ANÁLISIS Y MODELO INTEGRADO PARA LA GESTIÓN DE PROGRAMAS DE PROYECTOS EN COLOMBIA

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Resumen

Esta investigación, desarrolló un detallado análisis de la gestión de los programas de proyectos en el contexto empresarial colombiano. Inicialmente, un detallado análisis cienciométrico sobre la gestión de programas fue conducido mediante el estudio de 1031 artículos científicos en *journals* internacionales de *Project Management* en Scopus y Web of Science (WOS) en el periodo 1972 – 2020, determinando los principales temas de investigación, autores principales, y fuentes con mayor impacto sobre la gestión de programas. Seguidamente, un marco teórico fue definido, las variables de estudio fueron descritas e incluidas en un instrumento de recolección de información, así como en el modelo integrado para la gestión de programas. Subsiguientemente, un extenso trabajo de campo, con alcance nacional, se analizaron más de 700 organizaciones en Colombia que desarrollan programas de proyectos; entrevistas semiestructuradas con gerentes de programas, de PMO, y patrocinadores de programas fueron desarrolladas. Posteriormente, un meticuloso análisis estadístico determinó los niveles de utilización de los elementos de la gestión de programas en la información obtenida en el trabajo de campo, y un impacto significativo en el desempeño de este tipo de iniciativas fue determinado. Finalmente; los resultados del análisis de la gestión de programas en Colombia fueron documentado; un modelo integrado para la gestión de programas de proyectos fue propuesto; las conclusiones del estudio fueron identificadas; y como futuras líneas de investigación, se planteó el desarrollo de estudios aplicados de comparación y de correlación sobre la gestión de programas en otros contextos geográficos.

Palabras Clave: Gerencia de proyectos, Gerencia de programas, análisis del contexto empresarial, modelo, Colombia.

ANALYSIS AND AN INTEGRATED MODEL FOR MANAGING PROGRAMS OF PROJECTS IN COLOMBIA

Abstract

This research work conducted a detailed analysis about the management of programs of projects on the Colombian enterprise context. Firstly, a meticulous scientometric analysis about program management was undertaken by studying 1031 scientific articles on main international journals of Project Management on Scopus and WOS on the period of observation 1972 - 2020, defining main topics of investigation, principal authors and most influencing sources about program management. Secondly, a theoretical framework about managing programs of projects from relevant literature were defined, variables of study were described and included into an information gathering instrument, as well as, in to an integrated model for program management. Thirdly, an extensive nationwide fieldwork was conducted analyzing more than 700 organizations in Colombia that conduct programs of projects; semi-structured interviews were conducted with program manager, PMOs, and / or program sponsors. Fourthly, a meticulous statistical analysis measured the level of utilization of program management elements from the fieldwork information, and a significant impact on the performance of this kind of endeavors was identified. And finally; results from the program management analysis in Colombia were documented; an integrated model for managing programs of projects was proposed; conclusions of the study were identified; and as future lines of research, develop applied correlation and comparative analyzes, on the management of programs of projects on other geographical contexts were proposed.

Keywords: Project management, Program management, enterprise context analysis, model proposal, Colombia.

1. INTRODUCTION

Several researchers have studied how the management of programs of projects; typically form an exploratory perspective, with a limited statistical significance and developed in contexts far away from the reality of programs management in Colombia. The lack of applied research on managing programs of projects in the country, as well as the absence of a model to deal with this kind of endeavors, justifies the need to analyze and propose a model, to manage programs of projects in the Colombian business context.

A detail scientometric analysis of 1031 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, a model to diagnose and manage programs of projects, in the Colombian business context was built with the elements identified in the literature review. Later, an extensive fieldwork analyzed over 700 organizations that conduct programs of projects in the Colombian business context. Next, a detailed statistical analysis with high levels of significance identified the clusters of management of programs of projects in Colombia.

The main purpose of this research work is to analyze and propose a model for managing programs of projects in the Colombian business context. The steps of this research were defined:

- Develop a detailed scientometric analysis, to determine main topics, principal authors and relevant sources on the subject matter.

- Define a research methodology to analyze and propose an integrated model for managing programs of projects in Colombia.
- Conduct an extensive fieldwork analysis covering over 700 organizations that conduct programs of projects in Colombia.
- Execute a detailed statistical analysis to determine the clusters of management of programs of projects in the country.
- Document research findings and conclusions and propose future lines of research about managing programs of projects.

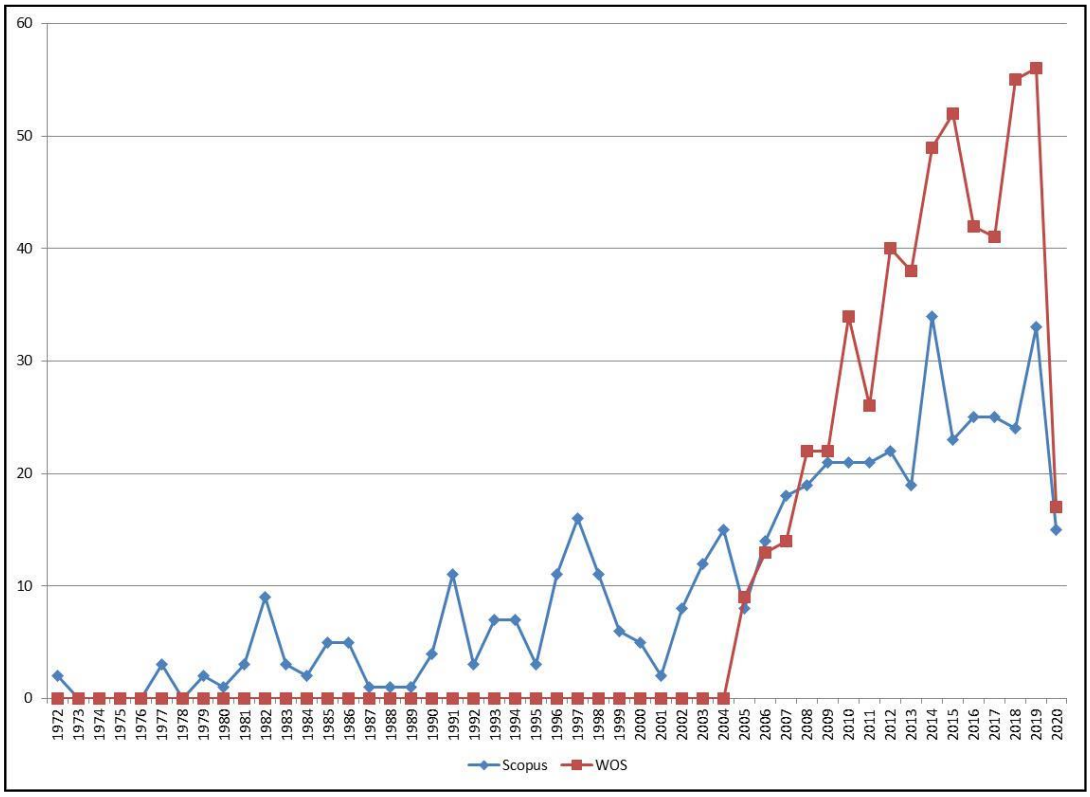
2. FRAMEWORK

A scientometric analysis of 1031 specialized publications searched on Scopus (2020) and WOS (2020) related to the management of programs of projects was conducted, 501 articles were found on Scopus journals and 530 were identified within WOS publications. Since 1972 until 2020, Scopus showed a low-rate increase in the number of publications related the management of programs of projects. 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 remarked the relevance of program management as an area of research.

Main topics of research were identified in the scientific literature, the bibliometric analysis showed: (a.) project management, (b.) program management, (c.) portfolio management, (d.) programme management, (d.) knowledge management, (e.) human factors, (f.) technology management, (g.) risk management, (h.) multi-project management, (i.) benefit management, (j.) governance, and (k.) evaluation, as the most relevant elements of study in this research field as can be seen in figure 2.

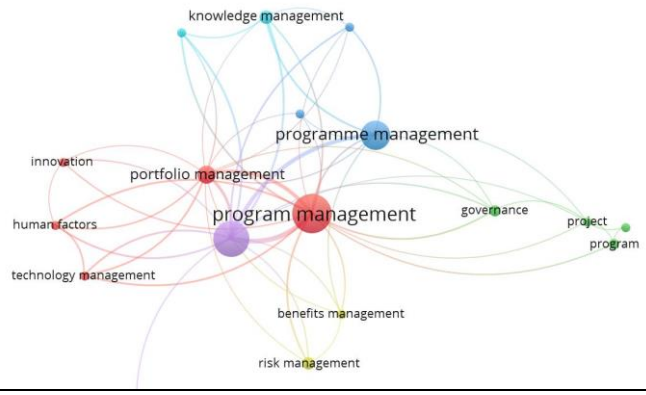
As principal authors on the management of programs projects, the researchers with the highest number of publications and influence rating are: (a.) Jiang, J; (b.) Klein, G.; (c.). Parolia, N.; (d.) Li,Y.; (e.) Thamhain, H.; (f.) Artto, K.; (g.) Kwak, Y.; and (h.) Martinsuo, M. The most relevant sources, on managing programs of projects are: (a.) The International Journal of Project Management, (b.) The Project Management Journal, (c.) International Journal of Managing Projects in Business, (d.) Journal of Management in Engineering, (e.) IEEE Transactions on Engineering Management, and (f.) Journal of Modern Project Management.

Figure 1. Scientometric analysis of program management on Scopus (2020) and WOS (2020) (1972 – 2020).



Source: The author with Scopus (2020) and WOS (2020).

Figure2. Bibliometric analysis of program management on Scopus and WOS**.**

Scopus	WOS
	

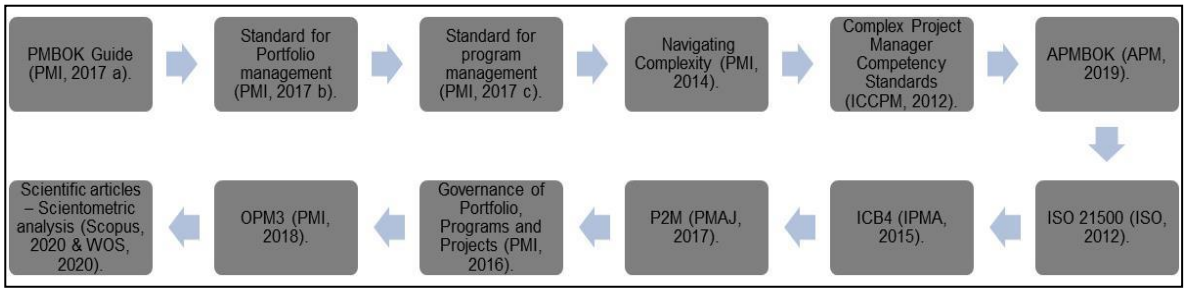
Source: The author with Scopus (2020) and WOS (2020).

A program can be defined as "a group of projects, subsidiary programs, and program activities managed in a coordinated manner to obtain benefits not available from managing them individually" (PMI, 2017 a, p. 11). What is more, "a project may or may not be a part of a program but a program will always have projects (PMI, 2018 b, p. 7). Moreover, "Programs are conducted primarily to deliver benefits to the sponsor organizations or constituents of the sponsoring organization" (PMI, 2017 c, p. 3). Furthermore, "Programs are common elements of portfolios, conducted to deliver benefits important to an organization's strategic objectives" (PMI, 2017 c, p. 7). Additionally, "a portfolio is a collection of projects, programs, subsidiary portfolios, and operations, managed as a group to achieve strategic objectives" (PMI, 2017 b, p. 3).

Artto, Martinsuo, Gemünden & Murtoaro (2009); Chang, Jiang, Klein & Wang (2014, 2019); Dietrich, Kujala & Artto (2013); Jiang, Klein & Fernandez (2018); Kwak & Smith (2009); Kwak, Walewski, Sleeper & Sadatsafavi (2014); Lehtonen & Martinsuo (2008); Li, Lu, Ma & Kwak (2018); Liu, He & Li (2011); Martinsuo (2019); Martinsuo & Hoverfält (2018); Martinsuo & Lehtonen (2007); Parolia, Chen, Jiang & Klein (2015); Parolia, Jiang & Klein (2013); Parolia, Jiang, Klein & Sheu (2011); Shenhar, Dvir, Milosevic, Mulenburg, Patanakul, Reilly, … Thamhain (2005); Turkulainen, Ruuska, Brady & Artto (2015); and Vuorinen & Martinsuo (2018) emerged as main publications related to program management on the scientific literature related to this matter of study.

A framework was developed in order to identify the variables of study for the analysis and the proposed model for managing programs of projects in Colombia as can be seen in figure 3. Standards and bodies of knowledge related to the management of programs of projects were analyzed and incorporated into the theoretical framework of this research study, and also into the model (refer to Table 1).

Figure 3. Theoretical framework of the proposed model for managing programs of projects in Colombia.

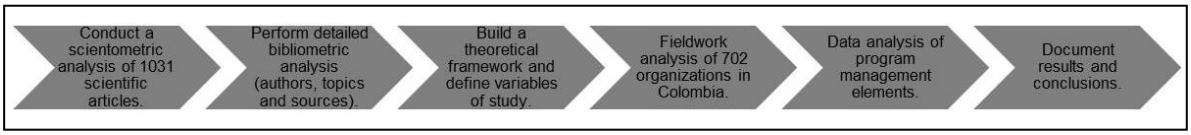


Source: The author.

3. METHODOLOGY

This research involved a detailed scientometric analysis of 1031 scientific articles in major journals on project management, related to the management of programs of projects. 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 integrated in a proposed model for managing programs of projects, as well as related variables of study. Subsequently, an extensive fieldwork analysis covered 702 organizations that undertake programs of projects in Colombia, by conducting interviews with programs managers, PMOs, or program sponsors 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 managing programs of project in Colombia. Finally, research results were documented, conclusions were established and future lines of research were proposed, as can be seen in figure 4.

Figure 4. Research methodology.



Source: The author.

On table 1, the elements of study were defined and integrated in a proposed model for managing programs of projects in the Colombian business context.

Table 1: Integrated model proposal for managing programs in the Colombian business context.

Source	Elements of program management	Variables of study*
The PMBOK Guide (PMI, 2017 a, p.11).	Program components refer to projects and other programs within a program. Program management focus on the interdependencies between projects and between projects and the program.	Strategic alignment (Pg1); program components (Pg1); components (Pg3); Risk (Pg2); constrains, conflicts, and issues (Pg3); managing change (Pg4); budget (Pg2); and benefit management (Pg5).
APMBOK (APM, 2019).	Programmes are group of related projects and business-as-usual (or steady state) activities that together	Project selection (Pg1); programme structure (Pg1); benefits (Pg5); stakeholders (Pg4); risk appetite (Pg2); programme governance

Source	Elements of program management	Variables of study*
	achieve beneficial change for an organization.	(Pg4); programme life cycle (Pg2); decision-making (Pg3); alignment and priorities (Pg1); and closing programmes (Pg6).
ISO 21:500 (ISO, 2012).	A program is a group of related projects and other activities related to strategic goals. Program management consists of centralized and coordinated activities to reach goals.	Integration (Pg3); strategic alignment (Pg1; and coordination and control (Pg3).
ICB4 (IPMA, 2015).	A programme is a temporary organization of integrated programme components managed in a coordinated way to enable the implementation of change and the realization of benefits.	Integration (Pg3); strategy (Pg1); change (Pg4); benefits and objectives (Pg5); communications, relationship and engagement (Pg4); leadership and teamwork (Pg Total); results orientation (Pg5); programme design (Pg1); programme plan and control (Pg2); risk and opportunity (Pg2); and stakeholders (Pg4).
P2M (PMAJ, 2017).	A program involves temporary activities produced positively according to a business strategy to support the sustainability of the business.	Business management (Pg1); knowledge management (Pg4); human resource management (Pg4); value of program (Pg5); strategy (Pg1); program management (Pg Total); integration (Pg3); and risk management (Pg2).
The Standard for program management (PMI, 2017 c).	Program management is the application of knowledge, skills, and principles to a program to achieve the program objectives and to obtain benefits and control not available by managing program components individually.	Program strategy alignment (Pg1); benefit management (Pg5); stakeholders engagement (Pg4); governance (Pg4); program lifecycle management (Pg2); program business case and program charter (Pg1); program roadmap and program management plan (Pg2); Risk (Pg2); program closure (Pg6); change (Pg4); and program management (Pg Total).
The Standard for Portfolio management (PMI, 2017 b).	The portfolio components, such as programs and projects within the portfolio, are quantifiable (…) may be related or unrelated, may be dependent or independent, and may have related or unrelated objectives.	Strategic planning of programs, projects and operations (Pg2); alignment of programs within a portfolio (Pg1); program benefits (Pg5); integrate and control interdependencies (Pg3); and oversight and governance (Pg4).
Navigating Complexity (PMI, 2014).	Research project or program prior to approval, manage complex programs and projects. In addition, program management is a way to deal with complexity.	Research projects and programs (Pg1); manage complex programs (Pg Total); and organizational considerations (Pg4).
ICCPM (2012).	Program management is part of the traditional competencies of project management, and is deployed by the executive project management level of competency.	Integration (Pg3); strategy (Pg1); business planning (Pg1); change (Pg4); structure (Pg4); leadership (Pg Total); communication (Pg4); culture (Pg4); and governance (Pg4).
Governance of	The framework, functions, and	Program management (Pg Total); governance

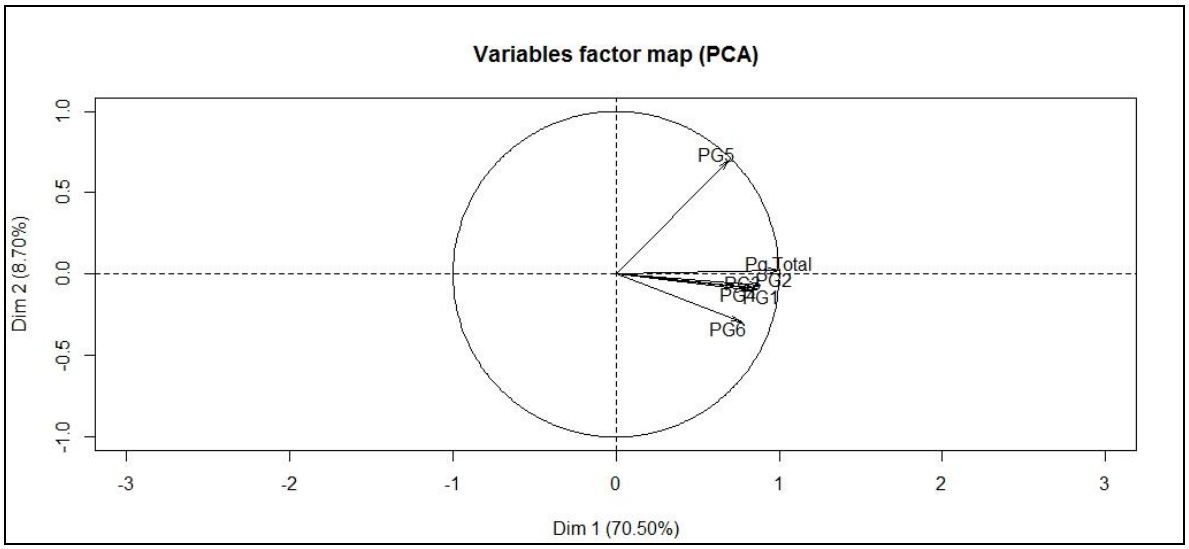
Source	Elements of program management	Variables of study*
Portfolio, Programs and Projects (PMI, 2016).	processes that guide program management activities in order to deliver baseness value to meet organizational strategic and operational goals.	(Pg4); alignment (Pg1); risk (Pg2); performance (Pg3); and communications (Pg4).
OPM3 (PMI, 2018).	Organizations manage projects and programs to support organizational goals.	Result delivery (Pg5); resolve resource constrains and conflicts on projects (Pg3); alignment with strategy; and resolve issues and change (Pg4).
Scopus (2020) & WOS (2020).	Project management; program management, or programme management, or multi-project management; and portfolio management.	Knowledge management (Pg4); human factors (Pg4); risk management (Pg2); benefit management (Pg5); program governance (Pg4); and program evaluation (Pg3).

Source: The author with Rincón-González (2015, 2016, 2017 a, 2017 b, 2018 a, 2018 b, 2020 a, 2020 b, and 2020c)*.

4. 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 70.5% of dispersion, and se second one a 8.7%, both dimensions together accumulate 79.2% of the dispersion in the analysis (see figure 5). In addition, all of the items of study point to the same direction and integrate the Program Total variable (Pg Total) in a proper way, those variables were later used to determinate the clusters of program management in Colombia (see figure 5).

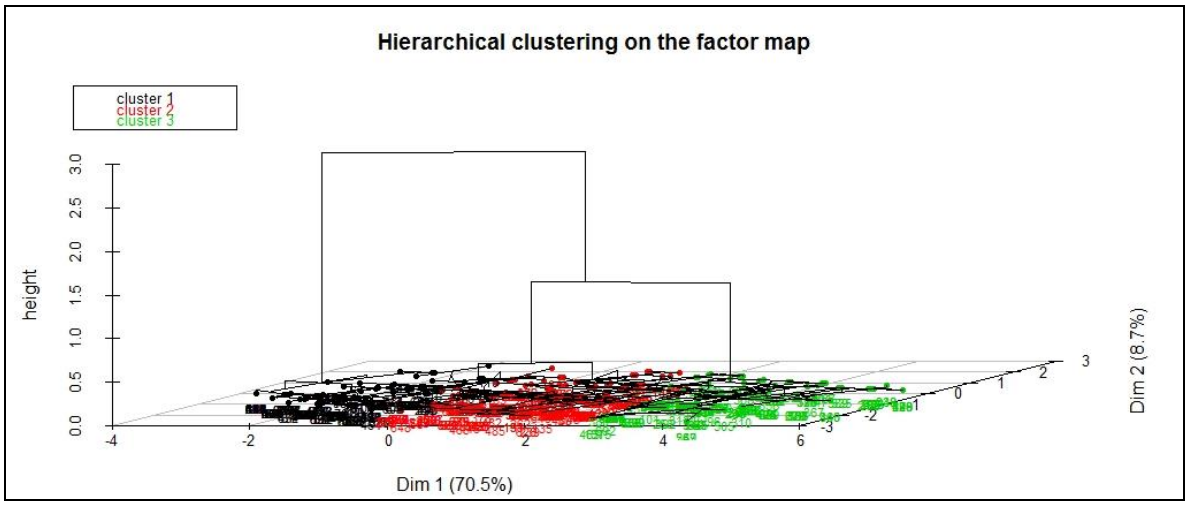
Figure 5. Variables factor map (PCA) for the management of programs in Colombia.



Source: The author.

Once the analysis instrument is used in the 702 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 performance levels, of program management in Colombia, was 3, as shown in figure 6.

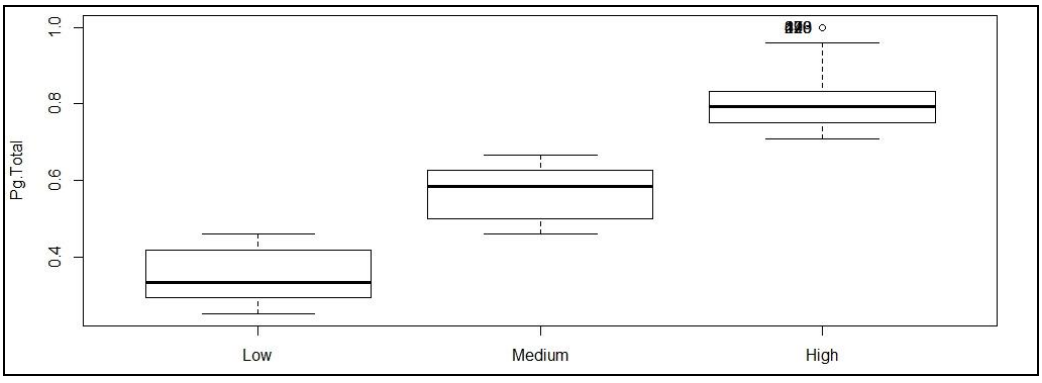
Figure 6. Hierarchical clustering on the factor map for the management of programs in Colombia.



Source: The author.

Likewise, a *Boxplot* diagram was generated for the Pg Total variable and 3 clusters for the management of programs in Colombia were identified. It shows, visually, a clear differentiation between the 3 grouping levels (see figure 7).

Figure 7. Boxplot of the clusters of program management 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 (α=0.05); it was noticed a *p_value* ≈ 0.00 (see table 2) direct evidence of rejection of the hypothesis of equality of medias between the clusters. Therefore, clusters have different performance levels in the program management context, 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	19.269	9.635	1966	<2e-16
Residuals	699	3.426	0.005		

Source: The author.

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 analysis and the model for program management, for the Colombian business context.

5. CONCLUSIONS

This research involved a detail scientometric analysis of 1031 scientific articles in major journals related to the management of programs of projects, suitable bodies of knowledge were added to define a framework, as a base for a model for managing programs. An extensive fieldwork covered 702 organizations that undertake programs of projects in Colombia, by conducting interviews with key programs stakeholders within those organizations based on a random selection criteria. A detailed statistical analysis with high levels of significance was conducted, and clusters of the managing programs of project in Colombia were identified. All above, scientifically, confirms the validity of the analysis and the proposed model for managing programs of projects in Colombia and make known a significant contribution for the project management discipline in the country. As future lines of research, it was proposed to undertake this kind of studies in other geographical contexts, to conduct comparative and correlational analyses.

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