

Methodological guide for the proposal of a Project Management Office

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Abstract—This research proposes a methodological guide to design a proposal for the creation of a project management office (PMO) at the University of Cartagena. As a methodology, a conceptual model consisting of the following phases is proposed: Diagnosis, Selection of the population and study sample, Design and application of surveys, Analysis of information collected and Proposal of PMO. For the case study, and in order to validate the effectiveness of the proposed guide, the previous items were implemented at the University of Cartagena. For the analysis, the variables were identified: Maturity in Project Management, Methodology Level in Project Management, Project Management Tools, Competency Development Level in Project Management, Methodology Level in Portfolio Management, Methodology Level in Direction of Programs and Multi-Projects, Level of Office of Project Management; these were classified between medium and low levels of development. In response to the above, it is stated that the type of PMO according to the structure of the University is "Control Tower". The conclusions indicated that the guide allows: creating PMO proposals, finding strengths, weaknesses and establishing PMO functions in organizations.

Keyword - PMO, Strategic goals, Control resources, management, organizations.

I. INTRODUCTION

The projects are defined as a set of investments, activities and institutional measures, with which the fulfillment of an established objective within defined limits is sought, with the purpose of creating products or services of value that generate changes in the society that continue even after its completion [1].

Just as the project has a purpose, it is necessary that during its development there are standards or procedures that allow its realization, for this an important tool is the management. This consists of the use of management techniques and systems for the realization of a project, in order to achieve preset achievements of effectiveness and efficiency [2]. Another definition is that of the [3] which is focused on 4 phases for management: Start, organization and preparation, completion and completion. In addition, each contains 5 groups of processes (initiation, planning, execution, supervision and control, and closure).

In organizations, you can find that project management is delegated to each unit, or on the contrary, they can have project management offices (PMOs), which are created to support strategic issues to implement: principles, practices, methodologies, tools and management techniques [4]. PMOs have the obligation to contribute to the success of project management, in addition, they must ensure that they are in accordance with the purpose of the organization. They also develop norms and procedures for management and help the organization improve their execution [5].

The form and role of the functions of the PMO change according to the environment in which they are applied [6], because not all are the same or are adopted in the same way in organizations, because of the type of PMO which is implemented depends on the attributes of the organization, value proposal and level of maturity in project management [7].

In the investigation of [8] a search was made of the different types of PMO models that exist, where they differentiated 25 types of PMO studied by several authors. Among the commonly referenced are: Business PMO [9] [10] [11] [12] [13] [14]; Center for Project Management Excellence [15] [11] [16] [17] [14]; Project Support Office [15] [11] [17] [14]; and Project Office [10] [16] [17] [14].

The process of managing a project requires techniques, procedures and controls to ensure the correct performance within the established limits, otherwise, it may present delays, cost overruns and may even fail. In the case of the University of Cartagena, the management of project management is not something simple to perform, due to the constant red tape and bureaucratization that is having to manage the projects that the departments or faculties are in charge of. Taking into account the above, the diversity of existing PMOs and the lack of standard procedures to adopt a type of PMO, there are cases in which organizations implement PMOs without a clear vision or direction, without taking into account the organizational structure, size and level of maturity of project management [6].

For this reason, a methodological guide was created to design a proposal for the creation of a project management office at the University of Cartagena, based on the organizational needs of the institution. The proposal facilitates the realization of an entity during the execution of the projects in which the institution is linked, which allows the use of best practices in the management of these, which benefits the actors involved.

II. METHODOLOGY

Based on the information expressed, the model represented in Figure 1 was designed to carry out the study.

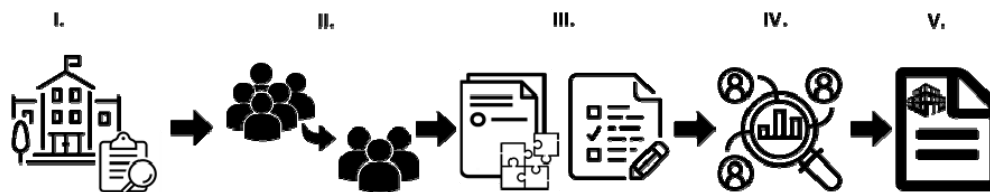


Fig. 1: Model to propose the creation of PMO

The model proposed in Figure 1 is made up of the following phases:

1. Diagnosis

The information concerning the institution is gathered, in order to know its organizational structure and development plan in terms of project management to choose the PMO model that best matches it.

2. Selection of the population and study sample

Individuals are selected who are directly related to the management of projects in the institution, such as: managers, coordinators, and other officials involved in the process, because their knowledge and experience with the institution help define the functions of the PMO.

3. Design and application of surveys

To understand the state of the institution in the area of project management, surveys are designed that apply to different officials of the institution, the questions are oriented to know the degree in which the University is in relation to the following variables: Maturity level, Methodology used, Project management tools, Level of development of competencies in project management, Degree or level of methodology in project management, Methodology level in direction of programs and multi-projects and finally the officer level of project management As a way of measuring the responses, the scale shown in Table 1 is proposed.

TABLE I. Font Sizes for Papers

Percentage	Category
0 – 20%	Low
21% - 40%	Medium Low
41% - 60%	Medium
61% - 80%	Medium High
81% - 100%	High

4. Analysis of information collected

An evaluation of the data is done to know the situation in which the institution is in the area of project management.

5. Proposal of PMO

Based on the diagnosis and analysis carried out, the proposal of Risk Management Office is formulated that best fits the needs of the institution.

III. RESULTS

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A. Case study

In order to validate the effectiveness of the proposed guide, the items corresponding to the guide were implemented at the University of Cartagena, to obtain a proposal for the creation of a project management office, which allows having a standard organization during the execution of the project.

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involved in them. In contrast, [18] proposed a framework that seeks to propose, create and implement a PMO, through aspects such as: understanding the definition of success of the organization, specify the type and functions of the PMO, defines the place of the PMO in the organization, make the PMO proposal letter, obtain approval of the letter and implement the office, which, in the planning stage, are similar to the phases described in the proposed guide.

Below are the stages of the implementation of this guide for the University of Cartagena.

1. *Diagnosis*

The structure of the University is given by a Rectoría, where several vice-rectories and five support offices for processes converge. According to the above, Figure 2 shows how the structure is structured in relation to the rectoría and its dependencies.

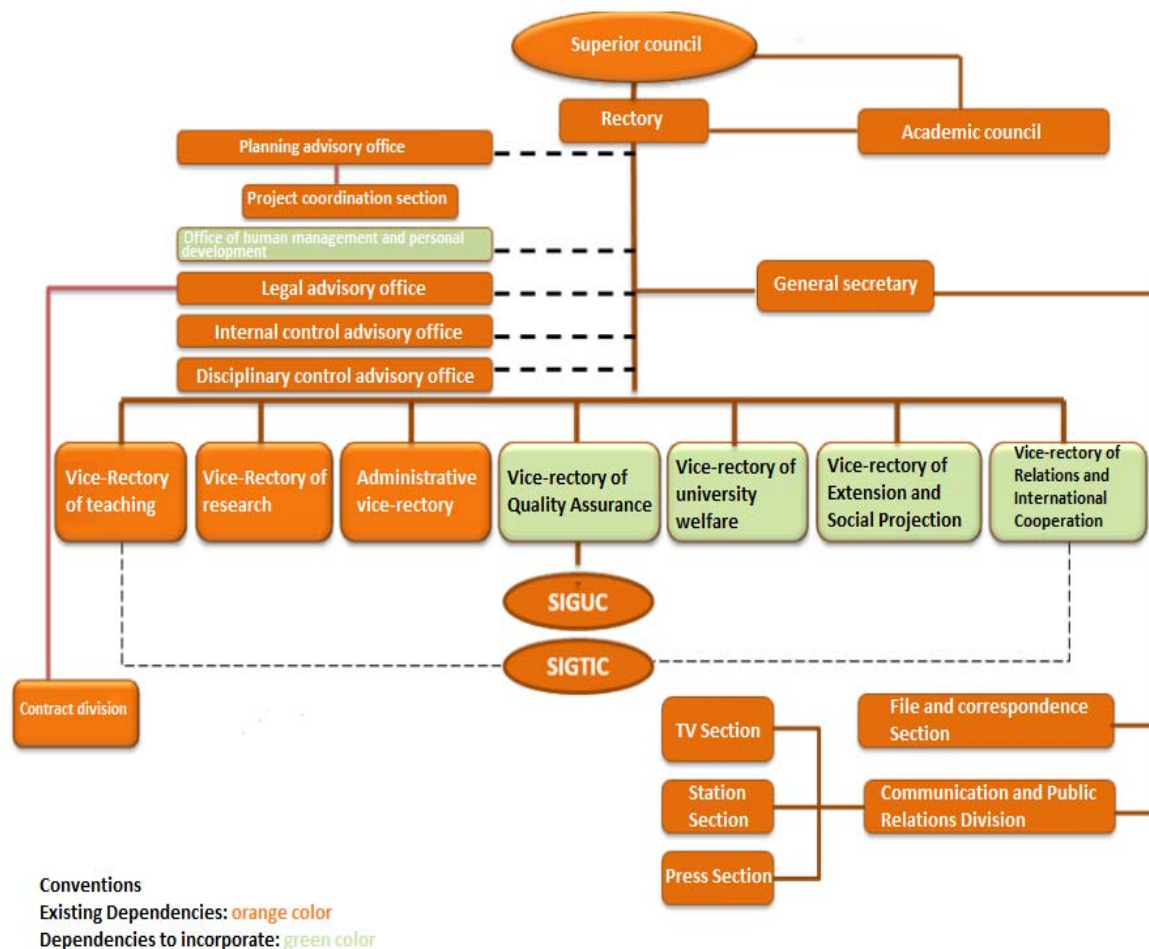


Fig. 2 Organic Structure of the University of Cartagena

The University of Cartagena presented a gap among what was stated in the organizational strategy developed in the Strategic Development Plan 2010-2014, which defined the integration of two management systems MECI and NTC GP 1000, in a single integrated management system IMS, and what really could be appreciated as a result of the implementation of the strategies. The implementation of this IMS, did not remedy organizational deficiencies which led to the development of that strategy; this can be seen in the difficulty that project management presents in the organization, an aspect that was not resolved with the implementation of integrated management systems. Implementation of management systems was a strategic decision that has allowed the improvement in the development of daily operations, but has failed to produce the desired related to the project management impact.

The institution presented an item of income from the different inter-administrative agreements of around \$3.5 million USD, which were made by public and private sector entities. These agreements are intended to provide a service or the generation of a good by the University to the contracting entity, i.e. projects.

The 2014-2018 Development Plan showed that the University, during the whole period of the plan, had a very significant and proportional progress in terms of participation in inter-institutional cooperation projects and the linking of social policies (professional associations, scientific societies, external editorial committees and local, national and international councils).

As a project management tool we have this plan that seeks to increase the sale of services of the University; for the period 2010, according to budget revenues, specific destination agreements were managed for approximately \$261,800.00 USD (base), for 2011 the amount decreased, remaining at \$226,100.00, in 2012 amounted to \$292,600.00 and for 2013 it was above \$220,500.00 USD.

2. *Selection of the population and study sample*

The staff that manages or is part of the main projects at the University of Cartagena was selected as a population, among them a sample of 11 people was chosen: seven project coordinators and four officials at the managerial level. The areas to which these officials belong are: Planning, Postgraduate and External Relations, Quality, Budget and Faculty of Engineering, Chemistry, Social Sciences.

3. *Application of surveys*

Once the population sample was obtained, seven survey formats were applied, to determine the current situation of the institution in relation to the administration of projects in relation to the variables: maturity level, methodology used, project management tools, level of development of competencies in project management, degree or level of methodology in project management, level of methodology in direction of programs and multi-projects, and finally level of project management office.

4. *Analysis of information collected*

The University of Cartagena has a planning advisory office, which is in charge of a project coordination section which seems to be linked to the different advisory offices existing in the entity. In the University there are figures of project coordinators and qualified project managers.

Each project is executed by the academic units of the institution. This execution policy has not been the most effective, since there are sometimes delays in the execution of the projects, breaches in the budgets assigned, increases costs, lack of control mechanisms by the parties involved, non-compliance with the desired quality specifications and non-compliance with the schedules.

After tabulating and grouping the results of the surveys, the analysis was performed, obtaining the following conclusions for each variable studied:

i. *Maturity in Project Management*

The coordinators and project managers at the University of Cartagena considered 28% that the institution is in a "Medium High" Level in terms of maturity in Project Management.

Of the people surveyed, 45.45% considered that the institution makes permanent efforts to socialize the strategic goals and objectives, this result is in accordance with the activities carried out in the institution by the Quality area, which has under its responsibility the Continuous improvement of the Institution, that allows to maintain the certification of high quality that at the present time the University has. In addition to the above, 63.64% of the respondents considered that during the management of the projects an effort is made to define clear and measurable objectives, an important aspect to be able to define the other activities of the life cycle of the project. However, the results regarding the organization of administrative processes, the development of planning models, the use of project management tools and aspects related to effective communication by project managers presented regular results, namely: 45.45%, 81.82%, 45.45% and 54.55%. Evidencing aspects to improve in the face of the implementation of a project management office. The University of Cartagena did not present the use of project management standards to improve performance, this was mostly stated by 45.5% of the respondents.

ii. *Methodology Level in Project Management*

Regarding the level of methodologies used for the direction and management of projects, the results were not positive, given that 64% considered that during the execution of the different projects at the University of Cartagena, there is no standardized methodology. While 73% of the participants in the survey said they did not consider any of the nine areas of knowledge of the Project Management according to the PMI, and that their management depends directly on the shift manager and the personnel participating in the project. Regarding the establishment of metrics or performance indicators, 64% said they did not use any indicator of this type. This aspect makes the stage or control phase of the project notoriously difficult. Nor is there formally a process that collects lessons learned for continuous improvement, 55% of respondents said.

iii. *Project Management Tools*

The aspects related to the project management tools involve knowing if the institution has computer tools that allow it to manage portfolios, programs and projects effectively. In this sense, the results showed a low level of 49%, a low average of 36%, that is, 85% of the respondents placed the institution at a low level of use of computer tools. In a more detailed way, the results showed that the tools used for project management at the University of Cartagena are Excel spreadsheets, Power Point presentation sheets and word processors. This was shown by 73% of the coordinators. This behavior is similar to the aspects related to the management of

portfolios and programs that likewise lack computer tools, the percentages related to these two aspects are: 55% and 64% respectively.

iv. Level of Development of Competence in Project Management

The level of development of competence in project management was considered at a lower level by the project coordinators of the University of Cartagena, since according to the results obtained and subject to the criteria that determine the analysis contemplated for the study, it is defined At this level, 41% of respondents agreed with this perception for the different variables analyzed.

This result was due to the behavior presented in relation to the seven variables that seek to measure the mentioned aspect, in this same order of ideas it was obtained that 45.5% said that there is a process of development of competence in project management in some areas of the company, this in response to items that seek to respond to the current status of the process of development of competence in project management. What was recorded by the project coordinators in relation to the current state of the use of the processes, showed as a preponderant aspect the non-existence of a process as such in this sense, and it was also observed that the organization in terms of methodology in project management the coordinators defined the University of Cartagena mostly as non-standardized for the development of knowledge competence in project management, with a 45.5% concentration.

Other aspects analyzed in this section, have to do with respect to the competence of knowledge of project management, and specifically in the knowledge of the use of the software tools of project management, where the respondents said that they feel their organization mainly as an entity that does not include training in this aspect, 36.6 % of project coordinators state this. To finalize the analysis of the aspects that determined the results of the level of competence development in project management, a preponderant percentage is presented in relation to the coordinators who stated that there is a standardized process for the development of performance competence in the direction of projects.

v. Level of Methodology in Portfolio Management

The level of methodology in project management was considered by the project coordinators as a medium low. This aspect was worked according to the development of 6 variables that sought to determine their status, in relation to this, the following consideration weights were presented in each of the observed items.

It is said that 54.55% said that there is no risk management methodology for projects at the University of Cartagena, this being the highest proportion, as well as 36.36% of the coordinators said that the culture of Project management within the university is described with policies and procedures but only in some areas directed by projects, and with no or deficiencies in matrix areas.

45.5% of respondents indicated that the University of Cartagena, in the process of selection and prioritization, performs actions in accordance with the area that has more power in the organization and that the criteria on which this prioritization is based are given by clients and degree of difficulty, subjective and financial benefits.

In the aspect related to the periodic reviews in the established points of control (Quality Gates), for the approval of successive phases of the projects and the generation of a document of requirement of changes to submit it to evaluation and authorization by the decision committee, the coordinators expressed in greater proportion that it is done in some cases, because it is requested by the client, this is given in 36.36%. In a significant participation, 45.45% said that there are some indicators per project, but it is not possible to integrate them into programs or portfolios.

vi. Level of Methodology in Program Management and multi-projects

The status of the methodology level in program management and multi-projects determined in the analysis is a medium, that is, 43.6% perceived this aspect in a balance. In relation to this aspect, 54.55% of the group of project coordinators surveyed stated that the University of Cartagena establishes and partially uses metrics to formally initiate its programs or multi-projects. Likewise, the most important proportion stated that it identifies, evaluates and implements improvements for the main processes of program management and multi-projects in the planning, execution, control and closure processes, as well as a process of compilation and dissemination of lessons learned and a process of continuous improvement in 36.36%.

Regarding the establishment and use of performance metrics for the processes of the different areas of knowledge of program management and multi-projects, 54.55% said that the university establishes it in time, cost, indicating scope and quality. A significant proportion of coordinators concluded that partially the University considers effectively the workload of the resources involved in the projects, requirements for profits or margins, and limits delivery times to decide the amount of work that can be undertaken, this amounts to 45.45%.

To conclude, an important proportion is presented, 63.6% of respondents said that in the University the projects are established establishing profiles with the necessary skills in the assignment of activities to later plan assignments based on the actual availability of resources.

vii. Level of Project Management Office (PMO)

The level of office as an aspect of importance was perceived by the project coordinators at a low level in a percentage of consideration in the analysis, which was 75%, this aspect presented within its particularities the following results that determine the previous behavior.

Respondents considered the following aspects in greater percentage; In relation to the current status of the project management office, 54.55% said that there is no project management office in the organization.

In concentrations of 81.8% most of the coordinators presented the following considerations as what is fulfilled in the entity subject of study in relation to the level of responsibility of the Project Management Office, the proportion of the executives by the office of projects, the roles that are held, all these aspects come together in the absence of an officially established office in the organization, this being the most important response in this variable. In the aspect of corporate communications in relation to the flow of information on project management, the project coordinators said that this aspect occurs informally, by 81.8%.

In relation to the management of projects, aspects that denote weaknesses and strengths of the organization were determined, for which the process developed by the University regarding the direction of projects was taken into account, as the main input was studying the characteristics of the mechanisms used by the areas of the entity that are in charge of the administration of projects, in the hands of the different coordinators that in most of them register positions of vice chancellors.

According to the analysis carried out in the entity and using the results of the application of the instruments as input, strengths are determined in terms of management and project management:

Strengths:

- The constant efforts in the socialization of strategic goals and objectives, the organization tends to continuous improvement in this sense, makes efforts that are well reflected.
- The organization has high quality certification.
- The effort in the measurement of clear objectives by the entity in terms of the development of projects, makes it possible to achieve the programmed goals.
- The existence of a competence development processes in project management in some areas of the company
- Periodic reviews at the control points, this occurs in some cases, in search of the approval of successive phases of the projects and the generation of a change request document for evaluation and authorization by the decision committee
- There are some Indicators per project to measure the management.
- The establishment and partial use of metrics to formally start their programs or multi-projects.
- An important proportion shows that improvements are identified, evaluated and implemented for the main processes of program management and multi-projects in the planning, execution, control and closure processes, as well as a process of collecting and disseminating lessons learned and a process of continuous improvement by 36.36%.

Weaknesses:

- There is a lack of technological tools that allow a better management of portfolio and project management and decision making in their management. The level of project office is low in relation to some aspects.
- There is no project management office officially established in the organization
- The university does not tend to continuous improvement in terms of project management, training processes are not carried out in this area, the procedures must be done externally, according to what is observed, it is established that the level of development in competencies in project management It is low, despite the fact that in some areas a good panorama is perceived.
- There is no project risk management methodology in the university, or so a group of project coordinators considers it. The level of methodology in project management is low.
- Despite the fact that there are some indicators for projects, deficiencies in the management of the same prevent them from being articulated or integrated into specific programs or portfolios.
- Communication is informal, there is no protocol established as such.

5. Proposal of PMO

As described, the PMO proposal is made that best fits the Institution, having the following considerations:

i. Type of PMO

With its particularities and according to the analysis carried out entity states that the type of PMO according to the structure of the University is "Control Tower".

With this type of PMO there must be an instance that establishes the methodology of project management, including risk management, definition of roles and responsibilities, communication, management of objectives, lessons learned and tools to be used. In addition, she is responsible for internal consulting to ensure that the methodology is used. A similar case is presented in the research carried out by [7] in which "Control Tower" was selected as PMO to be implemented, because it supplements the deficiencies found in the organization such as the lack of a methodology for project management to guide the project managers in their phases.

With the application of this model, we can cover many of the weaknesses found in the analysis within the University and strengthen the existing strengths; You can meet deadlines, establish what tools should be used and provide the appropriate support and support in it; You can work on systems of continuous improvement in the administration of projects, as well as established a methodological structure to homogenize, streamline and qualify the actions carried out from each project, to link efforts in the management of each coordination.

At the University of Cartagena, the Control Tower allows each project leader to lead their project efficiently, taking into account the guidelines implemented by the model, mainly in the initial stage and the closing stage of the project.

This type of PMO allows project managers to appropriately take responsibility for the autonomy given for the execution of them, they are responsible for all the inconveniences that arise. It also allows the project manager to have the freedom to manage creativity, time, and adequate control over resource allocation and coordination.

ii. Location of the PMO in the organization

The Project Office, due to its cross-sectionalism, that is, to support the seven vice-rectories within its management as project manager, is inconvenient to locate it in some of these, because it generates conflicts of interest, for this reason it is appropriate to make it dependent on the Rector (Figure 10), as an advisory office, to support the different Vice-Rectories in the management of projects, in addition to participating and recommending strategic projects to the rectory when it deems appropriate. The PMO supplies the project coordination section and supports the planning office.

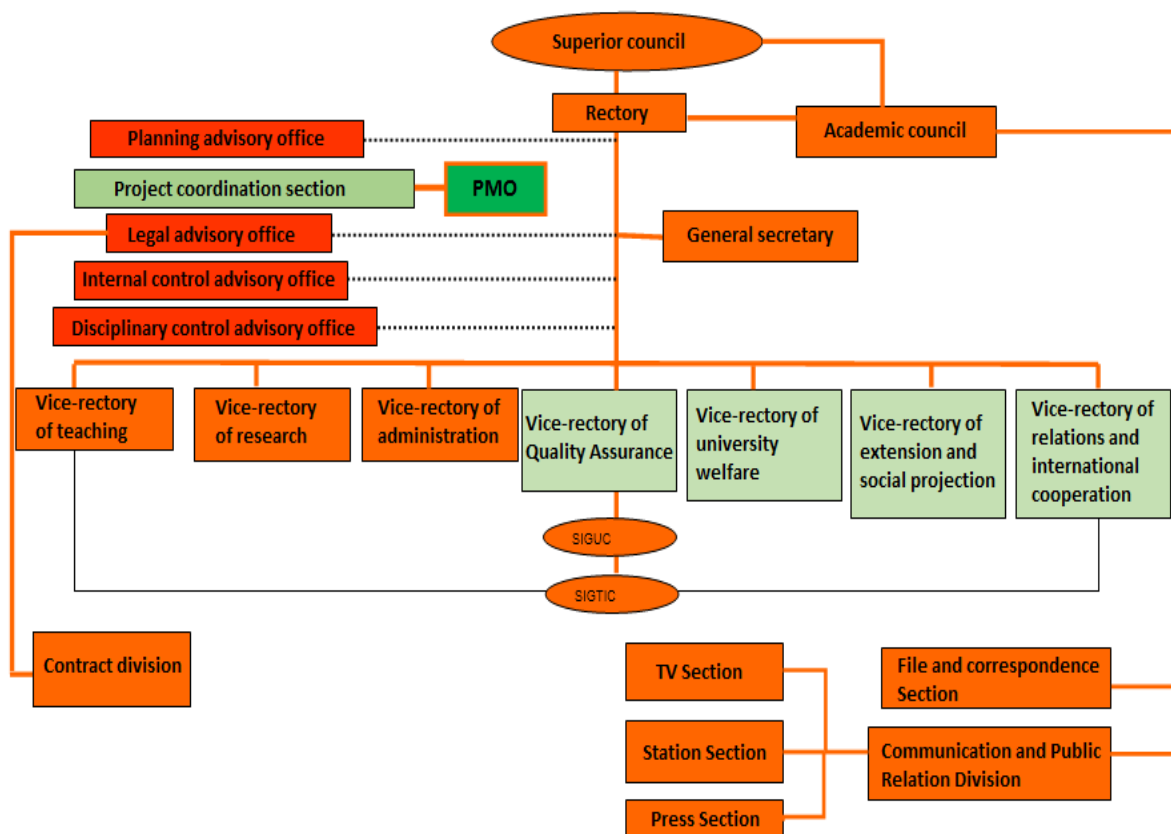


Fig. 10: Location of the PMO in the organization

iii. Functions of the PMO in the short (C), medium (M) and long (L) term

According to the opinion of the respondents, the main functions that the PMO must assume are those shown in the Table 2.

TABLE II. Main functions of the PMO

Functions	Description	C	M	L
Support in project planning	Maintain the methodology and variations of normal procedures		x	
	Store and update the templates for planning		x	
	Maintain Progress measures	x		
	Provide consultation on cost and time estimate		x	
	Store and recover the lessons learned		x	
Audit of projects	Process the checklists of extraordinary events			x
	Support the investigation of a project due to deficiencies		x	
	Maintain a log of corrective actions		x	
Support for project control	Maintain a log for tracking change control. (M)		x	
	Maintain the actions of exchange control and settlement elements		x	
	Validate the annotations and the follow-up in the histogram			x
	Carry out trend analysis of the progress			x
	Support the preparation of reports on the status of the project	x		
	Run condensations and summaries of all projects		x	
Support for the project team	Participate in team integration exercises	x		
	Teach and direct project management techniques or tools	x		
Development of attitudes for project management	Carry out attitude assessments for future projects		x	
	Participate in the elaborations of the project's performance		x	
	Support the continuous learning of work teams	x		
Maintenance of the project management process	Maintain guidelines and changes in project methodology		x	
	Identify the training requirements for the process	x		
	Maintain policies, procedures and practices for project management		x	
	Institutionalize project management	x		
Resources for project management	Carry out a needs assessment for the projects and the organization	x		
	Evaluate the suitability and compatibility of current resources with projects		x	
	Coordinate project training for project managers and their teams		x	
	Provide technical knowledge about resources		x	
Executive support for projects	Recommend priorities for new projects		x	
	Recommend the allocation of resources between projects		x	
	Review project performance evaluations		x	
	Serve as a project management consultant for authorities and other officials		x	
Project reports	Collect and validate the information periodically or continuously		x	
	Prepare reports for the administrative headquarters		x	
In the Problems	Establish a blog and follow up on the problems of project management	x		
	Close them after solving them	x		
	Keep your history for later reference		x	
On the risks	Assess, quantify and mitigate risks		x	
	Track risks and liquidate risk events		x	
	Prepare contingency plans		x	
In the details of actions	Establish a log and track the details of actions		x	
	Close the details of actions after their completion			x

	Keep a history of the actions.		x	
Communications	Prepare a plan for the projects		x	
	Update it if necessary		x	
	Distribute reports to beneficiaries		x	
	Maintain registered copies of communications		x	
In the Programs	Prepare the programs in an automated system		x	
	Maintain the state based on the reported progress		x	
	Produce them if necessary		x	
In the Costs	Prepare the budget	x		
	Keep it based on expenses	x		
	Inform the state of it	x		
In the Quality	Prepare insurance plans and quality control	x		
	Keep these plans	x		
	Prepare test and demonstration plans		x	
	Maintain the risks of the tests			x
In Internal Consultation on Project Management	Providing experience in project management at all stages, in order to improve planning, recover projects and advise on techniques and successes	x		

The proposed functions allow the PMO to adjust to the project management needs of the organization, helping to successfully complete the projects, oriented to managers in matters of: support in planning, development of rules and procedures, advice, internal communication, audit. A similar case is evidenced in the study by [4] which describes the functions that a PMO must have, such as: developing and maintaining PM standards and methods, providing administrative support to the project, providing PM advice and tutoring and provide or organize PM training.

IV. CONCLUSION

From the results obtained, the following conclusions about the guide can be presented:

- 1) Allows the creation of a PMO proposal for any organization.
- 2) Helps to find the strengths and weaknesses of an organization in the area of project management.
- 3) Makes it possible to choose a PMO that fits into the structure of the organization and allows improving the effectiveness and efficiency indicators of the projects.
- 4) Allows, according to the organizational structure and the perception of those involved, to establish the functions that a PMO has in the organization
- 5) Facilitates identification of the various mechanisms used in the institution for project management.

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