

Exploring quality culture in project management

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Abstract

This study examines the extent of quality culture in project management in Colombia. The research is conducted through a mixed-methods approach using a concurrent design. We examine four dimensions of quality culture in project management: customer focus, leadership and communication, human talent, and project performance. The results show that the majority of respondents attach great importance to well-defined requirements, benchmarks and adequate documentation. They also emphasize the importance of effective communication and the use of soft skills. Beyond technical project management training, these findings suggest that investment in general professional skills such as communication, teamwork, leadership, and adaptability is critical. The research provides valuable insights into the core factors that contribute to the success of quality project management and offers training improvements and practices. Finally, the article emphasizes the need to develop an improvement-oriented quality culture that involves all project members.

Keywords: quality management; leadership; human talent; learning; assertive communication; project management

Explorando la cultura de calidad en la gestión de proyectos

Resumen

Este estudio tiene como objetivo explorar el grado de desarrollo de la cultura de la calidad en el contexto de la gestión de proyectos en Colombia. La investigación se lleva a cabo mediante un enfoque mixto mediante un diseño concurrente. Se examinan cuatro dimensiones de la cultura de calidad en la gestión de proyectos: enfoque al cliente, liderazgo y comunicación, talento humano, y desempeño del proyecto. Los resultados indican que la mayoría de los encuestados otorgan gran importancia al establecimiento de requerimientos claros, parámetros y a una adecuada documentación. Además, destacan la relevancia de la comunicación efectiva y el desarrollo de habilidades blandas. Estos hallazgos sugieren que, además de la formación técnica en gerencia de proyectos, es esencial invertir en habilidades profesionales generales, como comunicación, trabajo en equipo, liderazgo y adaptabilidad. La investigación proporciona una valiosa perspectiva sobre los factores clave que contribuyen al éxito en la gestión de calidad en proyectos y ofrece recomendaciones para mejorar la formación y prácticas en el área. En última instancia, este estudio resalta la necesidad de desarrollar una cultura de calidad orientada a la mejora, en el que todos los miembros del equipo del proyecto se encuentren involucrados.

Palabras clave: gestión de calidad; liderazgo; talento humano; aprendizaje; comunicación asertiva; gestión de proyectos

1 Introduction

Quality management models have positioned themselves as strategic imperatives to meet the challenges of project management in a global environment characterised by market volatility and uncertainty [1-5]. Although quality management has great potential for value creation [6], its successful implementation requires structural changes that consolidate a culture of agile,

interdisciplinary and collaborative work with customers, suppliers and other partners [7], so that it is receptive to change.

Quality culture is defined as a set of values and principles [8] that are focused on customer satisfaction, legal and regulatory compliance, error prevention and continuous process improvement [9,10]. The quality culture demonstrates a systemic approach to management and improvement, which in turn promotes excellence in all phases of the project, from planning to final delivery [11].

Although most project management standards describe quality management approaches, in practice this aspect is not always given sufficient attention. The final quality of the project is often determined by the results and how these results were achieved [12], i.e. by the quality of the project processes.

A quality culture can significantly improve project management performance by ensuring that all team members are focused on the project objectives and work together to achieve them [13]. In this sense, staff motivation and top management commitment [14], as well as creating learning environments and fostering innovation [15-17], are essential to achieving a successful quality culture.

This article examines the degree of development of a project management quality culture in the Colombian context. For this purpose, a mixed, concurrent, transformative design approach is used. Empirical data were collected using an expert-validated instrument. Quantitative data were analysed using factor analysis [18], while qualitative data derived from open-ended questions were analysed using grounded theory and discourse analysis through coding [19].

The paper is divided into six sections. Section 2 discusses the literature review, and section 3 describes the materials and methods. Section 4 presents the results of the study and section 5 discusses the results and main findings. Section 6 presents the main conclusions, limitations and future research directions.

2 Framework

A project is defined as "a temporary effort undertaken to create a unique product or service" [20]. This definition indicates that projects are characterized by having a defined beginning and end and are designed to achieve specific goals. Projects are often unique, which means that they cannot be repeated in the same way after completion. In this sense, PMI defines project management as "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" [13].

The complexity of projects includes various aspects that increase the management effort, from defining the project objectives to monitoring and controlling the project until completion [21]. It is essential to incorporate quality into all processes and deliverables for the success of projects [13]. Quality acts as a mediator between the risk level of the project and its ultimate success [21].

Considering that the concept of quality in projects has often been limited in practice to the development of activities related to quality management systems based on internationally recognized standards and ensuring compliance with established procedures [20]. It is considered important not only to maintain standardized management models, but to develop a culture based on quality management principles to achieve effective project management [9].

Quality culture encompasses the conceptual framework - including goals, strategy, management styles, and communication - that should guide and contextualize

all project activities. The balanced development of project management culture, processes, people, methods, and tools leads to excellence in operations and business results [22].

Implementing a quality culture in a project involves applying quality practices, methods, and tools in the planning, execution, and process control phases [12]. The objectives, scope, and requirements must be clearly defined and communicated to all project team members so that they can work together efficiently. In this way, the quality culture is composed of several factors: customer focus, leadership and communication, human talent, and project performance.

2.1 Customer focus

In project management, customer focus is considered a fundamental principle that focuses on understanding and meeting the needs and expectations of customers at different stages of the project to ensure that the project delivers the expected value. Although there are different ways to maximize value for the client, the performing organization, and other stakeholders in projects, the lack of clarity in the definition of quality is often the source of disputes that, in the long run, are reflected in a failure to meet the expectations of users or customers [23].

Quality in a broad context has many meanings according to project customers, "ranging from luxury and merit to excellence, value for money or convenience, and even practicality" [23]. According to PMI, the deliverable should be provided with the required functionality and quality at an acceptable level of risk, using the minimum amount of resources and avoiding any waste [13]. In this context, proper quality management is key to ensure that the project deliverables meet the requirements of the various relevant stakeholders and the previously defined standards.

2.2 Leadership and communication

Leadership has been defined as a driving force in the implementation, monitoring and measurement of quality management [3], it establishes the vision from the focus on the project customer. Likewise, leadership creates the conditions for the involvement of people in an environment of knowledge sharing, experimentation and creation, and provides the resources and training necessary to act with autonomy [24, 25].

Individual and collective learning is essential to know and adapt to changes in the environment and to improve the performance of project processes [26], requiring the right conditions in terms of training, strategic clarity and support [27]. Likewise, adequate communication channels ensure access to and understanding of the information needed to develop activities [28].

Assertive communication leverages improvement actions and facilitates the creation, dissemination, and appropriation of knowledge, thereby increasing the dynamic capabilities of the project. The ability to share knowledge among members of the project team allows information to reach all people at all levels, thus promoting the improvement of processes and results. According to Senge, "it is about continuous adaptation and growth in a changing environment" [29].

2.3 *Human talent*

An adaptive and people-oriented organizational culture has a positive effect on performance [15]. According to Deming, quality management is possible if there is an organizational culture where people are trusted and supported in learning [30]. People's skills, commitment, and ability to learn can be used to achieve proposed goals and improve performance [2].

People should "know what to do rather than do the best they can", be aware of learning and facilitate the learning of others [4], thus overcoming the obstacles of resistance to change and adaptation to new routines. The mediating role of learning in the quality culture refers, among other things, to the importance of staff training, the creation of a trusting working environment, the interaction and communication of the project team, and the use of appropriate methods for analysis and decision-making [16,3].

It is expected that the knowledge generated by project participants in this learning process will expand and crystallize through dialogue, discussion, and sharing of experiences [31]. In addition, team members who have contributed to improving project performance may benefit from better working conditions, incentives, or rewards, among other things [16].

2.4 *Project performance*

Organizational and project results are effectively achieved when activities are understood and managed as interrelated processes that function as a coherent system [24]. Learning should be woven into each of the project activities and processes [26] in a way that facilitates improved performance and adaptation to changes in the environment [2].

A successful project has been defined as one that is delivered on time, within budget, and with the quality expected by the client [22]. However, while this definition still recognizes the "iron triangle of cost, time, and quality" [32], project management includes other aspects such as extended coordination of resources, risks, and procurement [20].

Measuring project performance is conceived as a metric to quantify its effectiveness or efficiency [33]. Specifically for quality, some authors suggest measuring project quality effectiveness in terms of visible and hidden quality costs throughout all phases of the project [33]. In addition, it is important to consider that quality culture favors employee, customer and supplier performance indexes and has an indirect positive effect on financial performance, mediated through knowledge creation [34,35].

In this sense, and although measures of project management success often focus on on-time and on-budget delivery, probably because of the ease of measuring these two variables [22], it is important to incorporate other metrics to assess the achievement of short- and long-term objectives, such as quality culture, relevance to beneficiaries, social impact, and sustainability [33].

Measuring project performance across the three economic, social, and environmental dimensions allows for a more holistic assessment of a project's success. The importance of measuring project performance across multiple dimensions allows organizations to assess project impact and continuously improve their processes [36].

3 **Materials and methods**

This research implements an integrative mixed methods approach, using primarily a quantitative approach complemented by qualitative data collection. The methodology is characterized by a concurrent schema, characterized by the simultaneous collection and analysis of both types of data. The research is rooted in the nature of the subject and aims to provide a comprehensive approximation of the subject matter and to refine the research problem as a basis for subsequent studies. A non-probabilistic sample of project management professionals involved in a project located in Bogotá (Colombia) was collected using a simple random sampling method for voluntary participation.

The data collection instrument is structured in three parts. The first part is related to the characterization of the sample, while following part uses a structured metric methodology, consisting of 25 indicators distributed in four factors: 1) customer orientation, 2) leadership and communication, 3) human talent, and 4) project performance. These indicators were adapted from existing literature [3,12,13,16], and all the items were measured on a four-point Likert scale (1 = "strongly disagree", 4 = "strongly agree"). The final section consists of five open-ended questions designed to add depth to certain analyses and to clarify the findings.

To ensure the reliability and validity of the instrument, it underwent a rigorous review and improvement process conducted by a panel of two methodologists and three professionals with extensive experience in project management. The validation process evaluated the content, structure, and form of each variable in the instrument, assessing the clarity of wording, internal coherence, appropriateness of wording, and contribution of each question to the research objectives. The detailed measurement construct of project management quality culture is included in Appendix A.

Data was collected in March 2023, using an online questionnaire-type instrument via SurveyMonkey. The response rate was 18.5%, with 88 representatives of different projects and sectors of the national economy. The results of the descriptive analysis of the sample are presented in Table 1. The quantitative data were analyzed using descriptive statistics. Cronbach's alpha was used to determine the reliability of the results, and the Kaiser-Meyer-Olkin test was used to validate them. Finally, the text categories were coded and the qualitative data were analyzed using a grounded theory approach.

Despite the predominant quantitative approach of the study, the inclusion of open-ended questions adds depth and nuance to the numerical data. This approach allows participants to articulate their perspectives in a more unstructured and detailed manner, complementing the structured Likert-scale responses and enriching the interpretation of the quantitative data. The qualitative responses were analyzed thematically to identify recurring patterns and themes that effectively contextualize the quantitative findings and contribute to a fuller understanding of the research topic.

Table 1.
Descriptive statistics of the sample.

Project term	
less than 6 months	18,2%
6 to 12 months	31,8%
13 to 18 months	15,9%
19 to 24 months	9,1%
more than de 24 months	25,0%
Time spent on the project	
less than 6 months	50,0%
6 to 12 months	18,2%
13 to 18 months	18,2%
19 to 24 months	2,3%
more than de 24 months	11,4%
Project methodology	
PMBOK guide	38,6%
Scrum methodology	22,7%
Kanban methodology	0,0%
Lean methodology	9,1%
Critical Path Method (CPM)	20,5%
Other	9,1%
Quality management area/department	
Yes	63,6%
No	36,4%
Project quality management standards	
ISO 9001	54,5%
Six Sigma	2,3%
EFQM	0,0%
ISO 17025	2,3%
Other	9,1%
None	31,8%
Role in the project	
General manager/director	15,9%
Project director/coordinator	18,2%
Specialized professional	29,5%
Support staff	36,4%

Source: Own work based on the research conducted

Table 2.
Distribution by size and type of project

Size of project	Type of Project			Total
	Private	Public	Mixed	
Microproject	6,8%	0	0	6,8%
Small	18,2%	0	0	18,2%
Medium	2,7%	15,9%	6,8%	47,7%
Large	2,7%	9,1%	4,5%	18,2%
Macroproject	2,3%	4,6%	2,3%	9,1%
Total	59,1%	27,3%	13,6%	100%

Source: Own work based on the research conducted

4 Results and discussion

In terms of project size, the distribution of participants was as follows: 6.8% micro project, 18.2% small project, 50% medium project, 18.2% large project, and 9.1% macro project. As for the type of project, the distribution is 59.1% private, 34.1% public, and 13.6% mixed. Table 2 shows the distributions.

The scope characterization shows that private projects tend to be smaller (micro and small projects) and focus mainly on software development, process optimization,

and business entrepreneurship; medium and large projects involve infrastructure development, such as office construction, real estate projects, and facility maintenance; the scope of private projects tends to rely on efficiency improvement, process optimization, and business growth.

Public projects tend to be larger (large-scale and mega-projects) and focus on improving infrastructure for public use, such as roads, bridges, and educational buildings. Mid-sized projects improve communities and strengthen local infrastructure. Overall, the scope of public projects aims at collective welfare and sustainable development of infrastructure and public services.

Finally, projects address issues such as structural integrity management of hydrocarbon transportation infrastructure, technical assistance for road projects, and power transmission lines. The scope of mixed projects often includes public-private partnerships for plans of national importance.

In summary, the scope of projects in the study varies by type and size. Private projects focus on efficiency, process optimization, and business growth, while public projects focus on the collective good and sustainable development of infrastructure and public services. Furthermore, hybrid projects represent a collaboration between both sectors to address projects with national outcomes.

The Stata program was used to analyze the statistics from Table 3. They were validated, which led to the description by factors. For the analysis, we considered the type and size of the project to which the participants were linked.

Table 3.
Statistical analysis of the measurement construct

Factor	Indicator	Mean	Standard deviation	Cronbach's alpha if the item is deleted
Customer orientation	C1	4.32	0.708	0.776
	C2	4.32	0.708	0.820
	C3	3.91	1.074	0.778
	C4	3.93	0.950	0.826
Leadership and communication	L1	4.16	0.833	0.703
	L2	4.11	0.813	0.741
	L3	3.91	1.007	0.738
	L4	4.27	0.694	0.728
	L5	4.05	0.939	0.798
	L6	3.95	0.963	0.699
Human talent	T1	3.84	1.098	0.785
	T2	4.25	0.781	0.824
	T3	3.91	1.074	0.800
	T4	4.29	0.701	0.803
	T5	4.02	1.067	0.794
	T6	3.91	0.856	0.853
	D1	4.00	0.835	0.908
	D2	3.98	0.821	0.901
	D3	4.02	1.067	0.921
Project performance	D4	4.20	0.851	0.906
	D5	3.84	1.098	0.909
	D6	3.70	1.069	0.906
	D7	4.02	0.849	0.909
	D8	4.05	0.861	0.912
	D9	4.05	0.776	0.899

Source: Own work based on the research conducted

4.1 *Customer orientation*

The first evaluated factor corresponds to customer orientation and consists of four indicators. The reliability of the scale is satisfactory, with a Cronbach's alpha of 0.831 ($\alpha=0.831$); the KMO measure of sampling adequacy is 0.710, and Barlett's sphericity is <0.001 . The value of the determinant of the correlation matrix is 0.147, indicating an adequate degree of correlation between the variables.

The results indicate that in the Colombian context, projects seek members who understand the client's objectives, needs and expectations; therefore, it is relevant that team members adequately understand the scope to avoid any resistance to possible changes. In this sense, it is crucial to create a common vision to understand these objectives.

In addition, quality management has been effectively implemented, including monitoring and control activities that ensure quality in the processes and in the final results, even for suppliers and contractors involved.

4.2 *Leadership and communication*

The second factor, leadership and communication, consists of six indicators. The reliability of the scale is satisfactory, with a Cronbach's alpha of 0.763 ($\alpha=0.763$), the KMO measure of sampling adequacy is 0.688, and Barlett's sphericity with significance <0.001 . The value of the determinant of the correlation matrix is 0.134, which indicates an adequate degree of interrelation between the variables.

The results indicate a positive attitude towards quality from the project planning stage. In this sense, we observed that the communication channels favored the exchange of ideas among team members and facilitated the coordination of activities related to quality management, teamwork and learning at all levels. Regarding communication, one participant stated that the value of meetings in project management is fundamental because "they can provide immediate solutions and the customer's needs can be understood directly".

In addition, it has been found that trust among members can be improved by developing collective co-creation experiences and maintaining more open and assertive communication channels [37]. In this sense, leaders should act as change agents in the transformation of organizational culture, so it is crucial to establish the vision, mission, values, policies, and action plans in line with the strategy, maintain assertive communication, and assign roles and responsibilities according to the functions, qualifications, competencies, and skills of employees.

In the case of environmental change projects, it is necessary to adopt strategies that allow for a timely response and to strengthen innovative communication channels to promote learning and ensure understanding of the mission, vision and organizational policies, as well as the involvement of people in strategic formulation.

4.3 *Human talent*

Human talent is defined by six measurement indicators: a people-oriented culture is considered a relevant part of project management. The scale reliability exhibits a satisfactory score, with a Cronbach's alpha of 0.837 ($\alpha=0.837$); the KMO measure of sampling adequacy is 0.830, and Barlett's sphericity is <0.001 . The value of the determinant of the correlation matrix is 0.093, implying a high interrelation of the variables.

Regarding human talent, the findings show comprehensive and understandable information about the role in the project, allowing autonomy and responsibility. The needed knowledge to direct the organizational activities must be accessible to the indicated people at the right time [38].

From the results, the project management inclines to provide adequate training and capacity building to its collaborators, improving the performance of the respective functions. Training is the principal activity to develop employees' competencies and skills [28]. Likewise, the climate of trust and respect facilitates the exchange of knowledge, experiences, and information necessary for developing the organizational activities and the proposed objectives.

Therefore, respondents indicated that the received training is related to leadership, soft and managerial skills: 18.8%; followed by topics on project formulation and development methodologies, technical training, and integrated management systems: 17.7%, 14.6%, and 10.4%, respectively. In terms of standards and regulations applicable to the project: 9.4%. On the other hand, the remaining topics, such as customer service (7.3%), improvement methods and techniques (5.2%), including business intelligence (4.2%), data analytics (2.1%), lean manufacturing (2.1%), and other unspecified topics, obtained a response percentage, increasable aspects to foster more competitive environments that stimulate learning and improvement actions.

As for the types of incentives and recognition among employees in the context of projects, emotional appreciation in the private and public spheres seems to be the most common type of motivation, with 25% and 24%, respectively, followed by flexible working hours or teleworking, with 28.8%; direct economic motivation, with 11.5%; promotion, career development or increased responsibilities in the project, with 7.3%, and access to continuous training processes, with 7.3%. Consequently, it is observed that in-kind incentives and recognition in social networks or the press, among others, are less prevalent in this context; therefore, management projects must innovate in recognizing employees who contribute to the achievement of objectives and performance improvement.

4.4 *Project performance*

The fourth factor in the measurement corresponds to the project performance scale, which consists of nine items. The reliability of the scale presents a very satisfactory level, with a Cronbach's alpha of 0.911 ($\alpha=0.911$); the KMO measure of sampling adequacy is 0.855, and Barlett's sphericity is <0.001 . The value of the determinant of the correlation matrix is 0.001, indicating that the variables are highly correlated.

The results on organizational performance show that leadership as part of the quality culture was fundamental to

improving project performance. Improvement is how the project solves problems, makes decisions, manages change, and constantly learns [39].

Quality culture promotes better project performance by mediating people's work styles [40]. This culture is essential for achieving peak performance because it helps group members share the same vision, feel they have common goals, and work toward a greater purpose. In addition, it allows for the creation of a support network whose members can trust each other.

The results show that project managers in the Colombian environment are willing to listen to and consider suggestions for improvement from team members, clients, and other stakeholders. Timely change management focused on improvement leads to positive results in customer satisfaction [36].

Regarding the participants' perception of process monitoring and measurement mechanisms, it is observed that the most used methods for data and information processing are financial analysis and quality tools and techniques, such as the cause-and-effect diagram and the Pareto diagram, as well as time analysis and critical paths, among others. In specific cases, "business intelligence tools" are used, as mentioned by participant P, and participant E: "PMI standard tools and software such as Power BI". Thus, the use of different methods for monitoring and measuring performance is evident.

The results indicate the need to strengthen performance monitoring and measurement mechanisms, and tighten information analysis to facilitate assertive decision making by project members. Employees need to be given more responsibility, freedom and opportunities to participate in decision making, as this leads to empowerment and changes in their behavior [41]. This will improve the quality of the project and the organization's ability to respond to change and customer needs.

4.5 Perspectives on quality culture in projects

Participants were allowed to express their perspectives on five central facets of the project's quality culture, with questions ranging from training and incentives to performance, improvement, and lessons learned. Responses to these open-ended questions were analyzed using a grounded theory approach.

Q1 explored the training and education subjects received during the course of the project. Q2 inquired about the type of incentives or recognition received in project implementation based on individual outcomes. Q3 sought to understand participants' views on the contribution of quality management to operational performance, with participants tending to emphasize the importance of minimizing unforeseen events and optimizing resources. In addition, Q4 was designed to gain insight into participants' thoughts on potential improvements to the project's quality culture, while Q5 asked participants to share lessons learned about quality management within the project.

These qualitative responses were systematically analyzed using grounded theory [42], a methodological

Table 4.

Codified analysis of the contribution of quality management to the operational performance of the project

Recurrent expressions	Category	Definition
Control of milestones, minimize contingencies	Control and monitoring	Monitoring and controlling project milestones to anticipate and manage risks and contingencies.
Assurance of deliverables, compliance	Quality assurance	Process of ensuring that project deliverables meet established requirements and quality standards.
Avoidance of rework, delays, and cost overruns Cost and time reduction	Cost and time reduction	Optimization of resources and times, avoiding rework, delays, and additional project costs.
Early problem identification	Problem detection and resolution	Problem identification and resolution in early stages to avoid negative impacts on the project.
Development improvement, resource optimization	Continuous process improvement	Process of constant review and adjustment of project processes to optimize the use of resources and improve efficiency.

Source: Own work based on the research conducted

approach that facilitates the identification of key themes and patterns within the data. This approach provided a rich, nuanced understanding of participants' experiences and perceptions that effectively complemented the primary quantitative data and contributed to a fuller understanding of the research topic. This underscores the value of the mixed methods approach, despite the greater emphasis on quantitative data. Table 4 shows the coded results of the analysis of the contribution of quality management to the operational performance of the project.

In response to the question, "In your opinion, how can the quality culture in project management in Colombia be improved? They responded by highlighting the digital transformation in projects and companies. The majority

Table 5.

Codified analysis of possible alternatives for improving the quality culture in project management in Colombia.

Recurrent expressions	Category	Definition
Strengthening knowledge, training, education	Training and education	Training, capacity building, and education on quality issues to those involved in project management
Quality standards, company policies	Implementation of standards	Establishment and promotion of clear quality standards and company policies for monitoring and compliance.
Commitment, involvement	Commitment and accountability	Encourage commitment and accountability of everyone involved in the project to improve the quality culture.
Improve training plans, programs	Program development	Design and improve training plans and programs focused on promoting and strengthening the quality culture.
Accessibility, support software	Tools and technology	Implementation and use of tools and technology facilitating access to and assimilation of quality information.

Source: Own work based on the research conducted

considered as very relevant the potential adoption of digital technologies and processes to develop projects with a significant impact on all indicators, thus improving the quality of project management. Table 5 summarizes the results of the analysis of possible alternatives for improving the quality culture in project management in Colombia.

Finally, when asked to share some lessons learned about quality management in the project, most respondents tended to emphasize the importance of having well-defined requirements and parameters and maintaining proper documentation in quality management. Respondents emphasized the importance of effective communication and interpersonal skills in quality management. The latter can be interpreted as a call not only for rigorous project management training, but also for training in general professional skills.

One of the most striking findings from the analysis of the open-ended questions is the emphasis on establishing and maintaining a customer satisfaction-oriented approach, which is inextricably linked to assertive communication. Quality management in projects involves ensuring that specific requirements and parameters to be measured are recorded in a document that serves as a guide throughout the process, preventing nonconformities and ensuring that the client is satisfied with the results.

Respondents involved in construction projects stress the importance of quality control of materials and construction processes. They emphasize the need for laboratory testing and field inspections to ensure that the finished work meets expected quality and safety standards. Table 6 shows lessons learned in project quality management.

Table 6.
Codified analysis of lessons learned in project quality management.

Recurrent expressions	Category	Definition
Specific requirements, parameters, documentation	Documentation and requirements	Relevance of clarified requirements and parameters, and maintaining adequate documentation in quality management.
Quality control, constructive processes, laboratory tests.	Control and monitoring	Testing, monitoring, and quality control to ensure compliance with standards and safety.
Resource optimization, constant review	Continuous improvement	Optimization of resources and constant review to improve quality.
Quality standards, management indicators	Standards and indicators	Quality standards and management indicators to measure and improve quality in projects.
Communication and soft skills	Communication and soft skills	Importance of effective communication and soft skills development in quality management.

Source: Own work based on the research conducted

5 Conclusions

Managing quality in the context of projects is a complex process that requires a comprehensive understanding of the needs and expectations of not only the client, but all relevant stakeholders. However, creating a quality culture goes beyond this customer-centric approach and requires a structural framework that fosters a paradigm shift toward collective learning and improvement.

This culture of quality aligns with the project's ability to deliver expected results in a competitive arena and improve performance. As such, organizations and projects that cultivate a culture anchored in quality management principles can transcend traditional boundaries, easily adapt to change, and demonstrate greater resilience.

This study uses a mixed-methods approach, utilizing a predominantly quantitative approach, supplemented by qualitative inputs, to understand the culture of quality in project management. The validity and reliability of the instrument used for data collection, consisting of both Likert-type scale questions and open-ended questions, were thoroughly assessed.

Statistical analyses showed that the constituent indicators of the instrument used were highly effective in measuring the variables and factors defined. The factor analysis extraction method revealed an inherent structure with a high level of sample adequacy. Furthermore, the determinant of the correlation matrices for each factor suggested robust intercorrelations among the variables, maintaining linear independence.

Our study provides substantial empirical results regarding the state of quality culture as a foundation for project success. The findings suggest that the projects included in the study have successfully implemented a customer focus, developed continuous improvement processes, and incorporated training and capacity building activities for human talent.

Leadership has encouraged projects to adapt quickly to environmental changes, fostering a culture of trust and respect that facilitates the exchange of ideas and knowledge among team members. In addition, communication channels are well maintained to help achieve the goals and scope defined by the project.

It is recommended that processes be continuously monitored and evaluated using appropriate methods, and that the impact of quality practices on project performance be studied in a way that minimizes risk and ensures success. In addition, project management in the Colombian context should increase its dynamic capabilities to take full advantage of the digital technologies of Industry 4.0, with due recognition of the mediating role of learning.

The study highlights the need for project team members to possess soft skills, such as assertive and effective communication. This finding highlights a potential gap in formal project management education, which may still be heavily focused on technical and operational aspects.

This research contributes significantly to the project management literature by providing insights from a preliminary sample on the state of cultural development in the Colombian context. Despite its considerable value, the study has limitations regarding the generalizability of the results and should be extended to other regions of the country, taking into account

possible regional differences and the need for a larger sample size to obtain generalizable results.

The results of this exploratory study invite the formulation of new hypotheses and provide a foundation for future research, particularly focusing on strategies to promote a culture of quality. Future research could further explore the interactions between learning and knowledge management in the project environment, and develop strategies for motivating and retaining human talent in project teams.

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Appendix A. Measured construct

Section B. Please indicate the extent to which you agree or disagree with the following statements about the project, where 1 - Strongly Disagree, 2 - Disagree, 3 - Agree, and 4 - Strongly Agree.

Factor 1. Customer orientation

- C1. The objectives of the project were communicated to me.
C2. I understand the needs and expectations of the project customer.
C3 Quality management practices are extended to suppliers and contractors.
C4 Project quality management is monitored on a regular basis.

Factor 2. Leadership and communication

- L1. There is a pro-quality attitude from the start of the project.
L2. The communication channels used by the project allow me to express my ideas clearly and to listen to those of other members of the work team.
L3. The project management makes timely decisions to adapt to changes in the environment.
L4. My responsibilities are defined according to my role in the project.
L5. Managers are available and involved in project quality management.
L6. The project team operates according to a quality policy.

Factor 3. Human talent

- T1. The training I receive is relevant to my role.
T2. I have an environment of trust and respect that allows me to share my knowledge, information and experience with the project team.
T4. My contribution to the achievement of project objectives is recognised.
T5. My learning and professional development as a project team member is encouraged.
T6. The documented information is clear and understandable for the development of my role in the project.

Factor 4. Project performance

- D1. Project managers are interested in hearing and implementing my suggestions for improvement.
D2. Teamwork is encouraged to solve problems and lessons learned are shared.
D3. They evaluate my performance and communicate the results to me.
D4. The data and information obtained from monitoring project processes is useful for decision making.
D5. Quality management has contributed to meeting the project schedule.
D6. Quality Management has enabled expenditure to be kept within the approved project budget.
D7. Customer complaints are carefully analysed to improve project performance.
D8. Detected non-conformities are carefully analysed to improve project performance.
D9. Continuous improvement is evident in the project.

Section C. Please answer the following questions,

- Q1. On what subjects did you receive training and/or education during the development of the project?
Q2. What kind of incentives or recognition have you received during the project implementation for your results?
Q3. In your opinion, how does quality management contribute to operational performance?
Q4. In your opinion, how can the quality culture in project management in Colombia be improved?
Q5. Could you share any lessons learned about quality management in the project?