

CARACTERIZACIÓN Y ANÁLISIS DE LAS OFICINAS DE GESTIÓN DE PROYECTOS EN COLOMBIA

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Resumen

El presente trabajo de investigación desarrolló una detallada caracterización de las Oficinas de Gerencia de Proyectos (PMOs por su sigla en inglés) en Colombia. Inicialmente, un meticuloso análisis cientométrico fue desarrollando, analizando 318 artículos científicos en los principales *journals* internacionales de la gerencia de proyectos sobre las PMOs en Scopus y WOS, definiendo un pormenorizado estado del arte sobre el objeto de estudio. Seguidamente, un marco teórico fue construido, los principales tópicos relacionados con las PMO de la literatura científica y de los estándares internacionales relevantes fueron definidos, las variables de estudio fueron descritas, y posteriormente incluidas en un instrumento de levantamiento de información, utilizado para recolectar información primaria sobre las características de este tipo de estructuras en el país. Subsiguientemente, un extenso trabajo de campo con alcance nacional fue desarrollado, analizando 249 PMOs en Colombia, estas oficinas fueron seleccionadas aleatoriamente en organizaciones de diferentes sectores económicos que desarrollan proyectos como objeto de negocio; el instrumento, fue aplicado en entrevistas semiestructuradas con gerentes de PMO. Consecutivamente, un análisis de *clusters* con altos niveles de significancia y un máximo error permitido acerca de las características de este tipo de estructuras, hacen una contribución significativa a la disciplina de la gerencia de proyectos en el país. Finalmente, los resultados fueron documentados, las conclusiones identificadas y futuras líneas de investigación fueron propuestas.

Palabras Clave: Oficinas de gerencia de proyectos, PMO, Gerencia de proyectos, Caracterización, Análisis nacional, y Colombia.



CHARACTERIZATION AND ANALYSIS OF THE PROJECT MANAGEMENT OFFICES IN COLOMBIA

Abstract

This research work conducted a detailed characterization of the Project Management Offices (PMOs) in Colombia. Firstly, a meticulous scientometric analysis about PMOs was undertaken by studying 318 scientific articles on main international journals of project management on Scopus and Web of Science (WOS), defining a comprehensive state of the art about the matter of study. Secondly, a theoretical framework was developed, main concepts related to PMOs from scientific sources and relevant international standards were defined, variables of study were described, and later included into an information gathering instrument, to collect primary data about the characteristic of this kind of structures in the country. Thirdly, an extensive nationwide fieldwork was conducted analyzing 249 PMOs from the Colombian enterprise context, those offices were selected randomly from organizations from different sectors that conduct projects on business basis; the instrument, was applied, via semi-structured interviews with PMO managers. Fourthly, a cluster analysis with high levels of significance and low maximum error about the characteristics of this kind of structures, made a significant contribution to the project management discipline in the country. And finally; results from the characterizations of the PMOs in Colombia were documented, conclusions of the study were identified, and future lines of research, were proposed.

Keywords: Project Management Offices, PMOs, Project management, Characterization, Nationwide analysis, and Colombia.

1. INTRODUCTION

Several scholars have PMOs; mainly form an exploratory perspective, with a limited statistical significance and developed in contexts far away from the reality of projects in Colombia. The very few applied studies about PMOs in Colombia, justifies the need to analyze this kind of organizational units in the Colombian business context.

A detail scientometric analysis of 318 research articles in major journals on project management was conducted. Bibliometric studies were carried out to identify principal authors, main topics of research and the most influencing sources on the matter of study. Then, an information gathering instrument to analyze PMOs in the Colombian business context was developed with the elements identified in the literature review. Later, an extensive nationwide fieldwork studied 249 organizations that host PMOs in the Colombian business context. Next, a detailed statistical analysis with high levels of significance identified the clusters of PMOs in Colombia.

The main purpose of this research work is to analyze and characterize PMOs in the Colombian business context. The steps of this research were defined:

- Develop a detailed scientometric analysis, in order to determine main topics, principal authors and relevant sources on this kind of structures.
- Define a research methodology to analyze and characterize PMOs in the Colombian business context.

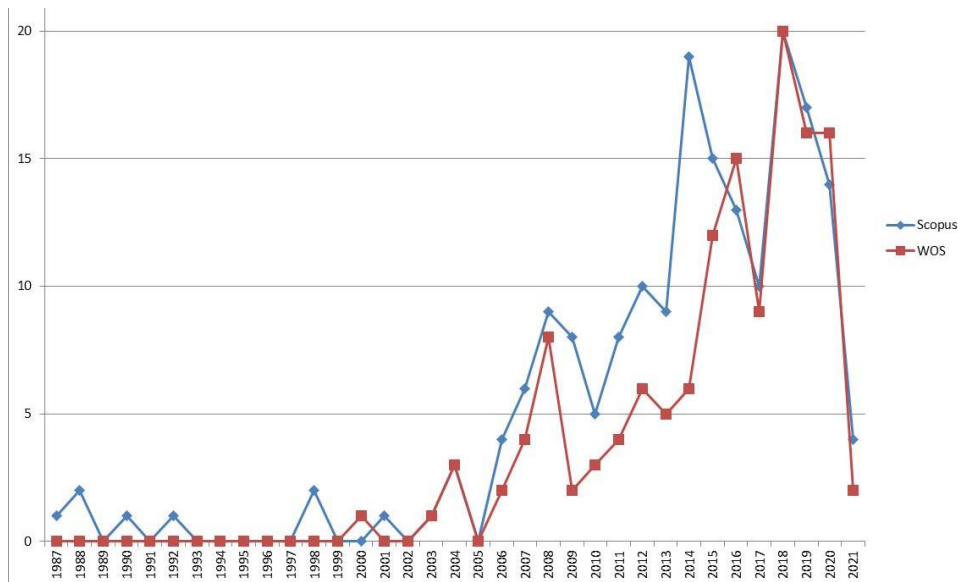
- Conduct an extensive fieldwork analysis covering over 249 organizations that host this kind of structures in Colombia.
- Execute a detailed statistical analysis to determine the clusters of PMOs in the country.
- Document research findings and conclusions and propose future lines of research about PMOs.

2. SCIENTOMETRIC ANALYSIS

A scientometric analysis of 318 specialized publications searched on Scopus (2021) and WOS (2021) related to PMOs was conducted, 183 articles were found on Scopus journals and 135 were identified within WOS publications. Since 1987 until 2020, Scopus showed a high-rate increase in the number of publications related to PMOs. On the other hand, WOS showed a significant growth in the number of articles on this topic from 2005 till 2019, as can be seen in figure 1. This evidence shows the relevance of PMOs as an area of research.

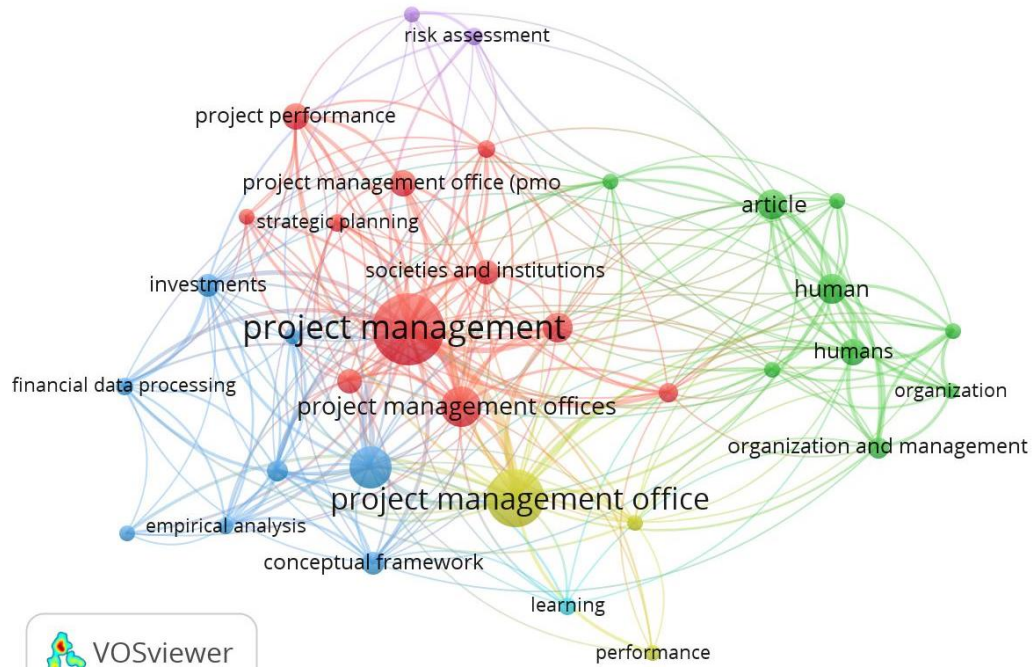
Main topics of research were identified in the scientific literature, the bibliometric analysis showed: (a.) project management, (b.) project management office, (c.) PMO, (d.) performance, (e.) human, (f.) organizational framework, (g.) societies and institutions, (h.) impact, (i.) knowledge, (j.) success, (k.) strategy, and (l.) investment, as the most relevant elements of study in this research field as can be seen in figures 2 and 3. As principal authors on the PMOs, the researchers with the highest number of publications and influence rating are: (a.) Aubry, M.; (b.) Lavoie-Tremblay M.; (c.) Richer, M.; (d.) Cry, G.; (e.) Hobbs, B.; (f.) Thuillier, D.; (g.) Muller, R.; and (h.) Glueckler, J. The most relevant sources, on PMOs are: (a.) The International Journal of Project Management, (b.) The Project Management Journal, (c.) International Journal of Managing Projects in Business, (d.) Revista de Gestao e Projetos, (e.) South African Journal of Industrial Engineering, and (f.) Journal of Modern Project Management.

Figure 1. Scientometric analysis of PMOs on Scopus (2021) and WOS (2021) (1987 – 2021).



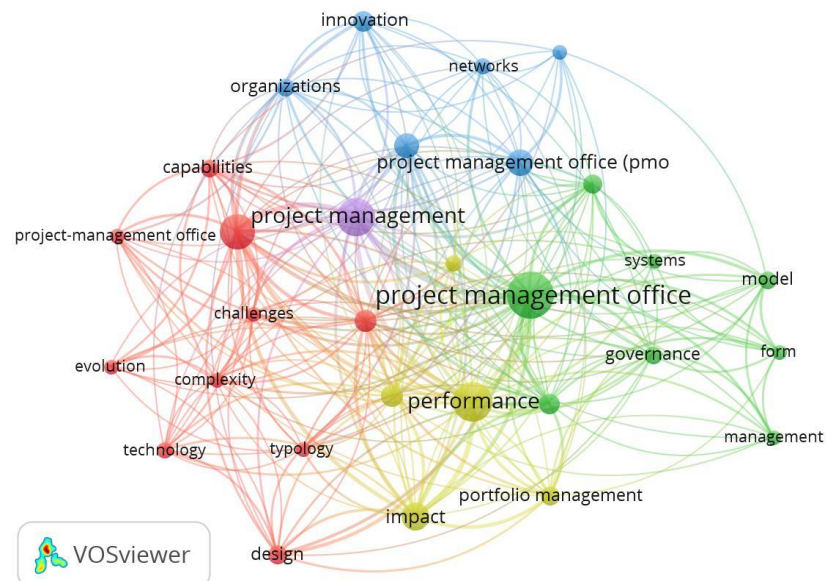
Source: The author with Scopus (2021) and WOS (2021).

Figure 2. Bibliometric analysis of PMOs on Scopus.



Source: The author with Scopus (2021).

Figure 3. Bibliometric analysis of PMOs on Scopus and WOS.



Source: The author with WOS (2021).

3. FRAMEWORK

The term PMO is been described from different points of view ion the literature, for instance, PMI (2021, p. 211) sets the definition as “a management structure that standardizes project-related governance processes and facilitates the sharing of resources, tools, methodologies, and techniques”. APM (2019) and IPMA (2015) extends the range to Project, Programme, and Portfolio Management Office (PMO), ISO (2012) developed around the governance, standardization, training, monitoring and control and a variety of services provided by this kind of structures on the hosting organizations.

Other types of structures can be seen on Program Management Office (PMO) (PMI, 2017c), Project, Program, and Portfolio Management Office (PMO) (PMI, 2017 b, 2016, and 2014), adding functions and services to the hosting organization such as governance, knowledge management, stakeholders’ management, infrastructure management, and support to Projects, Programs, and portfolios (PPP).

On table 1, the elements of study were defined and integrated in the characterization of the PMOs in the Colombian business context.

Table 1: Variables of study about PMOs in the Colombian business context

Source	Elements of PMOs	Variables of study*
PMI (2021, p. 211), PMBOK 7 th edition.	Is a management structure that standardizes project-related governance processes and facilitates the sharing of resources, tools, methodologies, and techniques.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5)
APMBOK (APM, 2019).	Project, Programme, and Portfolio Management Office (PMO), services, functions, support, types of structures.	Functions (PMO1), services (PMO2), resources and size (PMO3)
ISO 21:500 (ISO, 2012).	PMO, governance, standardization, training and development of PMs, planning and tracking of projects.	Functions (PMO1), services (PMO2), resources and size (PMO3), training and career paths (PMO 6)
ICB4 (IPMA, 2015).	PMO, Support to project, programs and portfolios.	Functions (PMO1), services (PMO2)
The Standard for program management (PMI, 2017 c).	Program Management Office (PMO), stakeholders, governance, infrastructure.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5)
The Standard for Portfolio management (PMI, 2017 b).	Project, Program, and Portfolio Management Office (PMO), functions, support.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4)

Source	Elements of PMOs	Variables of study*
Navigating Complexity (PMI, 2014).	Project, Program, and Portfolio Management Office (PMO), functions, support, governance, databases, knowledge management.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5), training and career paths (PMO 6), PMO database (PMO7), knowledge (PMO8)
Governance of Portfolio, Programs and Projects (PMI, 2016).	Project, Program, and Portfolio Management Office (PMO), functions, support.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4)
OPM3 (PMI, 2018).	Project, Program, and Portfolio Management Office (PMO), responsibilities, centralization, coordination, liaison.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5)
Hill (2013).	Types of PMOs, functions, and resources.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5)
Rincón-González (2014, 2018 a, 2018 b, and 2018 c)	Types of PMOs, functions, services, assigned resources, roles and responsibilities, tools and required infrastructure, personnel management, knowledge management and PMO databases.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5), training and career paths (PMO 6), PMO database (PMO7), knowledge (PMO8), PMO Total (PMOT).
Scopus (2021) & WOS (2021).	Project management, project management office, PMO, performance, human, organizational framework, societies and institutions, impact, knowledge, success, strategy, and investment.	Functions (PMO1), services (PMO2), resources and size (PMO3), personnel and roles (PMO4), tools and infrastructure (PMO5), training and career paths (PMO 6), PMO database (PMO7), knowledge (PMO8), PMO Total (PMOT).

Source: The author with cite sources*

From table 1, the following variables of study were grouped and integrated into the information gathering instrument latter applied on the 249 organizations sample of the research: Firstly, PMO1 variable collected elements of program management such as: functions of the PMOs. Secondly, PMO2 variable grouped elements such as: services of the PMOs. Thirdly, PMO3 variable contained topics as: resources and size of this kind of offices. Fourthly, PMO4 variable enclosed elements such as: personnel, roles and responsibilities of the PMOs teams. Fifthly, PMO5 variable gathered components as: tools, techniques, and PMOs infrastructure. Sixthly, PMO6 variable referred to: training, career paths for

project professionals. Seventhly, PMO7 variable extends on: PMO databases. Eighthly, PMO8 variable covers: knowledge management from the PMO. And finally, PMOT variable gathered around: success, strategy, and investment.

4. METHODOLOGY

This research involved a detailed scientometric analysis of 318 scientific articles in major journals on project management, related to PMOs. Afterwards, a detailed bibliometric analysis was developed in order to determine main topics of research, principal authors and the most relevant sources about the subject matter. Later, suitable bodies of knowledge and relevant scientific literature were consulted in order to define variable of study to analyze and characterized PMOs. Subsequently, an extensive fieldwork analysis covered 249 organizations host this kind of structures in Colombia, by conducting interviews with PMOs, sponsors, and/or key project management stakeholders within those organizations of study, based on randomly selected criteria. Successively, a detailed statistical analysis with high levels of significance was conducted to identify clusters of PMOs in Colombia. Finally, research results were documented, conclusions were established and future lines of research were proposed.

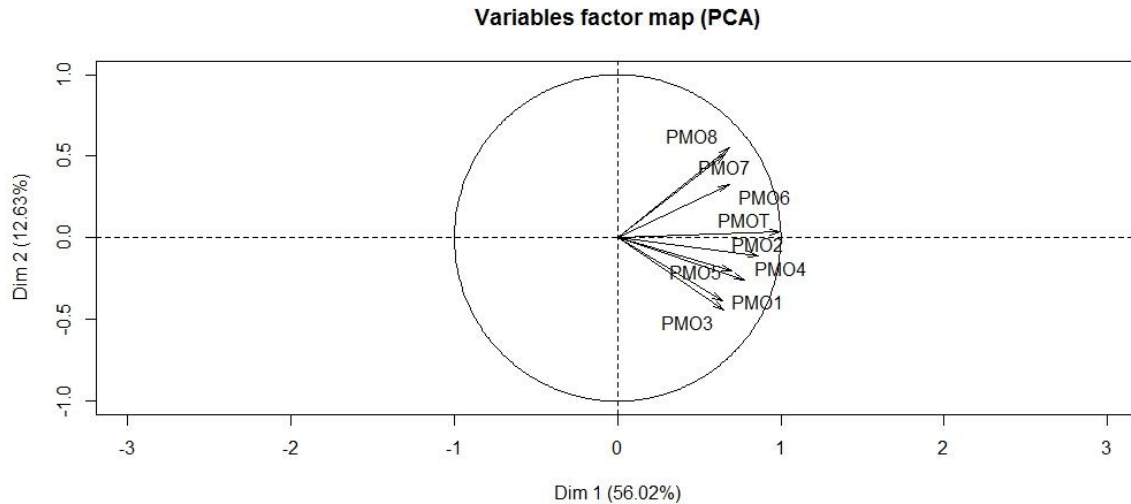
In order to determinate the size of the sample to be selected for the characterizations of PMOs in Colombia, a random selection formula for finite populations was used Equation (1), where N = size of the population = 705, σ is the estandar deviation = 0.5, z is the thrust level of 95% = 1.96, and e is the maximun error allowed = 5%. Therefore $n = 248.49$ equals to 249 as the size of the sample where the instrument was applied.

$$n = \frac{N z^2 \sigma^2}{e^2 (N - 1) + \sigma^2 z^2} \quad (1)$$

5. RESULTS

The variables described in table 1, were introduced in the R statistical software and a Principal Component Analysis (PCA) was conducted, 2 dimensions were determined from the factor map; the first one accumulated 56.02% of dispersion, and se second one a 12.63%, both dimensions together accumulate 68.65% of the dispersion in the analysis (see figure 4). In addition, all of the items of study point to the same direction and integrate the PMO Total variable (PMOT) in a proper way, those variables were later used to determinate characterized the PMOs in Colombia.

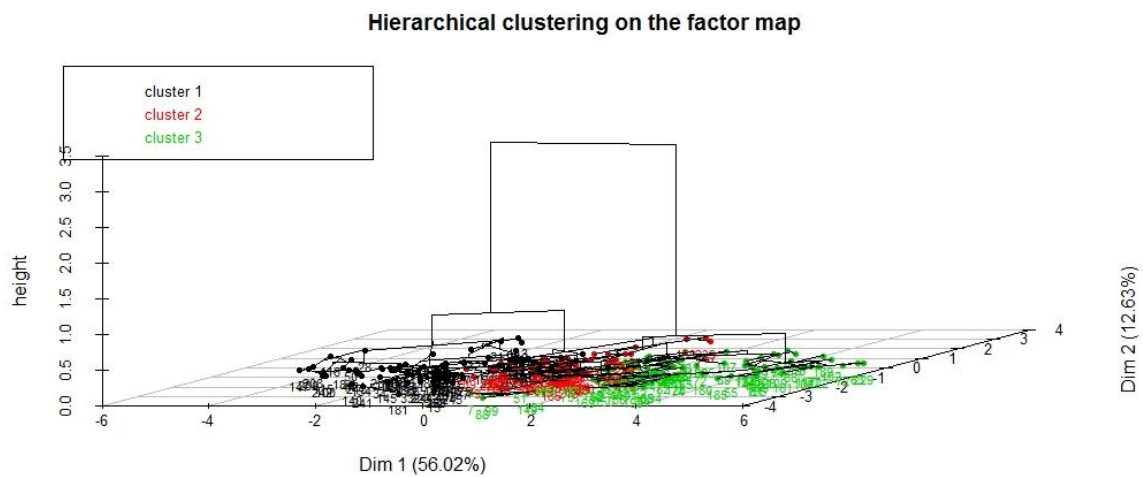
Figure 4. Variables factor map (PCA) for the characterization of PMOs in Colombia.



Source: The author.

Once the analysis instrument is used in the 249 companies of different economic sectors of the country, the information was processed. Later a hierarchical clusters analysis was performed, where it was determined that the optimal number of groupings to carry out the research on the determination of the characterization of the PMOs in Colombia, was 3, as shown in figure 5.

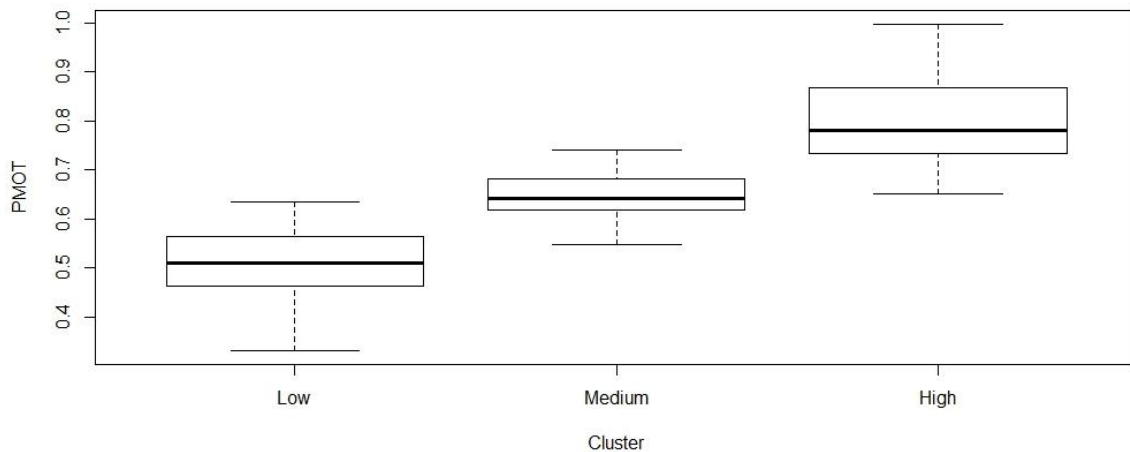
Figure 5. Hierarchical clustering on the factor map for the characterization of PMOs in Colombia.



Source: The author.

Likewise, a Boxplot diagram was generated for the PMOT variable and 3 clusters for the PMOs in Colombia were identified. It shows, visually, a clear differentiation between the 3 grouping levels (see figure 6).

Figure 6. Boxplot of the clusters of the PMOs in Colombia.



Source: The author.

Once the clusters were determined, a variance analysis was executed (Anova test) in the R statistical software, with a significance level of ($\alpha=0.05$); it was noticed a $p_value \approx 0.00$ (see table 2) direct evidence of rejection of the hypothesis of equality of medias between the clusters. Therefore, PMOs from each cluster have different values, and so, the classification done excludes and discriminates, perfectly, the organizations analyzed.

Table 2: Variance analysis for clusters.

Source of variation	Freedom degrees	Sum of squares	Mean square	F	P_value
Cluster	2	3.966	1.9832	384.3	<2e-16
Residuals	246	1.270	0.0052		

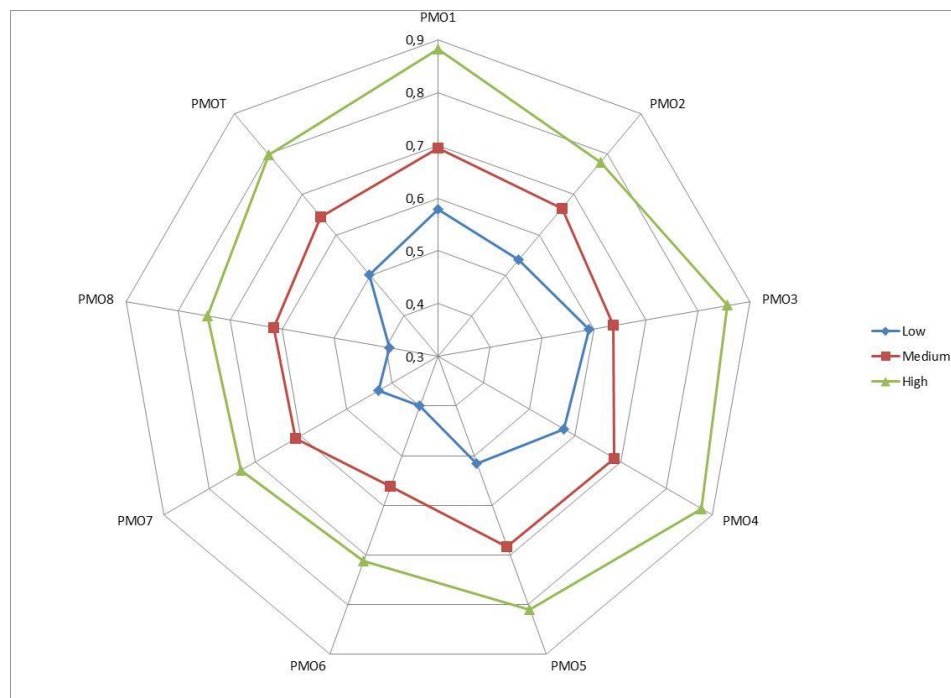
Source: The author.

3 distinctive clusters of PMOs were identified in the Colombian business context as presents on figure 7. In all variables of study, the low cluster exhibited smaller values in comparison with other groupings, significant lower values were identified on professional development of PMs and knowledge management, placing organizations on this cluster in a major disadvantage with the others 2 groups. Cluster 2, includes PMOs with a medium performance level, measures on roles definition and personnel assignment marked smaller values in comparison with other variables, on the other hand, tools and infrastructure and training and career paths showed a greater mark on average in contrast whit peer measures. Cluster 3 groups the most sophisticated PMOs of the sample, obtaining significant higher

marks across all variables of study: functions, services, resources and size, personnel and roles, tools and infrastructure, training and career paths, PMO database, knowledge, PMO Total.

The outliers' data absence, the high variation concentration in the research dimensions on the hierarchical clusters, and the great statistical differentiation between the 3 groups, validated the characterization of the PMOs, for the Colombian business context.

Figure 7. Clusters for the characterization of PMOs in Colombia.



Source: The author.

6. CONCLUSIONS

The topics of research on this matter, found on main bibliometric scoring tools such as Scopus and WOS, analyzed PMOs principally from a theoretical perspective, by conducting mainly unique or non-statistically representative fieldworks, far away from the reality of this kind of structures in Colombia.

This applied research work, made a significant contribution to the project management discipline by determining the characterization of the PMOs in the Colombian organizational context, based on an wide literature review of top scientific sources, an extensive fieldwork was conducted on 249 organizations in Colombia that host this kind of structures, and a statistically representative analysis of data in order to scientifically validate the results of this research.

This research involved a detail scientometric analysis of 318 scientific articles in major journals related to PMOs, suitable bodies of knowledge were added to define a framework, as a base to characterized this type of offices nationwide. On the 249 sample organizations analyzed on the nationwide field work, 3 distinctive clusters of PMOs were identified, with significant differences in all of the variables of study,

characterizing from a scientific perspective, the way this kind of structures behaved on the Colombian business context, making a significant contribution to the project management discipline in the country.

As future lines of research was proposed to develop deep-dive applied studies on main characteristic of the PMOs in order to improve the performance of projects within organizations in Colombia, and conduct correlation and comparative analyzes about this kind of offices on other geographical contexts.

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