and mapping processes with the UFCA's strategic map and value chain, providing training to promote autonomy among sectors to control and monitor activities via strategic institutional planning.
UFRN - Federal University of Rio Grande do Norte	Project Management Secretary, as a "secretariat" with administrative, asset, and financial autonomy, directly linked with the Dean's Office.	2015	5	Works with managing strategic projects, promoting best practices, and having dialogues between project and process managers and the UFRN administration. Supports adopting project management tools, methods, and techniques for process management.
UFPA - Federal University of Pará	Strategic Management Board (DIGEST) containing Project Management Coordination to	2017	1	No Information

Institution	PMO Data	Year Created	No. of People	Description
	manage strategic projects, linked with the Dean of Planning and Institutional Development (PROLAN).			
UFES - Federal University of Espirito Santo	Project Management and Process Office (PMOP)	2017	4	This PMOP supports teams via instructions, training, and using appropriate techniques for each project. The PMOP creates value by reducing or eliminating waste, reducing costs, improving performance processes, projects, and operations, and optimizing resource use and customer satisfaction.
UFFS - Federal University of Fronteira Sul	Project Management Department, at the third level (Dean -> Special IT Secretary -> Project Management Department)	2017	2	Carries out activities to identify demands, conducts business analyses, defines scopes, prioritizes solutions, details requirements for PMBOK areas like time, scope and stakeholders.
UNILA - Federal University of Latin-American Integration	Strategic Planning Department (DPE), linked with PROLAN.	2017	7	Develops work related to Institutional Planning (Development Plan, Institutional and Annual Plan), Process Management, Project Management, Studies on Governance, risks and organizational structure, etc.
UFCSPA - Federal University of Health Sciences of Porto Alegre	Project Office, administrative office linked with the Vice-Dean.	2017	3	Supports preparing and submitting Projects, Supports drafting technical reports and presenting project results. Promotes research qualification activities (workshops and courses).
UNIPAMPA – Federal University of Pampa	Project Management Division, part of the Coordination for Agreements, Projects, and Fundraising with the Dean of Planning and Infrastructure.	2016	None	Welcomes, identifies, investigates, systematizes, guides, supports, carries out and monitors development actions for strategic projects of interest to the institution.
UFPR - Federal University of Paraná	Governance and Risk Coordination working with processes and projects, with other offices that also work on projects.	2017	4	Process Management, Risk Management, Risk Management, and IT System Management.

Source: Adapted from Moura and Serafini (2019).

We observed that implementing PMOs in Brazilian FIHEs is not a trend yet, as only a few isolated institutions have systematically adopted this practice. It is known that

implementing PMOs at institutions that have existed for decades is very challenging. Paradigm shifts constitute one of the most impacting success points when PMOs are implemented (ABPMP, 2013). According to Arruda (2017), at the beginning of implementing PMOs, and even before they are implemented, institutions must have a specified direction, even if adjustments will eventually be needed. Starting with planning, institutions must understand where they want to be at the end of the year.

3. Methodological procedures

3.1. Classification of this study

According to Prodanov and Freitas (2013), research approaches and methods can be classified relative to their nature, objectives, technical procedures, and approaches to problems. This study is classified as a quantitative approach, while the objectives are exploratory, and the technical procedure is a survey. Table 5 gives some definitions from different authors on these classifications.

Table 5. Definitions for classifying research

Research Classification	Definition
Quantitative Research	Quantitative research results can be quantified (Fonseca, 2002). Quantitative research focuses on a few concepts and starts by considering preconceived ideas (Polit et al., 2004). Quantitative research requires using statistical resources and techniques, like percentage, mean, mode, median, standard deviation, correlation coefficients, regression analysis, etc. (Prodanov & Freitas, 2013).
Exploratory Research	Exploratory research seeks to foster familiarity with problems, make them more explicit, or build hypotheses (Gil, 1991). Exploratory research is used in cases when problems need to be defined with greater precision (Malhota, 2001). Exploratory research studies initially start with broader research processes, which clarify and define the nature of problems and generate more information that can be used by future studies (Zikmund, 2000).
Surveys	Surveys are used in exploratory and descriptive research (Fonseca, 2002). Surveys seek to understand the behavior of individuals by clearly and directly questioning them (Santos, 2000). In general, researchers proceed by requesting information from a significant group of people on the problem that is being studied to then draw conclusions corresponding to the collected data, using quantitative analysis (Prodanov & Freitas, 2013).

Source: The authors of this study (2022).

Seven steps were established, specified by Bryman and Bell (2011), to carry out survey research, which is listed as follows: a) create the conceptual structure (including objectives and the object of study); b) define the population that will be studied; c) prepare the questionnaire; d) carry out a pilot test; e) apply the questionnaire; f) analyze the data and establish information for replication.

We will present how we developed the survey to better understand the methodological flow of this study.

3.2. Developing the survey

The object of study includes all FIHEs registered with the Ministry of Education (MEC), consisting of Federal Institutes and Universities, i.e., a non-probabilistic sample. University data were obtained from government websites (https://emec.mec.gov.br/), which contained the names of the institutions and where they are located, among other information.

After selecting the object of study, a questionnaire was created and validated by specialists in Project Management, and specialists in implementing PMOs. To validate the questionnaire, an initial version of the questionnaire was sent to professionals, to be answered and analyzed to validate whether the questionnaire would achieve its purpose. The recommendations given by the experts were taken into consideration. We used Google Forms to send the questionnaires online. The questionnaires were sent to 100 FIHEs listed on the Transparency Portal, according to the Access to Information Law (LAI). Institutions were given 20 days to respond, and times could be extended up to an additional 10 days. Figure 1 shows the methodological flow research for better understanding.

Figure 1. Methodological research flow
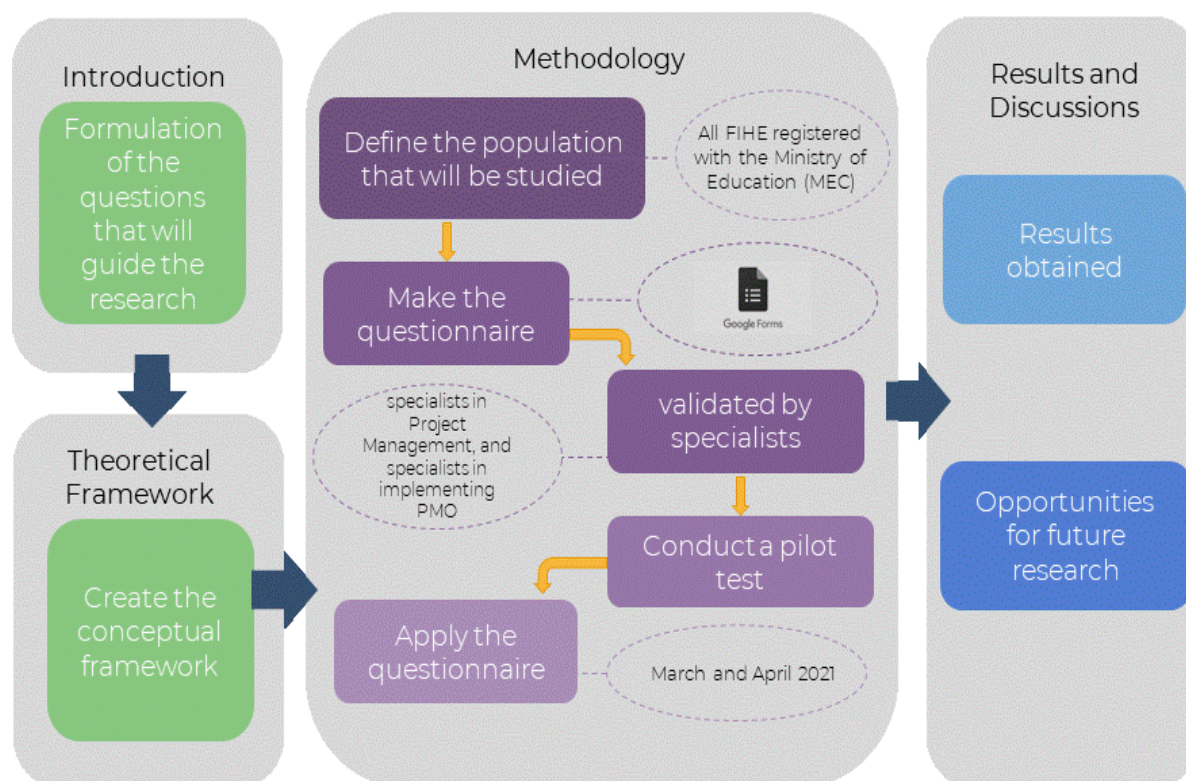
Source: The authors of this study (2022).

The survey took place between March and April 2021. We should note that, according to Floyd and Fowler (2011), the response rate must be above 20% of the selected sample when applying a questionnaire online, i.e., for this study we needed 21 responses from the 100 FIHEs.

4.   Results and discussions

4.1. General analysis

This section presents the results of the survey applied to the FIHEs. 100 questionnaires were sent out, and 64 were completed, resulting in a response rate of 64%. The first question in the questionnaire helped us identify the number of institutions with implemented PMOs in their organizations. The answers to the first question are given in Graph 1.

Graph 1. Level of implemented PMOs in FIHEs
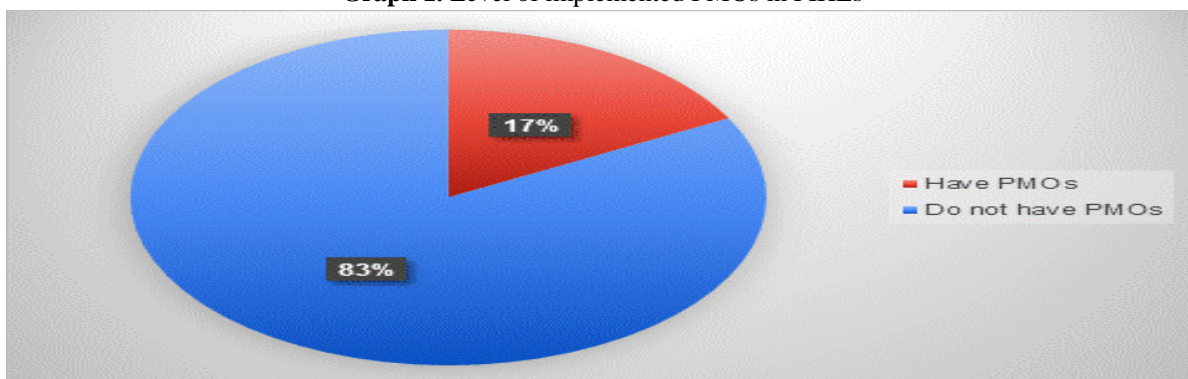
Source: The authors of this study (2022).

Of the 64 institutions that responded to the survey, 11 stated that they had PMOs (17%), while 53 institutions stated that they did not have PMOs (83%). It should be noted that they were asked about PMOs that supported institutional administrative activities on a whole, and not isolated PMOs. We found that PMO implementation at FIHEs is still not a common practice. Table 6 lists the institutions that had PMOs.

Table 6. FIHEs with PMOs

University	Region
Federal University of Pará (UFPA)	North
Federal University of South Bahia (UFSB)	Northeast
Federal University of Technology of Paraná (UTFPR)	South
Federal University of Rio Grande do Norte (UFRN)	Northeast
Federal University of Health Sciences of Porto Alegre (UFCSPA)	South
Fluminense Federal Institute (IFF)	Southeast
Goiano Federal Institute (IFGoiano)	Central-west
Federal University of Tocantins (UFT)	North
Federal University of Mato Grosso (UFMT)	Central-west
Educational, Professional, Scientific, and Technological Federal Institute of Pará (IFPA)	North
Federal University of Maranhão (UFMA)	Northeast

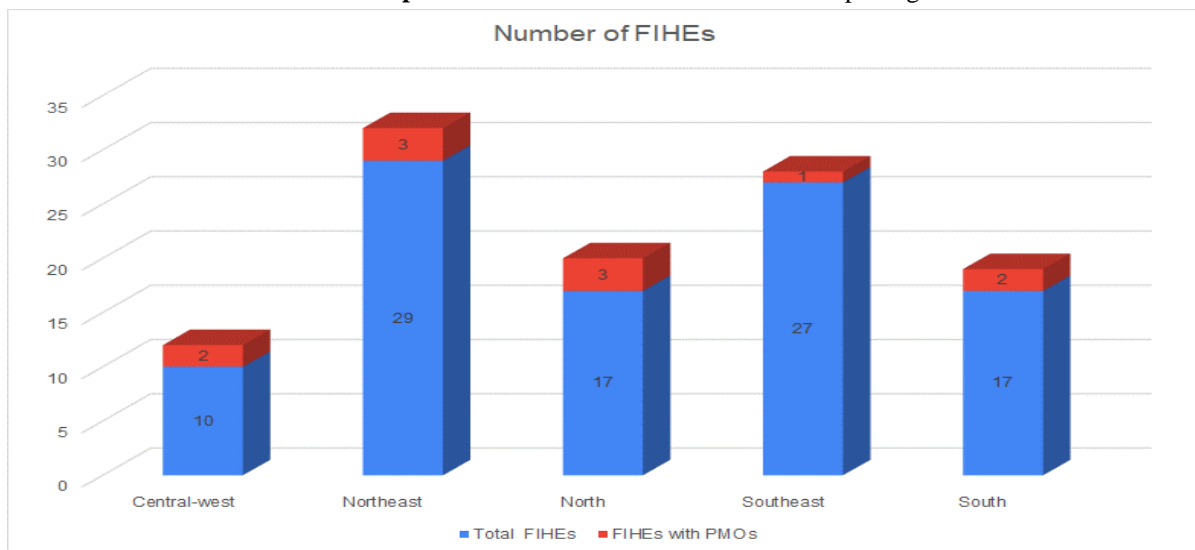Source: The authors of this study (2022).

Comparing the FIHEs with PMOs in Table 4, and referencing a study by Moura and Serafim (2019), on Federal Universities, we see that some Universities had previously stated

that they had PMOs, yet did not comment. This was the case for UFCA, UFES, UFFS, UNILA, UNIPAMPA, and UFPR, all of which received questionnaires.

Regarding the regions where the FIHEs are located, we can see that the Northeastern and Northern regions have the most PMOs, relative to the South, which has only one PMO. This is detailed in Graph 2, along with total FIHEs per region.

Graph 2. Total FIHEs vs. FIHEs with PMOs per region

Source: The authors of this study (2022).

After this survey we analyzed aspects related to implementing PMOs, the methodologies used to do this, and the criteria - based on lessons learned during the processes - that promote sustainably implementing PMOs, so we could answer our research question.

4.2.   Analyzing implementing PMOs in FIHEs

Aspects related to the PMO implementation stage will be presented for the 11 institutions that stated that they had PMOs, considering points like the reason for implementing the PMO, the duration time (from planning to completion), and the steps for building the PMO.

There are many ways of structuring a PMO, but the first step is associated with deciding whether to have a PMO at the institution or not. This is connected with the expectations that organizations will develop, considering the prerogatives and solutions that PMOs are expected to offer (Abe & Carvalho, 2005). It is recognized that the process of implementing a PMO starts with a decision. According to the respondents, decisions were mostly taken based on a direct request from the Dean, and approvals from councils (54%), or because this had already been outlined by the institution's strategic plan (46%).

According to Carvalho and Piscopo (2014), the steps for implementing a PMO are called "group actions", which are: decisions; pre-structuring; structuring; execution, evaluation, and continuous improvements. Patel et al. (2012), give a process for implementing PMOs according to three major steps, with several sub-steps, which are: Planning, Implementing, and Management. Table 7 shows how the PMO implementation process was structured at the FIHEs that stated that they had PMOs.

Table 7. PMO implementation process at FIHEs

FIHE	Description of the PMO	Implementation Time	Main implementation steps
UFPA	Project Management Coordination	1 year	Define Competencies / Prepare the Rules and Procedures / Approve the PMO
UFSB	Project Management Sector	2 months	Plan and define the structure of the sector / elaborate guidelines and attributions for the sector / Submit an organizational chart for approval.
UTFPR	Process Office	1 year	Study/ Lease servers/ Train/ Development processes
UFRN	Project Management Secretary (SGP)	1 year	Define the scope of the action: Office Processes, Projects and Risks / Define an anchor methodology - LCC / Define the first projects monitored / Search for People / Search for space / Pilot projects on three fronts: Processes, Projects, and Risks
UFCSPA	Project Office	2 years	PMO benchmarking for research institutions / Define the PMO action scope / Approval from the council / Allocate people to the PMO.
IFF	Office of Strategic Processes and Projects	Still being implemented.	IFFluminense carried out step 1 by establishing the PMO, and step 2 by training the main players involved. To complete the PMO implementation, future steps will be needed.
IFGoiano	General Coordination for the Office of Projects and Processes	9 months. Still being implemented.	There was a separate project and a process management initiative from the IT department. After an experimentation period, and after persuading senior management, using accountability and results, we decided to create a specific sector for this purpose, with only one public servant initially, which was the former IT director.
UFT	Engineering and Architecture Coordination	3 months	Define the purposes / Define the teams / Publish an ordinance
UFMT	Project and Process Office	5 months	Align the senior management / Define the attributions / Mobilize the team/train the team
IFPA	Project Management and Process Management Office (PMOGP)	3 years	Train the public servants / Forecast the Strategic Planning / Appoint responsible public servants / Prepare the Work Plan / Carry out and evaluate Actions.

FIHE	Description of the PMO	Implementation Time	Main implementation steps
UFMA	Special Projects Center (NPE)	1 year	Manage / Implement / Diagnose / Finish

Source: The authors of this study (2022).

We noted that there are no standards for implementing PMOs, but there are similarities. Each FIHE planned and implemented PMOs according to their needs and their available resources. This is also reflected in the amount of time it took to implement the PMOs, which ranged from 2 months to 3 years.

De Souza and Evaristo (2006) raised a relevant question on PMOs, that can help understand the "lack of standards". According to the authors, there is no universal definition for a PMO model, so the implementation must take individualities, structure diversification, size, and functions into account, according to the organizational requirements. Another line of argument was defended by Dai and Wells (2004), who offered another line of reasoning where PMOs are structured so that they undergo constant changes to their configurations, because the organizational project needs also change frequently.

4.3. Project management methodologies and software used by the FIHEs at the PMOs

PMOs are often responsible for forming a set of norms and rules that reflect an institution's methodologies for managing projects to standardize processes (Aubry & Hobbs, 2008). This is an essential concept that must adopt coherent methodologies and software programs, making it possible to create and connect people via information. Table 8 shows the responses of the institutions regarding this topic.

Table 8. Software and methodologies used by the PMOs

FIHE	Time in operation	How many public servants?	Software	Methods and guides
UFPA	3 years	1 Administrator	They only use systems from entities that decentralize resources, but they are in the process of adjusting a module in the University's integrated system for use as a projects management resource covered by the Decentralized Execution Term (TED).	They are in the process of approving a TED and a manual that details this resolution, to define the process for using, carrying out, and holding the TEDs accountable
UFSB	3 years	1 Head of the sector, 3 Architects, 1 Electrician.	Not used	Hire inspectors and project analysts.
UTFPR	4 years	3 public servants	Electronic Information System - SEI - TRF4 Base	No information
UFRN	5 years	1 Professor; 4 Administrative Technicians; 10	Redmine and GAS - Project Management System	Life Cycle Canvas

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| FIHE	Time in operation	How many public servants?	Software	Methods and guides
		Scholars from different courses		
UFCSPA	4 years	1 Coordinator, 1 Intern, 1 Statistical Technician	Not used	Not used
IFF	1 year	1 Administrator	Not used	PMBOK ® Guide
IFGoiano	1 year	1 IT Analyst, and 1 Educational Affairs Technician	Unified Public Administration System (SUAP), customized to meet the needs of IFGoiano.	Not used
UFT	5 years	3 Civil Engineers, 1 Electrical Engineer, and 1 Architect	Not used	Not used
UFMT	4 years	1 Director, and 2 Project Managers	Trello and GPWeb	Not used
IFPA	2 years	1 PMOGP Head	PM CANVAS	The bibliography; interaction with other institutions (UFPA); (IFSC)
UFMA	2 years	6 (Deans and Superintendents)	Open Project	Adapting the PMBOK ® Guide

Source: The authors of this study (2022).

Regarding software, the institutions have been using free software, e.g., Trello and Redmine, and paid software, e.g., GPWeb. There was also one specific case of software development, e.g., SUAP, which was developed by IFRN and adapted according to the needs of the institution where it will be installed. The FIHEs that stated that they did not use any software programs or methodologies, did so mainly because they are in the process of defining their processes.

The PMO Value Ring (2021), is a methodology for creating or restructuring PMOs, based on benchmarking and professional expertise from different countries. It is flexible concerning organizational needs, aligns contributions from a strategic standpoint, and focuses on perceived value, which is essential for consolidating any PMO (Pinto, 2016). 32 PMO attributions were listed in the questionnaire sent to the FIHEs based on this methodology, and Keeling and Branco (2019). Further responses could be added by the respondents. Graph 4 shows the attributions as reported by the respondents.

Graph 3. PMO attributions
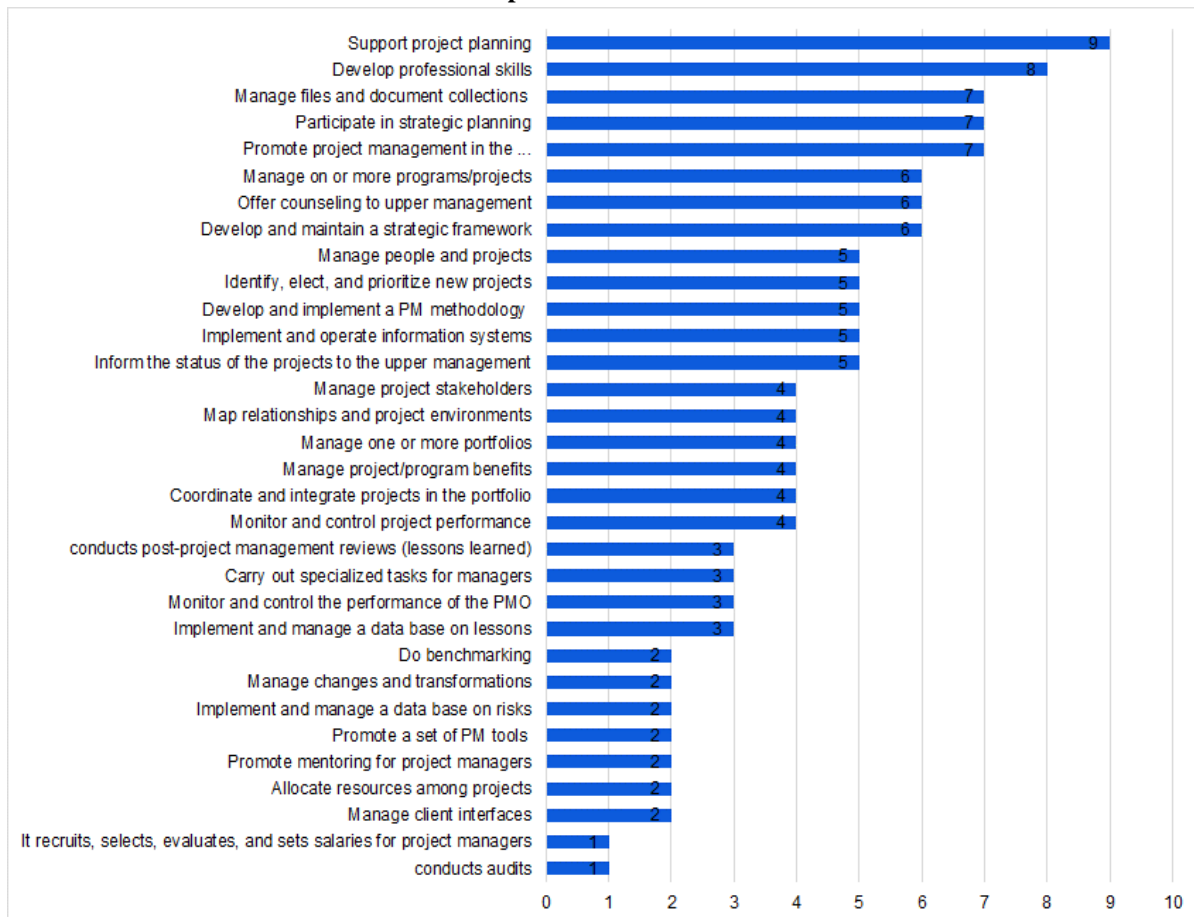
Source: The authors of this study (2022).

We can see that the FIHEs with implemented PMOs have different attributions and structures. This corroborates Cruz (2016, p. 59), who stated that "there are no defined standards for PMOs, and PMOs can take on many forms, depending on the degree of control and influence they exert on organizational projects".

We observed that actions like supporting project planning, and developing professionals skills, were the most employed activities at most PMOs. In addition to these practices, the Federal University of Health Sciences of Porto Alegre (UFCSPA) reported that it supports administrative management research projects and fundraising, while the Federal University of Pará (UFPA) stated that it supported project coordinators in processes for signing Decentralized Execution Terms (TEDs), i.e., raising funds for projects submitted by the coordinators, which is a specific PMO activity, and the Educational, Professional, Scientific, and Technological Federal Institute of Pará (IFPA) stated that it is still finalizing its scope, and reported that its activities are still changing.

4.4. Criteria for sustainably implementing PMOs

According to Sereda (2015), archiving and structurally sharing knowledge from studies on failures and successes, leads to organizational excellence, and for this, knowledge management must be methodical, planned, and relevant. Table 9 gives a list of learning acquired by FIHEs, that according to respondents, allows for sustainably implementing PMOs.

Table 9. Criteria for sustainably implementing PMOs in FIHE

FIHE	Criteria for sustainably implementing PMOs in FIHEs
UFPA	It is important to clearly define the scope and have structures that are aligned with the scope.
UFSB	Adopting integrated project guidelines is fundamental for success, along with involving all interested parties in all developmental stages, starting with the preliminary study and extending to project implementation, along with reducing deadlines and costs for carrying out and maintaining the PMOs.
UTFPR	The main developmental points are: Business Process Mapping / Process Optimization / Process Portfolio Management / Business Area Demand Analysis / Risk Management / Knowledge Base Process Management / Electronic Information System Administration - SEI / Meeting demands via an Electronic Information System - SEI / make new modules available within the Electronic Information System - SEI / Manage User Support Groups (SEI Facilitators) / Systems Management "Registration Commissions" / Support for Digital Transformations
UFRN	It is complicated to implement a merely normative PMO within the university structure. Strategic PMO project management is required. All kinds of projects should be taken up when building learning offices. It is important that the PMO take risks on short-term projects, but considering the whole university scope to help sustainability. It is important to have some axis projects that are expertise office, but not get stuck in it.
UFCSPA	Define and align the PMO scope with strategic planning. Identify qualified people for the team.
IFF	We are still in the initial phases of implementation.
IFGoiano	As was mentioned earlier, the PMO is still being implemented. Actions so far have aimed to change organizational culture, highlighting the importance of planning. We cannot list lessons learned.
UFT	Optimize the projects, develop professional skills, promote quality deliveries.
UFMT	Apply a methodology for selecting and prioritizing PMO services.
IFPA	Top management decision. Offer training courses. Search for a representative with experience in management. Receive support from senior management for actions that impact changes to the organization's routines. The main challenge is inserting "new activities" into the organization's day-to-day management.
UFMA	We are still in the initial phases of implementing continuous improvements.

Source: The authors of this study (2022).

Table 9 specifies that the most cited action was related to expanding a culture of project management, and transforming the organization's culture. To help with this, the PMO Value Ring methodology suggests that organizations need to see their PMOs as being "service providers", with "clients" and "stakeholders", so the best way to generate value, and the best way for perceiving value, is meeting the expectations of the "stakeholders" (Pinto, 2019). There need to be joint efforts if this is to work, from both top management and public servant. One institution that is still implementing a PMO stated that all actions so far are aimed at changing the organizational culture, emphasizing the importance of including this in the implementation planning phase. Furthermore, they stated that involvement from all stakeholders, at all

developmental stages, is crucial for success, focusing on organizational needs, and showing that cultural changes will be beneficial.

Another point mentioned by some FIHEs was related to defining the PMO scope and having adequate structures for defining scopes, e.g., an appropriate number of public servants for performing prioritized activities. Established directions are also necessary, even if adjustments may eventually need to be made. They also mentioned the importance of receiving support from senior management, which impacts changing organizational routines, given the challenges associated with inserting new activities into day-to-day management practices. This reinforces what was found in literature, like a strategic PMO Value Ring vision (2021), where top management alignment with PMO objectives and functions is a key success point.

Respondents also mentioned technical development professionals who would work at the PMO. They highlighted the importance of investing and seeking to develop teams in different areas, and not merely in the project and process management areas. One can also look for employees outside the institution who have experience in project management.

Respondents also cited the importance of taking risks in short-term projects, that reach the institution as a whole, thereby expanding the project management culture. If professionals are not aware of the work goals, and do not understand the value, projects will hardly be able to be performed, or seen by top management. We noticed the importance of defining maturity, and giving it purpose and leveled goals. PMOs need to develop professionals, and senior management needs to be reminded of the expected PMO benefits, starting at the planning stage. Without understanding the potential benefits, it does not matter how technical the activities being carried out are, as they may not be robust enough to act on needed organizational changes.

5. Conclusions

Given the specific objectives established in this study, and using the survey, we identified Brazilian FIHEs that have implemented PMOs, surveyed the macro steps used at these institutions for implementing PMOs, along with the software programs and methodologies that they used. We also listed the main implemented PMO attributions at the FIHEs to assess what these institutions thought were the best practices for this process so this could be replicated by other institutions and provide advancements in terms of sustainably implementing PMOs. Upon fulfilling the specific objectives that we established, we were then able to achieve our proposed general objectives for identifying the PMOs sustainability criteria at FIHEs.

The results indicated that only 11 institutions (17%) out of the 64 FIHEs that responded to the survey, had implemented PMOs. This indicates that PMO implementation is not yet consolidated at FIHEs, and this constitutes a research opportunity.

We found that few employees were involved in PMOs, which could limit some institutions in building a sector with adequate training and profiles for this purpose. Although this is not entirely an obstacle, it is worth drawing attention to, because generally a PMO must contain professionals with project management training and skills.

The literature analysis showed that the necessary requirements for sustainably implementing a PMO include the supporting role of senior management, and management from other interested parties. This corroborates the opinions of the respondents when asked about lessons learned during the implementing process. They mainly mentioned alignment and

support with/from senior management. Other criteria for sustainably implementing PMO include training professionals. PMOs may not be able to stay aligned with the scope without qualified public servants to carry out project management. Motivating other sectors within the organization could be an important criterion when consolidating the PMO. Adequate planning can help guide professionals who will work at the PMO, at least for the first year of operations, and this will keep the PMO from losing focus of its objectives.

Regarding the best practices for implementing PMOs, in addition to the best practices cited by respondents, we asked an expert in the area about this, and this professional listed important aspects like not following a standardized PMO model, since any model used must be adapted to expectations and needs senior management. A PMO must be restructured whenever there is the need to do so, and normally, strategic and business model changes require quick changes to PMO performance. Another important aspect reiterated by this specialist was offering basic training to project management technical teams, since these professionals can help management activities. Additionally, this professional highlighted projects with self-managing teams, where management is not centralized to a single manager. Regarding project management tools/software, this professional referenced alternatives like Atlassian (Jira, Bitbucket, Confluence), Sharepoint, MS Project, and traditional methods based on PMBOK, or Agile Methods based on Scrum, Kanban, TDD, and Continuous Integrations.

Implementing PMOs in organizational environments has already been consolidated to achieve results. However, within the scope of FIHEs, where resources come from the government, in addition to their agreements, results must be aligned with the principle of public sector efficiency, by involving, for example, best use practices for financial resources, human resources, and physical resources. This definition for using resources is outlined by Institutional Strategic Planning (PEI) and is based on policies defined for teaching, research, extension, and administration activities, tracing institutional objectives and goals, which are most often carried out by projects. Also, this could be a better way of adapting to possible budget constraints without compromising planned projects, since PMOs can facilitate sharing methodologies, tools, and resources. These are relevant points that can justify implementing PMOs in FIHEs. It is noteworthy that all the FIHEs have an Administrative Dean, and that PMO functions are often incorporated with the Administrative Dean, even if this is done informally. Managers at each institution need to assess the real need for PMOs and the scopes that will be defined since this can vary greatly.

Finally, for future work we suggest that researchers study the organizational structures (organizational charts) of PMOs, and how these structures relate to formal FIHEs structures. Also, practical studies could be performed, like studies resulting from action research, to monitor implementing PMOs in FIHEs using the criteria and lessons learned presented here, which were important contributions to this study.

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