

Business commitment to Project management processes, case study of SMEs in Pasto (Colombia)

Compromisso empresarial com processos de gestão de projetos, estudo de caso de PMEs em Pasto (Colômbia).

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Abstract

Project management associated with closure processes, covering initiation, planning, execution, monitoring, control and closure. In addition, it includes the management of time, costs and, consequently, changes or delays in specific areas that can impact the project, all the more so considering the common difficulties faced by entrepreneurs in Small and Medium-sized Enterprises (SMEs) in four areas: administrative, operational, external and strategic factors. The lack of project management practices in SMEs is attributed to the scarcity of resources, lack of knowledge, training and experience in the discipline. In order to address this gap, this article makes proposals for organizational management, based on the perception of the low levels of commitment identified. The researcher's approach is based on the quantitative paradigm, with the aim of assessing companies' commitment to applying project management processes, using 10 different scenarios.

Keywords: Project management; Business commitment; SMEs.

Resumo

Gestão de projetos associada aos processos de encerramento, abrangendo iniciação, planejamento, execução, monitoramento, controle e encerramento. Além disso, inclui a gestão do tempo, custos e, conseqüentemente, alterações ou atrasos em áreas específicas que podem impactar o projeto, ainda mais levando em consideração as dificuldades comuns enfrentadas por empreendedores de Pequenas e Médias Empresas (PMEs) em quatro áreas: administrativa, operacional, fatores externos e estratégicos. A falta de práticas de gestão de projetos nas PMEs é atribuída à escassez de recursos, falta de conhecimento, formação e experiência na disciplina. Para abordar essa lacuna, o presente artigo tem como propostas para a gestão organizacional, baseadas na percepção dos baixos níveis de comprometimento identificados. A abordagem da pesquisadora se fundamenta no paradigma quantitativo, visando avaliar o comprometimento das empresas na aplicação dos processos de gerenciamento de projetos, utilizando 10 cenários distintos.

Palavras-chave: Gerenciamento de projetos; Compromisso empresarial; smes

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1 Introduction

SMEs have become a relevant pillar within economies; they are a fundamental part of the economic system; they stimulate the economy and have a great social responsibility. Okpara and Wynn (2007), Vega, Castaño and Mora (2011) stated that small businesses are considered the driving force of economic growth, not only for the generation of employment, poverty reduction and wealth generation, but also for their contribution in income distribution, market dynamizer, among other aspects; ten years later, according to Moncayo (2017), this statement is still valid: "small and medium-sized enterprises are ratified as the locomotives of the country, not only for their contribution to employment, but also because their smaller size allows them to better weather the slowdown" (para. 1).

On the other hand, and due to the special nature of projects, their complexity and diversity, project management is an essential tool to manage them; the success or failure of the project depends on its appropriate or inappropriate management. The absence of planning generates deficiencies in time, costs and quality. Díaz (2015), states that the management profiles that impede growth and sustainability in organizations are related to the most common errors in the investment and execution of project planning and programming, questioning the role and skills of project management, methodology used, risk management, teamwork, environmental factors and change management.

The understanding and commitment of administration in project management in SMEs will be useful to generate change, this allows to establish strategies and, with them, appropriate methodologies to provide solutions to existing problems, creating opportunities to improve competitiveness levels. Hence the importance of managing projects overcoming risks and bottlenecks and generating conditions that allow human talent development, growth and not processes aimed at simple supervision.

To counteract economic losses, companies currently operate at an extremely competitive pace that requires them to be constantly changing, not only in their processes but also in their physical, financial and personnel structures. These changes must be made due to regulations or laws that oblige them to do so, or simply to remain in the sector. In the best of cases, to be leaders in that sector (Ceballos, 2022), it is for this reason that the business reality outlines goals and challenges that, in most cases, in those competitive productive units are met given the appropriate conditions of physical, technological, intellectual and service capacity, these challenges and goals require the preparation and planning of strategies that allow them to be met and for this it is necessary to have all the synergies belonging to each organization project management requires the efficient and effective administration of internal and external processes, for which knowledge, capabilities and skills are required to ensure the fulfillment of objectives with control adjusted to time, cost and scope; hence the importance of the skills that, according to Daccach (2018), guarantee its development: project definition, work planning, contract administration, work plan, scope, risks, communication, quality, stakeholders, aspects that are not taken into account by entrepreneurs of SMEs in the city of Pasto. The administration has an empirical approach; generally, it is managed by the owners themselves, who do not have knowledge in administrative, financial, commercial and management matters, nor do they have specialized technical personnel. As a result, there is evidence of an administration based on experience, without having the appropriate personnel and lacking an organizational culture oriented to project management, limiting planning for the development of various business projects.



On the other hand, statistics from specialized companies such as Gartner (cited by Ardila, 2015), state that only 20% of the projects end, obtaining the proposed objective, both in terms of time and estimated resources. Eighty percent of collaborative projects do not end; this generates an increase in direct costs (in cases where projects end with greater resources than expected) and indirect costs, due to the non-availability of expected benefits that the project would provide if it had ended on time and at cost. This is reaffirmed by the 2015 Chaos Report (The Standish Group International Inc. 2015), which indicates that 29% (out of 50,000 analyzed worldwide) are successful, i.e. they meet deadlines, budget and, in addition, obtain satisfactory results.

In this context, the present work aims to analyze the level of commitment of SME entrepreneurs to project management processes; commitment being understood as the agreement assumed by those involved in the planning process for the achievement of some future activity or action. that allow, as stated by Mazurkiewicz (2018), to improve knowledge, innovate, make continuous improvements, open new markets and internationalize, or collaborate with other companies and institutions in projects. It is worth noting that this type of studies in SMEs is quite limited (Arturo & Díaz, 2021).

2 Review of literature

Different countries have gradually become part of the dynamics of globalization, productivity and competitiveness, factors that are of concern to the private and public sectors. Productivity and competitiveness are closely related; thus, while the former refers to a company's capacity to produce with lower costs and better technologies, the latter refers to a company's capacity to enhance its productivity in order to compete successfully at the national and international levels.

Therefore, a country, region, company or sector that wishes to achieve success, and in the particular case of SMEs in the city of Pasto, must be productive and competitive; that is, they must have a set of internal and external qualities that allow them to generate sustained value in the market, to face new paradigms from a strategic point of view. To this end, they have, on the one hand, management processes that constitute a determining element of the quality of the performance of any organization, and affect the optimal use of human talent; and, as mentioned by Amat (2007), this refers to the development of the basic functions of administration: planning, organizing, directing and controlling, generating efficiency, effectiveness, productivity and, naturally, competitiveness.

On the other hand, with project processes that incorporate five groups: 1) Initiation, defines and authorizes a project or phase thereof; 2) Planning, establishes the scope, defines and refines objectives and the course of action necessary to achieve the proposed objectives; 3) Execution, integrates people, resources to carry out the project requirements; 4) Monitoring and Control, is responsible for monitoring, analysis and regulation of project progress and performance to identify the need for changes and 5) Closing, seeks the formality of acceptance of the project, phase or contract (Pmbook 2017). (Pmbook 2017). This allows the appropriate analysis of scopes and times that guarantee the fulfillment of objectives outlined with quality, on time and with stipulated costs based on assigned tasks.

2.1 Project Management Conceptualization

Table 1 lists some concepts presented by authors and concepts proposed by institutions internationally recognized as leaders in project research: International Project Management Association (IPMA), Project Management Institute (PMI), PRINCE2, among others; in them it can be inferred that the management, direction, or administration of projects (Project Management) generates an environment conducive to the achievement, scope and quality of the objectives set by the management, optimizing resources, promoting efficiency, effectiveness and mitigating risks.

Table 1

Project Management Conceptualization

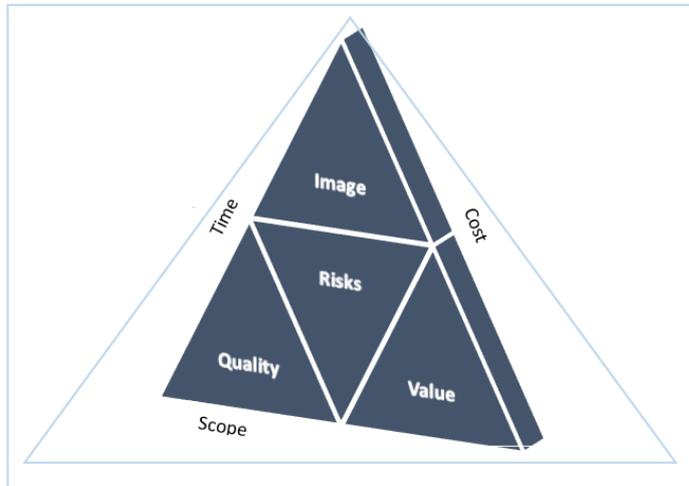
Author	Concept
Project Management Institute, Inc. (2013 – 2017 - 2021)	Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. It is achieved through the proper application and integration of the project management processes identified for the project, and enables organizations to execute effectively and efficiently.
ISO 21500 (2013)	Application of methods, tools, techniques and competencies to a project.
PMI (2008)	Application of knowledge, skills, tools and techniques to project activities to meet project requirements.
PRINCE (2009)	Planning, supervision and control of all aspects of the project, as well as the motivation of the people involved in the project to achieve the project objectives, in terms of time, cost, quality and performance.
De Heredia R. (2007)	Process of optimizing the resources made available to the project in order to achieve its objectives.
Lledó y Rivarola (2007)	Project management is the application of knowledge, skills, tools and techniques to the activities necessary to achieve project objectives; its efficiency saves resources and facilitates the delivery of the final product in a timely manner.

In this order of ideas, grouping the concept of project management and processes, project management is responsible for planning, organizing, directing and controlling three elements: scope, time and costs, hence the importance of the project triangle concept or called by Lledó and Rivarola (2007) as the 'triple project constraint', which currently incorporates other components as stated by Toro (2020) and the imbalance of them can affect the outcome of the entire project (Figure 1).



Figure 1

Graphical expression of the triple constraint



Source: Toro (2020)

Toro (2020) points out as the project manager's objective the need to balance the constraint triangle: staying within budget (keeps the project on track and avoids overspending), deadline (compliance with the schedule), and scope or project specifications (establishes limits and specifies deliverables), a balance that leads to minimize risks and maximize quality, image and business value. It is important to point out, on the one hand, the proportional relationship between scope and time and costs assigned to the project, and on the other hand, the inverse relationship between time and cost. Therefore, variations in these factors will positively or negatively affect the quality, image, value and risks of the project.

2.2 Project Management Methodologies

On the other hand, as shown in Table 2, project management methodologies present similar aspects and certain differences that allow satisfactory management of the achievement and scope of the project; it synthesizes objectives, processes, areas of knowledge and components that enable the use and diversity of good practices for the success of the company and good project management.

Table 2

Parallel project management methodologies

PMBOK	PRINCE2	P2M	ISO 10006:2003	GTC-ISO 21500
OBJECTIVES				
Define sub set of best practices	Cover organizational, management and control aspects	Methodological guide and project management guidelines	Regulates processes to manage a project (takes into account quality system)	Guide project management
PROCESSES				
Start	Start-up	Project strategy management	Planning, implementation and maintenance of the quality system	Start
	Start			
Planning	Project initiation	Management of project objectives	Interdependence (facilitates planning)	Planification
	Product delivery management			
	Project management	Project systems management		Implementation
Execution		Project development and implementation process		Performance of activities
Monitoring and control	Control of a phase	Project		
	Management of phase limits			
Closing	Management of phase limits.			Control and closure
	Closure of the project.			
KNOWLEDGE AREAS				
Integration	Change management		Processes of improvement actions	
Scope	Planes, <i>Business Case</i>		Interdependency Process	Scope
Schedule	Calendar	Project organization management		
Time	Planes, <i>Business Case</i>		Time process	Time
Cost	Cost	Project financial management	Cost Process	Cost
Risk	Risk	Risk Management	Risk process	Risk
Stakeholders				
COMPONENTS				
Quality	Quality			
Communication	Control	Project communications management	Communication process	Communication
		Project relationship management	Personnel process, organizational structure with allocation of resources and responsibilities.	
Human Resources	Organization			
		Project information technology management		
Procurement			Procurement Process	Procurement
		Project value management		



2.3 Bibliographic trace SME research

Arturo and Diaz (2021), based on the literature search during the period 2000 - 2019, identified 221 articles with relevant information on research conducted in small and medium-sized enterprises (SMEs) at the international level. It highlights the low levels of research in strategic factors (13.57%) and specifically in the topic of project management (the subject of this article), which as shown in Table 3, only 2 articles were traced (0.90% of the factor), an aspect that evidences a gap in knowledge in the subject of research. Therefore, the need and importance of advancing research processes in the subject that allows generating an organizational culture, in which the planned change becomes a dynamizing factor in this type of organizations, and project management becomes the tool that allows reaching quality, cost and scheduled time requirements in each project (table 3).

Table 3

Bibliographic crawls SME research (2000 - 2019)

Factor	Thematic	Articles	Total, factor	Percentage
Administrative	ICT and innovation	39	131	59.29
	Administration	36		
	Human Resources	29		
	Accounting and financial	27		
Operations	Control and Quality	19	30	13.57
	Marketing	7		
	Entrepreneurship	4		
External	Internationality	19	30	13.57
	Networks - Associativity	6		
Strategic	Regulations	5	30	13.57
	MANAGE	25		
	Strategic Thinking	3		
	Project Management	2		
Total	-	221	221	100

Source: Based on Arturo & Díaz (2021)

3. Methodology

The methodology, framed in the quantitative paradigm and relational type of research, seeks to characterize specific behaviors of the current reality of the case study: industrial, commercial and service SMEs in the city of Pasto, with an analytical empirical approach and privileging, as a criterion of validity, the use of data from the experience of the owners, administrators and/or area managers of these organizations.

The instrument is submitted to content validity, based on the bibliographic review, with which widely recognized models are identified and characterized, establishing the correspondence between research objectives and indicators, seeking congruence and quality. Subsequently, the expert's review and pertinent adjustments were made; with this, a pilot test was applied to 52 businessmen to finally measure the consistency through Cronbach's Alpha,

showing a high reliability of 0.84 for the instrument.

Small and medium-sized industrial, commercial and service enterprises (SMEs) in the city of Pasto were analyzed as the unit of study, comprising 514 establishments according to data provided by the Chamber of Commerce (2021). Taking into account the non-probabilistic convenience sampling from the total population and using the random distribution formula (95% confidence level and 7% margin of error), a sample of 147 entrepreneurs was selected, distributed proportionally: 117 and 30 entrepreneurs of small and medium-sized companies, respectively.

To determine the entrepreneurial commitment and respond to the hypothesis posed by the researcher: "there are low levels of commitment on the part of the owners, entrepreneurs and/or area managers to the application of minimum or basic project management tools that allow the success of their projects". To respond to this hypothesis, statistical validation was proposed in three phases (Figure 2).

Figure 2

Statistical validation phases



The first phase involves assigning a numerical value (M) to each company, taking into account the basic factors incorporated in the triple constraint (scope, time and costs) and applicable to business projects in SMEs in the city of Pasto. Their balance makes possible the quality of management and reflects the level of commitment advanced by those who manage them.

Table 4 shows the attributes used to measure the value (M) of the SME projects considered relevant to the research process.:

Table 4

Factors and attributes of measurement keys M-value

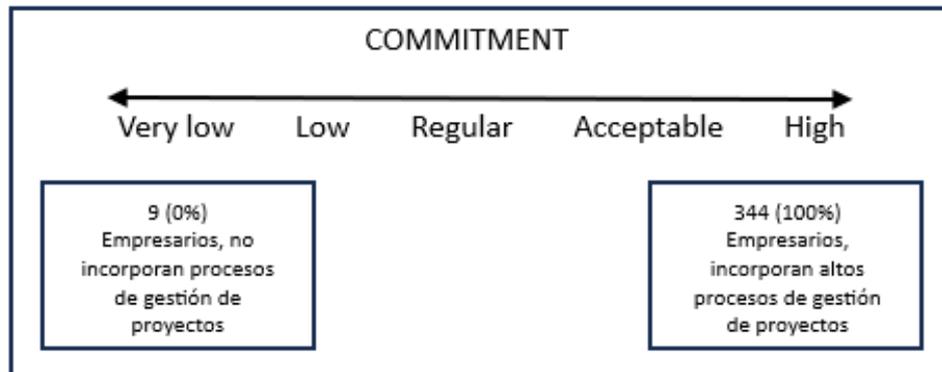
Factor	Key attributes
Scope	Formal document Product - results - deliverables Knowledge
Time	Timeline Project completion
Cost	Budget Materials - equipment - supplies
Other	Project risks Training plan Influence of the leader

Once the ranges have been defined, for the researcher, the existence of very high entrepreneurial commitment to factors and attributes is present in those who reach as a result (M) levels ranging between 307 and 344 and very low commitment for those who reach scores between 9 and 77, as shown in the following figure:



Figure 3

Assessment of the level of commitment: project management factors



For the second phase, ten (10) validation scenarios are established that compare the level of business commitment with project management factors. Finally, phase three (hypothesis testing) starts with the formulation of specific hypotheses, defining ANOVA as the test statistic for each of the scenarios, and a significance level of 5%, after identifying the parametric behavior of the M values.

4. Results analysis

The results are presented below, through inferential analysis, which seeks to define business commitment in SMEs in the city of Pasto (Colombia), seeking to respond to the hypothesis: a project management methodology for SMEs in the city of Pasto (Colombia) will support the implementation of articulated strategies in the achievement of mission objectives. For this purpose, statistical validation was proposed in three phases, focused on the analysis of ten scenarios.

4.1 First phase, numerical value assignment M, commitment level

Actually, little has been done in small and medium-sized companies on the application of project management processes in SMEs. Most of those who manage projects in this type of organizations do not base their project management on the support of these tools, as was shown from the state of the art advanced by Arturo & Diaz (2021) and the existing gap of literature on the subject (project management) for the SME segment, scarcely treated worldwide (Rodriguez, 2018).

Commitment refers, in general terms, to the use made by entrepreneurs and/or SME managers of project management factors and attributes to achieve efficiency and proper management of scope, time and projected costs, or as stated by Lledó and Rivarola (2007) the 'triple project constraint' where: every project must have: 1) clarity regarding its scope (requirements to be satisfied), 2) time required and 3) budget (human talent, tools, financial resources), to achieve project success.

According to the results of the study, the level of commitment in the SMEs of the city of Pasto is high, corresponding to only 0.68%, that is, one of the companies analyzed reaches the higher M interval, as a result of the use of various project management tools. Very

significant percentages show regular commitments (43.54%); low (10.20%) and very low (7.48%). The 38.10% of the respondents have rated themselves with acceptable commitments, which shows the application of some project management tools, however, there are aspects to improve in order to move from empiricism to the formalization of a project management methodology.

The Results allow inferring and show similarities with approaches by Mazurkiewicz1(2018), who emphasizes that, although small and medium-sized companies apply some project management procedures and reuse templates, these to improve their knowledge must innovate and make continuous improvements; with Saghati, McQueen, Dillon, & Wang (2017) who point to project management as a critical success factor in large and small companies and with the study of Zuzek, Gosar, Kusar and Berlec (2020) who conclude that the implementation of some project management practices, in small companies, generate positive impact on project success at the level of efficiency and stakeholder satisfaction.

Table 6

Evaluation of commitment in SMEs Pasto

Compliance Rating	Interval M-value	Number of companies	Percentage
Very low commitment	31 - 77	11	7.48
Low commitment	78 – 123	15	10.20
Regular commitment	123 - 214	64	43.54
Acceptable commitment	215 – 306	56	38.10
High commitment	307 – 344	1	0.68
Total	-	147	100

In this regard, the document Project Management for Development Organizations (PM4DEV, 2018) points out: on the one hand, that many organizations believe they have a good project management system; however, few can provide evidence of the use of a formal, consistent and reliable methodology; on the other hand, faith is placed in the technical skills of project managers, who, for the most part, have little or no formal training.

4.2 Second stage, validation scenarios

This phase establishes scenarios that compare the level of business commitment with project management factors advanced in the SMEs under study. Based on the responses of the applied instrument, Table 7 presents ten validation scenarios, directly related to project management and two, based on characterization elements and proposed subgroups (Yes - No - Partially), which allow creating scenarios to determine the degree of commitment to project management.



Table 7

Proposed scenarios

No	Guiding questions: Project management	Sub-groups
1	Developed document formally authorizing the project; identified requirements that meet stakeholder needs and expectations	Yes No Partial
2	Formally defined timeline, prioritizes activities, times and responsible parties, allowing for follow-up and avoiding delays.	Yes No Partial
3	Defines products, results, documents or deliverables at the end of a process or activity.	Yes No Partial
4	The organization prepared a detailed budget for the project.	Yes No Partial
5	Estimated the amount of materials, equipment or supplies required to execute each project activity	Yes No Partial
6	Identified, planned and monitored possible risks that the project team may face in the development of the project.	Yes No Partial
7	The project was completed and complies with the required characteristics.	Yes No Partial
8	The organization has developed a training plan for the team in charge of executing the project.	Yes No Partial
9	The project leader has a positive influence during all phases of the project.	Yes No Partial
10	The project leader has knowledge that facilitates the achievement of the goals and objectives outlined in the planning.	Yes No Partial
	Guiding questions: Characterization elements	
11	Indicate the number of permanent employees the company has.	Open option
12	How many years the company has been in operation	Open option

4.3 Third stage, hypothesis testing

The third phase proposes, based on the proposed scenarios (phase 2), the formulation of specific hypotheses. For this purpose, taking into account the comparison of three unrelated quantitative subgroups (with parametric distribution), the ANOVA test statistic is defined for each scenario with a significance level of 5%, and a comparison of means is made for the hypotheses proposed.

4.3.1 Scenario 1

Alternate Hypothesis

There are differences between averages of SMEs that prepare, do not prepare or partially prepare a formal document as a project management tool.

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

Null Hypothesis

There are no differences between averages of SMEs that prepare, do not prepare or partially prepare a formal document as a project management tool.

$$H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 8 shows, based on Student's T, the descriptive behavior of data in general, identifying that of the scenario of companies that formally define their projects in a document, each subset is composed of 70 for those organizations that take into account the formal



document as a project management tool; 52 for companies that do not take it into account and 25 for those that carry out the process partially. It is also possible to identify that the average M value of the companies that formally define their projects equals 245; those that do not define it reach an average of 122 and those that partially perform it reach an average of 188; results that seen in the light of Project Manager, more than half of the analyzed companies do not conceive the documentation of a project as one of the pillars of success to happily execute the proposed objectives.

The p-value, for the first scenario, is 0.000 lower than the established significance level (0.05), therefore the null hypothesis is rejected, finding statistically significant evidence of the existing difference between the means of the SMEs that prepare, do not prepare or partially prepare a formal document as a project management tool

Table 8

Student's t-test for Groups, scenario 1

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	70	245,13	39.086	235.81	254.45	0.000
2	52	122,73	51.222	108.47	136.99	
3	25	188,68	32.022	175.46	201.90	
Total	147	192,23	69.794	180.85	203.61	

1 Yes, it does; 2 No, it does not; 3 Partially it does; 1 Yes, it does; 2 No, it does not; 3 Partially it does

4.3.2 Scenario 2

Alternate Hypothesis

Null Hypothesis

There are differences between averages of SMEs that formally define a schedule, do not define it or partially define it in their project management process.

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

There are no differences between averages of SMEs that formally define a schedule, do not define it or partially define it in their project management process.

$$H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 9 shows, based on Student's T test, the descriptive behavior of the data in general. 47 companies formally define the schedule in their projects; 48 do not design it and 52 use it partially. The mean M-value of the companies that formally define the schedule in their project management process is 257, compared to the mean of 123 of those who do not use this tool and 196 use it partially. Despite being a simple and accessible control and monitoring tool that prioritizes activities, times and responsible parties, only 31% of entrepreneurs make use of it; in this regard, PMBOK (2017) considers that such process provides knowledge about the health of the project. An aspect that differs with what was found by White and Forune (2002) who state that Gantt charts are the most used aids in SME companies.

The p-value, for this scenario, is 0.000 lower than the significance level (0.05), rejecting the null hypothesis that allows finding statistically significant evidence of the existing difference between the means of the SMEs that formally define a schedule, do not



define or partially define a schedule in their project management process.

Table 9

Student's t-test for Groups, scenario 2

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	47	257,04	35.553	246.60	267.48	0.000
2	48	123.85	51.484	108.90	138.80	
3	52	196,77	45.494	184.10	209.43	
Total	147	192,23	69.794	180.85	203.61	

1 Yes, it does; 2 No, it does not; 3 Partially it does; 1 Yes, it does; 2 No, it does not; 3 Partially it does

4.3.3 Scenario 3

Alternate Hypothesis

Null Hypothesis

There are differences between averages of SMEs that define, do not define or partially define products or deliverables as a project management tool.

There are no differences between averages of SMEs that define, do not define or partially define products or deliverables as a project management tool.

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

$$H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 10 shows the descriptive behavior of the data. 46 companies define products or deliverables; 40 do not, and 61 do so only partially. The mean M-value is 255, compared to those who do not define (116) and those who partially define (194), making it difficult to control, monitor and achieve the objectives.

The p-value is less than the significance level (0.000), finding statistically significant evidence of the difference between the means of SMEs that define, do not define or partially define products or deliverables as a project management tool.

Table 10

Student's t-test for Groups, scenario 3

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	46	255,17	38.535	243.73	266.62	0.000
2	40	116.50	59.491	97.47	135.53	
3	61	194,43	39.664	184.27	204.58	
Total	147	192,23	69.794	180.85	203.61	

1 Yes define; 2 No define; 3 Partially define; 1 Yes define; 2 No define; 3 Partially define



4.3.4 Scenario 4

Alternate Hypothesis	Null Hypothesis
There are differences between the average number of SMEs that prepare a detailed budget for the project, do not prepare a detailed budget or do so only partially as a project management tool. $H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$	There are no differences between averages of SMEs that prepare a detailed budget for the project, do not prepare or partially prepare it as a project management tool. $H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$

Table 11 makes it possible to highlight, from Student's T, the descriptive behavior of data in a general way. In 29 companies the detailed budget is drawn up, 34 do not, and 84 of them do it partially. 263 is the average M value of companies with a detailed budget; 105 do not, and 202 of those with a partial budget.

As for the p value, for the quarter it is from 0,000 less to 0.05 (level of significance) rejecting the null hypothesis, therefore, there is statistically significant evidence of the difference between the averages of SMEs that draw up the detailed budget for their projects, do not draw up it or perform it partially as a project management tool.

Table 11

Student T Test for Groups, Stage 4

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	29	263,62	39.694	248.52	278.78	0.000
2	34	105.82	54.954	86.65	125.00	
3	84	202,56	43.465	193.13	221.99	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.5 Scenario 5

Alternate Hypothesis	Null Hypothesis
There are differences between average SMEs that estimate the amount of materials, equipment or supplies to execute each project activity; they do not estimate it or perform it partially as a project management tool. $H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$	There are no differences between average SMEs that estimate the amount of materials, equipment or supplies to execute each project activity; they do not estimate it or perform it partially as a project management tool. $H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$



Table 12 shows, starting with Student's T, the descriptive behavior of data in general, 31 estimates the amount of materials, equipment or supplies to execute each project activity; 30 do not define and 86 do partially. The average M value of the companies they define equals 258; 105 and 198, respectively, of organizations that do not or partially do so.

As for the p value, for the fifth scenario, this is 0,000, less than 0.05 (established level of significance), so the null hypothesis is rejected by finding statistically significant evidence of the difference between averages of SMEs that estimate materials, equipment or supplies to execute each project activity; they do not estimate or are partially carried out as a project management tool.

Table 12

Student T Test for Groups, Scenario 5

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	31	258,32	40.807	243.35	273.29	0.000
2	30	105.87	61.837	82.78	128.96	
3	86	198,53	46.998	188.46	208.61	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.6 Scenario 6

Alternate Hypothesis

Null Hypothesis

There are differences between average SMEs that identify, plan and monitor potential risks; they do not identify or partially identify it as a management tool

There are no differences between average SMEs that identify, plan and monitor potential risks; they do not identify or partially identify it as a management tool

$$H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

Table 13 shows, starting with Student's T, the descriptive behavior of data in general. 44 companies have identified, planned and monitored potential risks of the project; 54 do not, and 49 claim to implement it partially. The M value for companies that identify, plan and monitor risks averages 247; those that do not or partially do not, averages 139 and 201, respectively.

The sixth scenario reaches a p value of 0,000, lower than the established level of significance (0.05), finding statistically significant evidence of the difference between the averages of SMEs that identify, plan and monitor potential risks, do not identify or partially identify them as a project management tool.

Table 13

Student T Test for Groups, Stage 6

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	44	247,27	43.587	234.02	260.52	0.000
2	54	139.13	68.343	120.48	157.78	
3	49	201,33	43.857	188.73	213.92	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.7 Scenario 7

Alternate Hypothesis	Null Hypothesis
There are differences between the average number of SMEs that complete the project, do not complete or partially complete the management process $H_a: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$	There are no differences between average SMEs completing the project, not completing or partially completing their management process $H_o: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$

Table 14 shows the descriptive behavior of the data, identifying that the subgroup of companies that complete projects is 39, compared with 24 that do not complete and 84 that perform partially. It is possible to identify that the average M value of companies finalizing projects is equivalent to 263; for those who do not finalize 96 and those that do partially, it equals 186. Concerns are raised: only 26 per cent finish their projects, 16 per cent partially and 58 per cent do not finish them. A trend that coincides with the Gartner report (cited Ardila 2015), 20% of projects finish and the Chaos (2015) and Chaos (2020) reports, which claim 29% and 31%, respectively, are successful, showing high failure rates, which do not improve over time.

This scenario presents a p value of 0,000, less than the level of significance (0.05), accepting the alternate hypothesis, which shows statistically significant evidence of the difference between averages of SMEs that finish a project, do not finish it or perform partly in its management process.

Table 14

Student T Test for Groups, Scenario 7

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	39	263,36	35.833	251.74	274.97	0.000
2	24	96,08	56.327	72.30	119.87	
3	84	186,68	44.944	176.93	196.43	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.8 Scenario 8

Alternate Hypothesis	Null Hypothesis



There are differences between average SMEs that draw up a training plan for their workforce, do not carry out it or do it partially in their project management process

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

There are no differences between average SMEs that develop training plans for their workforce, do not carry out them or do so partially in their project management process

$$H_o: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 15 shows, from Student's T, the descriptive behavior of data, 27 companies are considering a training plan for their work team; 71 of them do not, and 49 do partially. The average M value of companies that define a training plan is 274, compared to those that do not define it (151) and 205 do it partially.

Considering that the training plan focuses on knowledge, skills and competencies to develop a project efficiently, the low interest in training is worrying; authors such as Gray and Larson (2009) consider it key in project management to develop high-performance teams; Leal Paredes (2020), for their part, emphasizes the need to incorporate soft competencies as a basis for the success of such management.

The p value, for this scenario, is 0,000 below the level of significance, finding statistically significant evidence of the difference between the average SMEs that draw up training plan, do not carry out it or are partly done, in their project management process.

Table 15

Student T Test for Groups, Scene 8

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	27	274,74	27.266	263.95	285.53	0.000
2	71	151.65	63.181	136.69	166.60	
3	49	205,57	46.315	192.27	218.87	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.9 Scenario 9

Alternate Hypothesis

There are differences between average SMEs in which the leader influences positively during all phases of the project, does not do so or performs partially in their project management process

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

Null Hypothesis

There are no differences between average SMEs in which the leader influences positively during all phases of the project, does not do so or perform partly in their project management process

$$H_o: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 16 shows, from Student's T, the descriptive behavior, 58 of the companies analyzed consider that the leader influences positively in all phases; 16 of them, consider there is no positive influence, and 73 say it acts partially. The average M value of the companies (252) consider the positive influence of the leader in each of its phases; 62 and 173, respectively, consider there is no influence or this is partial.

As for the p value, for the ninth scenario, it is 0,000 less than the level of significance, so the null hypothesis is rejected, finding statistically significant evidence of the difference

between the average SMEs in which the leader positively influences during all phases of the project, does not do so or is partially carried out.

Table 16

Student T Test for Groups, Scene 9

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	58	252,21	39.960	241.70	262.71	0.000
2	16	62.31	31.485	45.54	79.09	
3	73	173.05	37.225	164.37	181.74	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

4.3.10 Scenario 10

Alternate Hypothesis

Null Hypothesis

There are differences between SMEs averages in which the project leader has knowledge that facilitates the achievement of proposed objectives, has no knowledge or these are partial

There are no differences between average SMEs in which the project leader has knowledge that facilitates the achievement of proposed objectives, has no knowledge or these are partial

$$H_a: \mu_{Si(1)} \neq \mu_{No(2)} \neq \mu_{Parcialmente(3)}$$

$$H_0: \mu_{Si(1)} = \mu_{No(2)} = \mu_{Parcialmente(3)}$$

Table 17 shows, starting with Student's T, the descriptive behavior of the data. 58 companies consider their leader's knowledge to be adequate, 17 lack knowledge and 72 their knowledge is partial. The average M value, in companies that consider their leader to have knowledge, is 251; compared with averages of 64 and 174, for those who lack adequate knowledge or are partial.

The p value, for the tenth scenario, is 0,000 less than the level of significance, therefore, the null hypothesis is rejected, finding statistically significant evidence of the difference between the averages of SMEs in which the project leader has knowledge that facilitates the achievement of the proposed objectives, does not have them or these are partial.

Table 17

Student T Test for Groups, Scenario 10

M-value	N	Mean	Deviation	L. Lower	Upper L.	p-value
1	58	251,52	40.567	240.85	262.18	0.000
2	17	64.59	31.896	48.19	80.99	
3	72	174,61	37.136	165.88	183.34	
Total	147	192,23	69.794	180.85	203.61	

1 If prepared; 2 Do not elaborate; 3 Partially prepared

On the other hand, it was noted, as an interesting finding, that the experience of companies (measured in years of operation) and size (measuring in number of employees), are not factors that are related to the level of commitment of companies to the planning, organization, direction and control of the three basic elements of project management: scope, time and costs.



Figure 4 shows the average years of operation compared to the use of project management tools. It identifies how, over the years of operation, no different behaviors are visualized in the use of these tools, presenting similar levels in their M value, ranging between 186 and 230

Figure 4

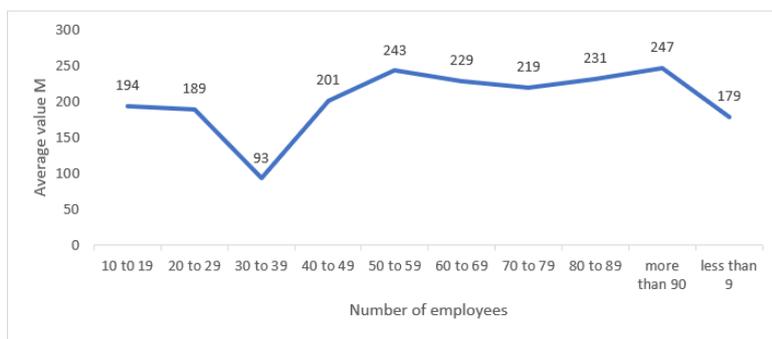
Average M Value by years of operation



For its part, Figure 5 shows that the average, according to the number of employees, is similar ranges (201 to 247), except for the range of 30 to 39 years, without this signifying a proportional ratio to the use of management tools.

Figure 5

Average M Value by Number of Employees



5 Final considerations

The scenarios contrasted by statistical inference: (elaborating a formal document, finalising the project, formally defining the timetable, defining products, results, documents or deliverables, taking into account a training plan, highlighting the influence of the project leader, demonstrating the knowledge of the Project Leader, establishing a detailed budget for the development of a project, estimating the amount of materials, equipment or supplies required in each activity and for the project and identifying, planning and monitoring the risks of the project) are significant for SMEs, however the study concludes the implementation of some processes by a limited number of companies, which in some way generate impact, which coincides with what O'Loughlin and Peláez (2019), a project can be considered

successful, if it adheres to the scope, schedule, budget, achievement of objectives and customer satisfaction.

For its part, Ocaña (2015) points out the need for organizations to adapt continuously to new and changing market situations that make the environment global, demanding and competitive; therefore, a good project management allows to respond to that environment.

Taking into account the basic factors incorporated by the research as part of the triple restriction (reach, time and cost), none of the 10 analyzed scenarios are applied by more than 50% of the companies under study. The highest implementation percentages are in the first scenario (formal documentation) applied by 47% of respondents; ninth scenario (leader influence) noted by 39% of the cases analyzed and tenth scenario, on which 39.5% of the target population consider the project leader has knowledge to guide the management of the projects. The other scenarios present representative statistics ranging from 68% to 81%.

The above makes it possible to validate the hypothesis proposed in the research: “there are low levels of commitment by the owners, entrepreneurs and/or heads of area towards their basic project management processes”, which does not favour the implementation of articulated strategies in the achievement of missionary objectives efficiently, that is, ensuring the success of the project, eliminating obstacles and inspiring the team to perform each activity with quality.

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