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Editorial

This issue of MLS Project Design & Management reinforces the academic and scientific multidisciplinary participation of our collaborators in the design, development and implementation of tools and instruments applicable to strategic management, resource optimization and sustainable innovation in engineering projects. Innovation in scientific and technological development is a fundamental feature, reflected in the main objectives of the journal, as part of its lines of research and dissemination. This new edition articulates, from diverse approaches and contexts, a convergent reflection on change management, sustainability and decision making in complex and territorially differentiated environments. The articles agree that contemporary challenges in sustainable rural production, public service delivery, access to health care, project implementation, organizational leadership, architectural design or academic management require integrative, adaptive and evidence-based models. Throughout the issue, we note the need to strengthen institutional and human capacities, optimize processes and reduce gaps, incorporating social, environmental and economic dimensions that have traditionally been neglected. Together, these contributions propose a common agenda oriented towards sustainability, methodological innovation and effective governance, offering rigorous and contextualized responses to complex problems that demand systemic and dynamic solutions.

The first article entitled "Feasibility of abacá fiber production and commercialization in Urabá (Colombia)" demonstrates, with technical, economic and environmental evidence, that abaca cultivation is viable in the Urabá subregion thanks to favorable soil and climatic conditions and competitive yields. Pilot test results confirm a high-strength fiber with sustainable productivity. Beyond production, the work highlights the potential of abaca as a driver of circular economy, soil conservation and socioeconomic inclusion.

The research presented in the second article of this edition evaluates the implementation of a quality management system based on the PDCA cycle, showing a significant improvement in internal customer satisfaction. The study shows that quality management not only optimizes processes, but also has a direct impact on labor welfare. Internal satisfaction emerges as a key indicator of institutional performance.

The third article analyzes how territorial dispersion structurally limits access to primary health care in extreme rural regions such as Cumaribo (Vichada, Colombia). Geographic extension, rurality and population growth strain the system's capacity to guarantee timely and quality access. The article highlights the need for differentiated territorial planning and governance strategies.

The fourth article proposes an integrated methodology for civil project management in the face of the fragmentation and partial use of existing standards. Based on international references and validated in real projects in Antioquia, the proposal improves planning, execution and decision making. The results show clear advances in time control, costs, resources and stakeholder satisfaction. The study provides a robust and adaptable tool to professionalize the management of civil works.

The fifth article argues that traditional management approaches are insufficient in the face of the complexity and uncertainty of rural development projects. Based on the empirical diagnosis, adaptive management is highlighted as an effective framework for dealing with risks and contextual changes. This approach prioritizes continuous learning and flexible decision making throughout the project cycle.

The sixth article reexamines Kotter's model in light of dynamic and digitized organizational environments. While recognizing its structural value, it identifies limitations associated with its linear and hierarchical nature. By contrasting it with contemporary approaches (Agile, Lean, adaptive leadership), it proposes a hybrid integration combining strategic discipline with flexibility offering a conceptual update relevant to sustainable change management.

Through a recent systematic review, the seventh article highlights the obsolescence of traditional architectural design methodologies in the face of today's challenges. The paper highlights the need to close the gap between theory and practice of design.

Finally, the eighth article diagnoses weaknesses in the capacities of academics to formulate and manage projects with an impact on the SDGs. The results reveal low knowledge of project management and the perception of difficulty in accessing external financing. Based on the theory of resources and capabilities, an R&D management system that strengthens competencies and institutional trust is proposed. The study provides a roadmap for linking academia, projects and sustainable development.

The research presented in this issue provides empirical evidence and relevant conceptual developments, inviting us to critically rethink how interventions are designed, managed and evaluated in contexts marked by complexity and uncertainty. In this way, the journal reaffirms its commitment to the dissemination of rigorous, relevant and impactful knowledge that contributes to informed decision-making and the strengthening of sustainable, adaptive and socially responsible practices in the different areas of development.

Before concluding this editorial, it is important for all of us who collaborate in this new project to thank the team of collaborators, IT and technical, as well as the Iberoamerican University Foundation (FUNIBER) and the Universities that have provided all the material support so that this issue can be carried out, with the conviction that we are on the right path towards international recognition.

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FEASIBILITY OF ABACÁ FIBER PRODUCTION AND COMMERCIALIZATION AS A SUSTAINABLE ALTERNATIVE IN THE URABÁ SUBREGION, ANTIOQUIA

FACTIBILIDAD DE LA PRODUCCIÓN Y COMERCIALIZACIÓN DE LA FIBRA DE ABACÁ COMO ALTERNATIVA SOSTENIBLE EN LA SUBREGIÓN DE URABÁ, ANTIOQUIA

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ABSTRACT

This article presents the results of a technical, economic, environmental, and social feasibility study for the production and commercialization of abaca fiber (Musa textilis) as a sustainable alternative in the Urabá subregion of Antioquia, Colombia. A mixed descriptive and analytical design was developed, structured in five methodological phases that included documentary review, application of the SWOT method, and the execution of a pilot test with 150 seedlings to determine fiber productivity and quality. Soil analyses, agroecological observations, and laboratory tests were conducted under the NTC 992 standard, complemented by financial and market evaluations. The study demonstrated that Urabá's edaphoclimatic conditions are optimal for cultivation, achieving yields of 1.4 t/ha/year and high-strength fibers (45 cN/Tex) classified as grade 1. The production of abaca contributes to soil conservation, circular economy practices, and the generation of employment and productive inclusion. These findings highlight the significant role of abaca in diversifying Antioquia's rural production and its contribution to the development of sustainable bioeconomic models.

Palabras clave:
abacá, agroindustria, producción agrícola, economía rural, planificación agrícola.

RESUMEN

Este artículo presenta los resultados de un estudio de factibilidad técnica, económica, ambiental y social para la producción y comercialización de la fibra de abacá (Musa textilis) como alternativa sostenible en la subregión de Urabá, Antioquia (Colombia). Se desarrolló un diseño mixto de tipo descriptivo y analítico, estructurado en cinco fases metodológicas, que incluyeron la revisión documental, la aplicación del método DOFA y la ejecución de un ensayo piloto con 150 plántulas para determinar productividad y calidad de la fibra. Se efectuaron análisis de suelos, observaciones agroecológicas y pruebas de laboratorio bajo la norma NTC 992, complementados con una evaluación financiera y de mercado. El estudio demostró que las condiciones

edafoclimáticas de Urabá son óptimas para el cultivo, alcanzándose rendimientos de 1,4 t/ha/año y fibras de alta resistencia (45cN/Tex). La producción de abacá contribuye a la conservación de suelos y a la economía circular, como también a la generación de empleo e inclusión productiva. Estos hallazgos remarcan el importante aporte del abacá en la diversificación de la producción rural de Antioquia y su aporte a la generación de modelos de bioeconomía sostenible.

Introduction

The search for sustainable productive alternatives has become a phenomenon of enormous importance in the current context of global environmental crisis, characterized by the degradation of ecosystems, climate change and overexploitation of natural resources, a situation that poses a risk to economic and social stability in vast regions of the planet. The understanding of this global problem has led the United Nations 2030 Agenda, in its Sustainable Development Goals (SDGs), to promote changes in production models, seeking the integration of environmental, economic and social criteria, and promoting the transition to a low-carbon economy based on the rational use of natural resources. The valorization of natural fibers from plant sources has been aligned with this trend, acquiring a place of importance for its potential to replace polluting synthetic inputs and offer income alternatives for rural communities that depend on agriculture for their livelihoods (Araya-Salas, Pérez, et al., 2022; Zambrano, 2015; Zambrano, 2015) (Araya-Salas, Pérez, et al., 2022; Zambrano, 2015).

Abaca (Musa textilis) turns out to be one of the natural fibers with the greatest projection in this new scenario, as its mechanical qualities, water resistance and durability are recognized (EcuRed, 2017; Richter et al., 2013). This crop, native to the Philippines, belongs to the musaceae family and is distinguished for producing a high quality fiber used in the production of twines, industrial papers, textiles, composite materials and, recently, in technological and automotive applications (Sinha et al., 2021). The versatility of abaca fiber and its biodegradable nature has led to its incorporation into sustainable production chains, making it a strategic resource for the bioeconomy. The Philippines continues to be the world's leading producer and exporter, followed by Ecuador, a country that has managed to consolidate a competitive agro-industrial and commercial model based on product quality and the opening of international markets, especially to Asia and Europe (Castellanos, 2015; Chamba, 2017). In Latin America, the Ecuadorian experience, the closest and most recognized, has become a reference for the rational use of this plant, showing positive results in terms of profitability, rural employment and export diversification (Alfaro, 2021; Rodríguez, 2022) (Alfaro, 2021; Rodríguez, 2022).

The abaca crop has agro-ecological characteristics that make it compatible with various tropical zones, and its production is feasible in warm and humid climates, with rainfall exceeding 1,800 mm per year. Abaca cultivation requires average temperatures between 22 and 28 °C and well-drained silt loam or clay loam soils (Furukawa Commercial Plantations, 2020; F. Zambrano, 2015). These conditions are present in large regions of Colombia, and the department of Antioquia rightly combines a diversity of thermal floors, fertile soils and a strategic location with access to the interior of the country and the Caribbean Sea. Although the geographic and soil conditions are potential for the case of Colombia and the department of Antioquia, its production has remained limited almost exclusively to fique, whose supply does not meet national and international demand (Castillo, 2012). It can even be stated that Colombia lacks documented experiences on the planting and processing of abaca, which represents a knowledge gap and an opportunity for innovation within the agroindustrial sector.

For the specific case of the department of Antioquia, its productive structure faces challenges associated precisely with the concentration of its productive economy in a few traditional crops and the vulnerability associated with the volatility of international markets, despite being a department with a strong economic leadership and its

contribution to the national gross domestic product (Rural Development Agency, 2019). Therefore, the promotion of new sustainable crops is a key alternative to strengthen the rural economy, diversify production and generate employment opportunities and social inclusion. The Urabá subregion, for example, located in northwestern Antioquia, has favorable climatic, edaphic and logistical conditions for the introduction of tropical species of high commercial value. Its location on the Caribbean coast, proximity to the future Puerto Antioquia and the development of 4G infrastructure project it as a strategic enclave for the export of agro-industrial products (Daza & Serrano, 2022; Comfama Magazine, 2023). In addition to the above, the processes of improving security and the consolidation of educational and business institutions have strengthened the socioeconomic fabric of the region.

Studies such as the one developed by Bula (2020) argue that sustainable agricultural expansion contributes to poverty reduction and the strengthening of local economies, especially when it is based on inclusive production chains. Other studies, related to the physiology and management of abaca in Ecuador, Costa Rica, and the Philippines (Araya-Salas, Arias-Aguilar, et al., 2022; Araya-Salas, Perez, et al., 2022; Yaguachi, 2024)the results of these studies show that its planting favors soil conservation, water retention and biodiversity, reducing erosion and improving soil structure. These are findings that make clear the profitability potential of this type of crop and the responsibility with the environment present in its practice, aligning with the principles of sustainable development, so that the introduction of abaca in Antioquia can contribute to the fulfillment of SDG 8 (Decent work and economic growth), 12 (Responsible production and consumption) and 15 (Life of terrestrial ecosystems).

International demand associated with the production and industrialization of abaca has grown significantly in the last decade, driven by this described trend, seeking the substitution of synthetic fibers for renewable natural materials (EcuRed, 2017; Sinha et al., 2021). However, given that producing countries face challenges related to climate variability, plantation installation costs, and the quality requirements of the international market (Bravo Esmeraldas et al., 2023; Tenorio & Añazco, 2022), the Urabá subregion offers an important opportunity to fill this gap and establish an agroindustrial project based on abaca as a sustainable natural fiber. Its clay soils with good cation exchange capacity, its average temperature close to 28°C and an annual rainfall of more than 2,500 mm place it within the parameters required for cultivation (Codazzi, 2007; IDEAM, 2020). The presence in Urabá of a diversified rural economy (banana, plantain, palm and cacao) also facilitates the transfer of agricultural know-how and the development of new production chains. At the infrastructure level, progress in the construction of the port and logistics corridors increases the territory's competitiveness and reduces transportation costs to international markets (Government of Antioquia, 2023).

Despite this potential, there is work to be done in terms of more detailed analysis of the technical, economic, environmental and social conditions of abaca production in Urabá. This is an important gap in the literature and in regional agricultural development planning. We have already mentioned the existence of studies related to its production and the context of the region, but the adaptation of the crop to the specific conditions of the Colombian Caribbean also requires empirical research to evaluate its viability from an integral approach. New studies of this nature can reduce investor uncertainty, guide rural development policies and strengthen the environmental sustainability of the territory. For Estrada et al. (2022), feasibility studies in agroindustrial projects are essential to efficiently plan resources and minimize financial, social, and ecological risks.

The present study, developed in the geographic scenario of the Urabá sub-region, contributes research to this empty space, orienting its purpose towards the feasibility

analysis to determine the viability of the production and commercialization of abaca fiber as a sustainable alternative in this region of the country. The study articulates the technical, economic, social and environmental dimensions, with the purpose of evaluating the real conditions for the establishment of the crop, its potential profitability and its impact on regional development. Thus, this research seeks to identify the conditions required for cultivation in the region; an analysis of the technical, economic, social and environmental feasibility of the production process; and the definition of the viability for its commercialization as a sustainable alternative.

Method

This research adopted a mixed descriptive and analytical approach, with the main purpose of integrating the empirical evaluation of the agroecological characteristics of the area with the documentary and financial analysis of successful international experiences, mainly those of Ecuador and the Philippines. This design allowed contrasting theoretical information with field evidence to generate conclusions applicable to the Colombian context, thus contributing to the planning of sustainable productive projects in territories with underutilized agricultural potential.

Direct observations and interviews were conducted with key stakeholders in the agricultural sector of the Urabá region to identify perceptions, limitations and opportunities associated with the introduction of abaca as an alternative crop. Technical analyses were carried out on soils and climatic conditions of the selected area, in order to compare these parameters with the agronomic requirements established by the specialized literature (Araya-Salas, Pérez, et al., 2022; F. Zambrano, 2015). The review of secondary information sources was another key activity for the assessment of information contained in institutional reports, agricultural databases and feasibility studies of producer countries, providing relevant information for the construction of evaluation indicators.

The method of analysis chosen for information triangulation was the SWOT method, regularly used in feasibility studies due to its capacity to integrate internal and external variables that influence project viability. The SWOT method allowed the technical, economic, environmental and social analysis of the crop, taking into account the structural conditions of the territory such as market, institutional and community factors.

The development of the study involved three sequential phases: A first phase of information gathering, consolidating a matrix of variables based on the critical success factors identified in regional and Latin American experiences of natural fiber production. This also involved the application of semi-structured interviews with agricultural experts, representatives of public entities and entrepreneurs from the agroindustrial sector, allowing the identification of perceptions about the viability of abaca in the region. A second phase was oriented to technical and economic analysis, comparing the agroecological conditions of Urabá and international production standards, with the documentary support of IDEAM's climatological records and IGAC's soil characterization. In the next phase, a simplified financial model was developed to estimate the expected profitability indicators, such as the Net Present Value (NPV) and the Internal Rate of Return (IRR), taking as a reference the results obtained in similar projects in Ecuador (Alfaro, 2021; Rodríguez, 2022). In the last phase of the study, the findings of each dimension were integrated into a SWOT matrix that made it possible to establish

feasibility scenarios and propose strategic guidelines for the future implementation of the crop in the region.

The present study respected the principles of truthfulness, confidentiality and transparency in the collection and handling of information, applying informed consent to the participants in the interviews, ensuring that the data used came from public or freely accessible institutional sources. The results are presented objectively, without inducing value judgments or compromising particular interests, seeking coherence with good research practices.

Results

Conditions Required for Abaca Cultivation in the Urabá Subregion

Colombia has no documented history of the crop, so the research required the support of recent studies carried out in countries with a tradition of production such as Ecuador, Costa Rica and the Philippines, whose tropical contexts and lateritic soils offer direct references for understanding the adaptation of abaca to similar conditions. The review was complemented with empirical observations obtained on farms in Chigorodó and Turbo, where soil analysis and microclimatic records were carried out for validation purposes.

The data collected showed that Urabá has an annual temperature range between 26°C and 28°C, relative humidity above 80% and annual rainfall between 2,400 and 2,800 mm (Weather Spark, 2024) (Weather Spark, 2024). These values are close to the optimal parameters described in the international literature for the development of abaca (values between 24 and 30°C and 2,000 to 3,000 mm per year), which confirms the climatic affinity of the territory with the producing areas of Southeast Asia and the Ecuadorian coast (Yaguachi, 2024; F. Zambrano, 2015). Urabá's thermal stability reduces water stress and favors sustained photosynthesis throughout the year, thanks to low diurnal oscillations and minimal incidence of prolonged droughts. This is an essential condition for biomass accumulation and fiber quality.

The edaphic laboratory analysis showed predominantly clay loam and clayey soils, with clay contents between 51% and 61%, acid pH (4.8 to 5.8) and organic matter between 1.3% and 2.8%. These are edaphic features that denote characteristics compatible with crop requirements, provided that corrections are applied with calcium carbonate or dolomitic lime characteristics, despite the fact that these results reveal a certain acidity (Araya-Salas, Pérez, et al., 2022). The adequate calcium content (14 to 22cmol(+)/kg) and the low presence of exchangeable aluminum improve soil structure and allow optimal root development. Phosphorus (5 to 10 mg/kg) and potassium (0.3 to 0.5 cmol(+)/kg) levels are sufficient to ensure leaf emission and pseudostem elongation, while iron and manganese remain at high levels without being toxic. Marginal zinc deficiency (<1.2mg/kg) was also detected in some areas, so foliar supplementation during the early stages of growth is important in this case.

Comparison with the soils of Esmeraldas and Santo Domingo de los Tsáchilas in Ecuador showed that the chemical conditions of Urabá are equivalent or even superior in terms of moisture retention and cation exchange capacity (CICE 22.9 to 30.3 cmol(+)/kg). This places the territory within the range considered "suitable with moderate management", which means that abaca could be developed without severe restrictions or requiring drastic land use transformations. The flat, undulating relief of the region also

facilitates partial mechanization of planting and weed control, increasing efficiency in the establishment phase.

Table 1

Comparison of edaphoclimatic conditions of Urabá versus abaca-producing zones

Parameter	Urabá (Antioquia)	Ecuador (Esmeraldas, Santo Domingo)	Optimum requirement Musa textilis	Interpretation
Temperature (°C)	26-28	24-30	24-30	Optimum
Precipitation (mm/year)	2.400-2.800	2.500-3.000	2.000-3.000	Adequate
Relative humidity (%)	80-85	80-90	>75	Favorable
soil pH	4,8-5,8	5,0-6,0	5,0-6,5	Slightly acidic (correctable)
Organic matter (%)	1,3-2,8	1,5-3,0	>1,5	Acceptable
ICC (cmol(+)/kg)	22,9-30,3	21-29	>20	Good nutrient retention
Texture	Clayey loam / Clayey	Clay loam	Clay loam	Compatible

Note. Own elaboration based on Laboratorio de Suelos UNAL (2022), F. Zambrano (2015), Yaguachi (2024) and Weather Spark (2024).

The studies of Araya-Salas, Pérez, et al. (2022) and Araya-Salas, Arias Aguilar, et al. (2022) demonstrated that abaca responds favorably to agroforestry systems with partial shade, where companion species reduce the direct thermal impact and conserve soil moisture. These conditions are similar to those in Urabá, which increases seedling survival and improves average fiber length by 15%. Tenorio and Añazco (2022) showed that fertilization injected with mixtures rich in micronutrients and biostimulants such as Agrotafol Combi and Basfoliar Algae SL optimizes pseudostem resistance and maintains productivity throughout the year, a technique that could be replicable in the region.

There are also the findings of Bravo Esmeraldas et al. (2023), who identified that low density treatments combined with organic fertilization (pollinasse) show greater increases in pseudostem diameter and number of tillers, indicators of higher potential fiber production. However, when there are high densities or the use of porquinaza, yields are significantly reduced, which coincides with the agronomic principle of avoiding light and soil competition. Given the geographical context of Urabá, and given the humidity and nutrient availability conditions, the most appropriate strategy would be to adopt wide planting frames (3×3m or 3.5×3.5m), with progressive organic fertilization and prioritizing the use of local agricultural by-products to maintain sustainability.

Direct observation in the field confirmed that the physical characteristics of the Urabá soil reduce the risk of waterlogging. This is a determining factor for the success of the crop in tropical regions; however, in areas with a high water table it is more advisable to install surface drains of the "camellon" type to avoid water accumulation during the rainy season, following the management recommendations related by Araya-Salas, Pérez, et al. (2022). The implementation of these practices, together with the mechanical control of weeds and the incorporation of organic matter, make up a viable initial technological package for the first stages of crop expansion.

Pilot Trial for Agroecological, Productive and Quality Feasibility Study

In order to empirically verify the adaptability and behavior of abaca in the tropical conditions of the Urabá region of Antioquia, a pilot trial was carried out with 150

seedlings in a mixed-use agricultural plot. This experiment sought to determine the productivity, yield and quality of the fiber obtained compared to international technical reference parameters. The trial was carried out during a complete cycle of establishment and harvest, under a monitoring scheme that included measurements of temperature, soil moisture, accumulated precipitation and physicochemical characteristics of the soil.

The process showed a stable physiological behavior of the crop, with no evidence of water stress or significant nutritional deficiency. The average temperature of the site ranged between 26.4 and 27.8°C, with annual rainfall close to 2,600 mm and relative humidity of 82%, values that coincide with the optimal ranges for the development of abaca reported by Yaguachi (2024) and F. Zambrano (2015). The soils, classified as clay loam, showed a pH between 5.5 and 6.0, homogeneous texture and good drainage, which favored root development and pseudotallus stability.

During the vegetative growth phase, plants showed high leaf vigor, with an average of 17 active leaves per individual at the sixth month, and pseudostems averaging 3.2 m in height at the end of the first year. These metrics reflect a positive result compared to the values recorded in the technical literature in tropical areas of Ecuador and the Philippines. Likewise, a shoot sprouting equivalent to 2.3 per plant was observed, which is a favorable indicator of regeneration and sustainability of the crop. Maintenance work focused on mechanical weed control and preventive leaf removal, without the need to apply herbicides or fungicides. The latter reaffirms the compatibility of abaca with agroecological systems with low environmental impact.

After 14 months of development, the harvesting phase began with the cutting of ripe pseudotalli and their processing by mechanical shredding. It is a process that included washing, partial drying and manual classification of the fibers according to their anatomical origin (external sheath, internal sheath and central sheath). During this stage, significant differences were identified between the three types of pods in terms of length, color, ripple content and tensile strength. The fibers from the central and inner sheaths showed better parallelization, more uniform texture, less presence of residues and greater mechanical resistance than the outer fibers, which showed a darker tone and slight surface irregularity.

The average weight of fresh bunches was 1.8 kg for the central sheath, 2.2 kg for the inner sheath and 1.2 kg for the outer sheath, for a total of 5.2 kg of wet fiber per plant. Considering a projected planting density of 10,000 plants per hectare, the estimated production reached 52,000 kg/ha of wet fiber. Based on an average moisture content of 12%, the dry yield was calculated at 45,760 kg/ha (45.7 tons), a figure significantly higher than the averages recorded in Ecuador and the Philippines where the FAO (2021) reports between 1.5 and 2 tons of dry fiber per hectare. It is exceptional evidence of the productive potential of the Urabá region of Antioquia, due to its thermal consistency, soil fertility and uniform distribution of rainfall throughout the year.

The material collected was sent to specialized laboratories in Medellín for analysis under the NTC 992 standard (icontec, 2021) (ICONTEC, 2021) this standard regulates the quality parameters of natural fibers used in the textile and packaging industry. The tests were performed on three representative samples corresponding to the central, inner and outer sheaths. The results, summarized in Table 2, reflect outstanding values for length, toughness and purity.

Table 2

Abaca pilot trial results

Parameter	Central Sheath	Inner Sheath	Outer sheath	Standard NTC 992	Compliance
Length (cm)	190	180	110	≥80	Exceeds 137%
Toughness (cN/Tex)	45.11	45.58	37.23	>19.6	Exceeds 131%
Ripio (%)	0.23	0.17	0.55	<3	Fully complies
Total score	95	95	65	-	-
Grade of cabuya	1	1	2	-	-

The fiber of the central sheath reached an average length of 190cm, with a tenacity of 45.11cN/Tex and a ripple content of 0.23%. Likewise, the inner sheath showed similar results (180cm, 45.58cN/Tex and 0.17% ripple), while the outer sheath, although shorter (110cm) and less resistant (37.23cN/Tex), maintained impurity levels below 1%. These values far exceed the minimum standards required by the standard (≥80cm in length, ≥19.6cN/Tex toughness and <3% ripple). The final grade assigned by the laboratory was 95 points for the central and inner pods, classified as grade 1 cabuya, and 65 points for the outer pod, classified as grade 2.

The overall average tenacity (45.34cN/Tex) exceeded the value required by the national standard by 131%, confirming the excellent strength of the material. Likewise, the maximum length of 190cm represents 137% higher than the minimum standard, placing the Urabá fiber among the highest quality reported in studies of natural abaca. The 0.2% gravel content confirms the cleanliness of the mill and the adequate separation of the strands during shredding. The chromatic homogeneity and good parallelization observed in the central and internal fibers reinforce its suitability for high performance industrial uses such as cordage, upholstery and kraft paper.

From the morphological point of view, the fibers were characterized by a light beige color with yellowish tones, natural luster and smooth texture. Likewise, the cross section showed a compact polylaminar structure and a high degree of lignification, which contributes to its high toughness. The characteristic vegetal odor and the absence of fermentative odors indicated an adequate beneficiation process. The uniformity in diameter and the low proportion of broken fibers demonstrate the efficiency of the mechanical defiberization and drying process.

These results confirm that abaca grown in Urabá not only adapts optimally to local soil and climatic conditions, but also produces fibers of higher quality than the international average. The inner and central sheaths are the most value-added material, while the outer fibers, despite being of lower quality, can be used in secondary applications such as fillers, packaging or composite materials. The efficiency of the experimental process, coupled with the low residue content, supports the possibility of scaling up the cultivation to semi-industrial levels without compromising the quality of the final product.

Improvement opportunities were also identified to optimize fiber size regularity and reduce variations associated with post-harvest handling. The study by Cerdeño et al. (2023) suggests that the post-cutting resting time of the pseudostem directly influences fiber strength and elasticity; therefore, an interval of four to seven days under controlled conditions could further improve mechanical attributes, provided that tissue breakdown is avoided.

The data obtained confirm that the Urabá subregion has a competitive potential in the production of high quality natural fiber, capable of meeting the technical standards of the national and international industry. This is confirmed by the successful adaptation of the 150 seedlings and the quality obtained in the laboratory. Together they form an

empirical basis for the controlled expansion of the crop and the consolidation of a sustainable abaca agroindustry in Colombia.

Environmental and Social Impacts Associated with Abaca Cultivation in the Urabá Sub-Region

At the environmental level, the results show that abaca has ecological characteristics that contribute significantly to soil conservation, water regulation and the recovery of degraded ecosystems. Its deep and dense root system acts as a natural barrier against erosion, retaining moisture and preventing sediment loss. Abaca plantations reduce surface runoff, prevent landslides and facilitate water infiltration, benefiting soil structure and local aquifers. This capacity makes the crop an ideal tool for environmental restoration projects on eroded slopes or agricultural-forest transition zones.

It was also possible to demonstrate the possibility of using crop residues, such as leftover leaves and pseudostems, in the production of compost or biomass, thus reducing dependence on synthetic fertilizers. The use of these residues as organic fertilizers increases the organic matter content of the soil and reduces the carbon footprint associated with the production cycle. Similarly, the association of abaca with timber or fruit species in agroforestry systems diversifies income, conserves biodiversity and protects local fauna. These synergistic effects contribute to the fulfillment of SDGs 12 (responsible production and consumption), 13 (climate action) and 15 (life of terrestrial ecosystems).

The study also revealed negative environmental impacts that must be managed from the planning stage, such as the intensive use of water during fiber washing, the possible contamination of water sources by spills and the generation of biosolid waste. In addition, inappropriate use of pesticides or uncontrolled crop expansion could lead to deforestation or loss of soil fertility, especially in flat areas with poor drainage. These impacts have been documented in other producing regions, so it is necessary to incorporate integrated management practices, such as biological pest control, the use of treated wastewater and the implementation of recirculation technologies during washing.

At the social level, the study identifies abaca as a productive practice of inclusion, employment and community development, given the potential to generate between 16 and 25 direct jobs per 20 hectares, in addition to indirect jobs in transportation, processing and marketing. This figure is relevant in a context where labor informality exceeds 65% (DANE, 2023). The new jobs associated with abaca offer the possibility of formalizing rural work, improving income and promoting the economic stability of farming families. In addition, the project is aligned with the policies of the National Development Plan 2022-2026, which prioritizes the bioeconomy and sustainable rural productive transformation.

It also allows the inclusion of rural women and young people in the production chain, especially in the processing, associative and marketing stages. It is feasible that abaca cultivation could become a vehicle for closing gender gaps, strengthening women's leadership and revitalizing the local economy through productive diversification. The articulation with PDET programs (Development Programs with a Territorial Approach) and the substitution of illicit crops reinforce the dimension of peace and territorial reconciliation, consolidating agriculture as an axis of social cohesion (Fundación Ideas para la Paz, 2022).

Abaca cultivation promotes associative processes and local governance, as it requires coordination between producers, authorities and technical entities to achieve quality and sustainability standards. The Government of Antioquia (2023) and SENA have

promoted training in good agricultural practices, paving the way for the creation of an abaca agroindustrial cluster. The coordination with public and private institutions also facilitates access to rural credit, environmental certifications and international markets that value the traceability of the product.

The introduction of abaca in Urabá can generate complementary environmental and social benefits, provided that the process is guided by principles of sustainability, equity and institutional co-responsibility. Planting them contributes to restoring soils and mitigating climate change; it favors the creation of decent employment, the inclusion of vulnerable populations and the strengthening of the community fabric. This will of course depend on the local capacity to integrate technical knowledge, citizen participation and territorial planning, ensuring that abaca fiber production is simultaneously an engine for environmental conservation and sustainable human development in the Antioquian Caribbean.

Economic and Market Viability

From the economic point of view, the proposed model is based on the comparison of production costs, expected income and profitability flows, disaggregating the cost structure into three categories: initial investment or fixed establishment costs, annual operating costs, and processing and marketing costs. The calculations of the study show the need for an initial investment per hectare of US$5,500, including land preparation, acquisition of seedlings, installation of drainage, shredding equipment and planting labor. Annual operating costs, such as fertilization, phytosanitary control, maintenance and harvesting, are around US$1,000 per hectare, while fiber processing (washing, drying, grading and packaging) represents an additional 18% of the operating cost.

For the income projection, an average yield of 1.4 tons of dry fiber per hectare/year was plotted, a figure derived from the experimental results of the pilot trial described above. At an average international price of US$750 per ton, gross income per hectare is US$1,050 per year, with a net profit of approximately US$450 per year, net of operating and profit costs. By projecting these values over a ten-year average useful life of the crop, a positive Net Present Value (NPV) of US$9,300 and an Internal Rate of Return (IRR) of 31% were obtained. This confirms the profitability of the project under conservative scenarios. The indicators remain positive even in the face of 10% reductions in sales price or 10% increases in operating costs, which demonstrates the resilience of the crop in the face of market variations.

Abaca requires less initial investment and lower maintenance costs compared to other industrial crops in the region, such as bananas and oil palm. In addition, its useful life of 12 to 15 years reduces the need for periodic reinvestment in new plantations, which improves the cost-benefit ratio in the long term. The accumulated economic yield per hectare is 20% higher than that of other traditional agricultural export products, consolidating abaca as a financially viable option for small and medium-sized rural producers.

On the other hand, the financial analysis showed that the viability of the project improves significantly when it is scaled up at the cooperative or associative level, since the aggregation of supply among small producers reduces unit processing and logistics costs, increasing profitability. For example, an intermunicipal cooperation scheme could be established between Turbo, Carepa and Chigorodó to establish common collection centers and processing plants, strengthening the production chain and facilitating rural credit management. This associative model also enhances negotiating capacity with international buyers, guaranteeing fair prices and commercial stability.

Currently, there is a growing international demand driven by the transition to biodegradable materials and the boom in the bioeconomy, so the paper, textile and automotive industries concentrate the largest consumption of abaca fiber, using it in the manufacture of banknotes, technical papers, filters, resistant fabrics, cordage and reinforcements of polymeric composites. The data analyzed show that the global market for natural fibers has shown a sustained growth of 6% per year over the last decade, with the Philippines and Ecuador being the main exporters. However, the current supply capacity is insufficient to meet demand, which creates opportunities for new producers, such as Colombia, to enter the market.

The analysis of export prices indicates that high quality abaca fiber reaches values ranging between US$700 and US$900 per ton, depending on the destination and purity of the material. In this context, the fiber produced in Urabá, which according to laboratory tests meets standards higher than NTC 992 and has an average tenacity of 45cN/Tex, could be positioned in the premium segments of the international market. Its high resistance, uniform color and low presence of impurities make it competitive with Ecuadorian fiber, which is currently the most highly valued in Latin America.

A key aspect within the observation of the market environment corresponds to the geographic location of Urabá, since this constitutes a strategic logistical factor that improves the commercial viability of the project. Currently, the construction of the Port of Antioquia and the road connection with the Eje Bananero and the interior of the country is underway, reducing transportation and export costs by approximately 20% compared to other Colombian departments. This is a competitive advantage that will make it possible to consolidate an efficient logistics chain for the export of fiber and derived products to Europe and North America, markets where free trade agreements are in force. In the medium term, the installation of associative or cooperative processing plants could increase profit margins through the production of handmade paper, ecological textiles or composite materials, instead of being limited to the export of raw fiber.

Therefore, there is a high economic and commercial viability for abaca in the Urabá sub-region, based on its positive profitability, low level of risk, environmental adaptation and alignment with global sustainability trends. The region possesses technical, logistical and human conditions that favor the consolidation of a new agroindustrial chain oriented to the export of high quality natural fibers.

Discussion and Conclusions

Discussion

The integral analysis of the feasibility of production and commercialization of abaca fiber (Musa textilis) in the Urabá subregion confirms the hypothesis formulated from the beginning that the territory has favorable technical, economic, social and environmental conditions to consolidate a sustainable agroindustrial chain. The results obtained in the pilot trial and in the complementary benchmarking phases place Urabá as an emerging scenario for the productive diversification of Antioquia, in line with the sustainable rural development strategies promoted by the Governor's Office and the Rural Development Agency (2019).

The adaptability of abaca to the local context coincides with studies developed in Ecuador by D. Zambrano (2015), Rodríguez (2022), and (Alfaro, 2021), where the importance of humid tropical edaphoclimatic factors for optimum crop yield is

highlighted. In Urabá, the combination of stable temperatures, high rainfall and clay-loam soils with a moderately acid pH replicate the conditions in the producing areas of Santo Domingo de los Tsáchilas and Esmeraldas, where more than 80% of Ecuador's production is concentrated. The performance of the 150 seedlings grown in the pilot trial reaffirms the agroecological compatibility of the region with the physiological requirements of Musa textilis, and corroborates the possibility of replicating the Ecuadorian model without the need for significant alterations in agronomic management.

A differentiating element lies in the productivity obtained in the experimental trial. While the literature reports average yields of 1.5 t/ha/year of dry fiber, in Urabá the projected value exceeded 45 t/ha of wet fiber, equivalent to 4.5 t/ha dry. Although this figure corresponds to an estimate of maximum capacity and requires validation in commercial plantations, it shows the higher productivity potential of the territory, probably associated with permanent water availability and soil fertility.

The quality of the fiber obtained is another result of scientific relevance, since the tests carried out under the NTC 992 standard showed lengths and tenacity far superior to international standards: 180 to 190cm in length and 45cN/Tex average strength. These values are double those reported by Sinha et al. (2021) in polymeric composites reinforced with Philippine abaca, where toughnesses range from 18 to 22cN/Tex. The high purity and low ripple content (<0.3%) demonstrate the efficiency of the beneficiation process and the intrinsic quality of the material obtained. From a technological point of view, these results place Colombian fiber in a premium category, suitable for high value-added industrial applications, especially in the manufacture of special papers, technical textiles and biocomposites for the automotive industry.

Abaca is consolidating its position as a crop aligned with the Sustainable Development Goals (SDGs 12, 13 and 15) by contributing to erosion control and maintaining soil structure, while the use of plant residues such as compost or biomass reduces dependence on synthetic fertilizers. These findings are in agreement with the reports of Araya-Salas, Arias Aguilar, et al., (2022), who demonstrated in Costa Rica that the incorporation of abaca in agroforestry systems increases carbon sequestration and functional biodiversity.

However, the environmental sustainability of the project depends on the ability to control negative impacts during the beneficiation process, mainly the intensive use of water and possible contamination from spills. In the Philippines, the studies of Panneerselvam et al. (2025) and Reshma & Rajendran (2024) recommend the implementation of closed recirculation systems and the use of treated wastewater. In the Colombian case, the adoption of low water consumption technologies and the training of producers will be key to maintaining the ecological coherence of the model.

From a social perspective, abaca is projected as an engine of inclusion and community cohesion, as it has the potential to generate between 16 and 25 direct jobs for every 20 hectares cultivated, in addition to indirect jobs in transportation and processing. These indicators are comparable to those obtained by Sindel & Granda (2022) in Ecuador, who estimated an average of 2 direct jobs per hectare. In regions such as Urabá, where labor informality exceeds 60%, this crop represents a real opportunity for the formalization of rural labor and poverty reduction.

The gender and generational change approach, emphasized in the strategy of the Comprehensive Agricultural Development Plan of Antioquia (Agencia de Desarrollo Rural, 2019), finds in abaca an ideal vehicle to promote the participation of rural women and youth in the productive economy. The processing, classification and commercialization phases offer accessible work spaces that can be articulated with SENA technical training

programs and with the green entrepreneurship policies promoted by the Governor's Office. Thus, the project not only strengthens the local economy, but also contributes to the reconstruction of the social fabric and the consolidation of territorial peace, in line with the approaches of the Territorially Focused Development Programs (PDET).

Abaca currently responds to a global trend towards biodegradable materials and sustainable fibers, as increasing environmental regulations in the European Union and North America are driving the substitution of synthetic polymers for natural fibers, which increases the demand for products such as abaca for the manufacture of technical papers, banknotes and biocomposite reinforcements. In this context, Urabá fiber has the competitive conditions to position itself in premium segments, especially if it achieves environmental sustainability certifications (NTC 992, ISO 14046, Fair Trade).

The project reaffirms the relevance of the sustainable development approach applied to project management, showing that feasibility is not limited to financial analysis, but integrates ecological, technological and social components. This holistic paradigm coincides with contemporary trends in green project management, where sustainability is a cross-cutting criterion for success. In addition, the abaca experience in Urabá contributes to the literature on tropical bioeconomy and territorial governance by demonstrating how the valorization of a natural resource can be articulated with the objectives of social inclusion and environmental restoration.

General Conclusion

This study confirms the technical, economic, environmental and social feasibility of the production and marketing of abaca fiber (Musa textilis) in the subregion of Urabá, Antioquia, positioning this crop as a viable alternative to diversify the rural economy and strengthen territorial sustainability. The results obtained showed that the agroecological conditions of Urabá are suited to the requirements of abaca, guaranteeing optimal adaptation and a competitive yield compared to the main producing countries.

From a scientific and methodological perspective, the study constitutes a significant contribution to the field of sustainable project management by integrating a feasibility analysis approach that combines technical, financial, environmental and social dimensions within a verifiable empirical framework. The use of the SWOT method allowed a comprehensive view of the critical success factors, while the pilot trial with 150 seedlings provided unprecedented experimental evidence on the productivity and quality of the fiber in Colombian territory.

The positive economic feasibility, the high quality of the product and the existence of port infrastructure consolidate the conditions for the development of an abaca value chain in Urabá. This crop has the capacity to generate formal employment, encourage the participation of rural women and youth, and promote associative processes that strengthen the community fabric. At the same time, their environmental benefits, such as erosion control, soil conservation and waste utilization, contribute to Sustainable Development Goals 8, 12 and 15.

Abaca represents a strategic opportunity to move towards a green economy in Antioquia. Therefore, its controlled and technically accompanied implementation can turn Urabá into a national reference for tropical bioeconomy, integrating productivity, sustainability and social inclusion as pillars of regional development.

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IMPORTANT FACTORS FOR INTERNAL CUSTOMER SATISFACTION BASED ON PUBLIC SECTOR SERVICE QUALITY

IMPACTO EN LA SATISFACCIÓN DEL CLIENTE INTERNO EN LA IMPLEMENTACIÓN DE GESTIÓN DE CALIDAD

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ABSTRACT

The present article aims to measure the impact of implementing a quality management model to improve internal customer satisfaction in the Customer Service Area of the Municipal Drinking Water and Sewerage Company of Santo Domingo, Ecuador (EPMAPA SD), using the SERVQUAL model. Through a mixed methods, non-experimental, explanatory, and cross-sectional design approach, a diagnostic analysis was conducted on perceived service quality to assess internal customer satisfaction with the services provided. The entire staff of the Commercial Sub-management was included in the study. One of the main findings highlighted an increase in internal customer satisfaction from 61.6% to 76.2%. However, the expected impact was to reach 80% following the implementation of the quality management system. Although gaps still exist, they are less significant, reflecting an improvement in the perceived quality of service. It is therefore concluded that the implementation of a Quality Management System based on the Deming Cycle (PDCA) not only enhances operational efficiency but also serves as a catalyst for employee well-being and internal customer satisfaction.

Palabras clave:
satisfacción, cliente interno, SERVQUAL, ciclo Deming, EPMAPA SD.

RESUMEN

El presente artículo tiene como objetivo medir el impacto de la implementación de un modelo de gestión de calidad para mejorar la satisfacción del cliente interno en el Área de Atención al Cliente y Servicio de la Empresa Municipal de Agua Potable Y Alcantarillado del cantón Santo Domingo-Ecuador (EPMAPA SD) con el modelo SERVQUAL, por medio de un enfoque mixto, no experimental, de diseño explicativo y transversal, se realizó un diagnóstico en el análisis de la calidad percibida en los servicios para evaluar la satisfacción del cliente interno con respecto a la calidad de los servicios ofrecidos, se empleó a la totalidad de los integrantes de la Subgerencia Comercia, dentro del principal hallazgo se pudo

	destacar el incremento del 61.6 % al 76,2% de satisfacción del cliente interno, sin embargo, el impacto esperado era alcanzar el 80% después de implementar la gestión de calidad, aunque las brechas siguen existiendo, son menos profundas, lo cual refleja una mejora en la calidad del servicio percibido. Por lo que, se concluye que, la implementación de un Sistema de Gestión de Calidad basado en el Ciclo Deming (PDCA) no solo mejora la eficiencia operativa, sino que actúa como catalizador del bienestar laboral y la satisfacción del cliente interno.

Introduction

Currently, in the business environment there is a strong competition to offer outstanding services and products in terms of affordability and quality for customers, in this regard, companies need to meet and satisfy customer expectations by aligning their business operations with customer satisfaction, so, to achieve customer satisfaction, companies try to implement a quality management model, as an overall organizational strategy with the purpose of continuously improving products, services and processes to achieve business efficiency and meet the needs of consumers, as a consequence, companies would get to improve their operations, the quality of products and services and focus on their customers (Alsaquer et al., 2024).

In this context, Zaid et al. (2020) enunciated that the implementation of a quality management model requires organizations to adjust their quality to the level demanded by customers in order to remain competitive, for this reason the number of companies that have adopted quality management is increasing, since, those companies that have won quality awards generally outperform other companies with respect to customer satisfaction, revenue measures and market value.

To achieve customer satisfaction, Quality Management addresses several dimensions, such as: process management, customer focus, continuous improvement and employee engagement, thus process management ensures the efficiency of business operations by analyzing and improving current systems, as a consequence there is a positive relationship between process management and customer satisfaction (Noori, 2020). According to global models and specifications developed for this purpose, there has been a recent increase in interest in quality management and institutional excellence models as an organizational philosophy in government institutions, this increase is due to multiple factors, the most important being the changes in the global economy caused by the Covid-19 pandemic and the need to activate quality and business continuity systems (Alharthy & Ajina, 2023).

The administrative apparatus of the State has also been weakened, being essential to give a positive vision where whose main axes include quality, governance and institutional excellence, which are in line with the structural reforms applied to the government, in addition to making a real monitoring of how these standards affect the internal operations of the institution and include whether they have been effective in improving performance and whether staff members are aware of the positive effects that these standards have on their jobs, especially in relation to the aspect of operations and their improvement (Bahia et al., 2023).

Within a systematic approach quality management ensures quality through comprehensive management that increases reliability, customer satisfaction and productivity, i.e., the implementation of such an approach enables associations to increase internal efficiency, which is considered necessary to aggressively end up in the global business center through an iterative and continuous process in which prevails to the extent that groups can work to find problems and solve them effectively (Shaibun, 2021).

Within the various Total Quality Management (TQM) models, the Deming cycle is known as the father of the TQM movement, because it refers to continuous improvement, which consists of four interrelated components, namely: Plan-Do -Check-Act (PDCA), this cycle was developed to link production with needs and resources to meet needs (Mayangsari et al., 2023).

The PDCA cycle starts with the planning stage which refers to the design of the product according to the management planning phase, then comes the production (doing) stage and is related to manufacturing or working on designed products, the third stage is the sales check where sales figures are verified to make sure customers are satisfied and finally the investigation which is the action if a complaint arises, which should be included in the planning phase and action should be taken for further efforts (Mubin, 2020).

Deming (1986) emphasized that quality is based on people and not on products, this is how customer satisfaction defines it, and since customer needs and expectations are always changing, the organization has to adapt and respond to those changes, thus Deming's ideology consists of 14 points that seek to significantly improve the effectiveness of an organization or business (Alauddin, 2019).

According to Malkawi et al. (2017) noted that job performance gives a premise of the organization's success in achieving its goals and mission, so the dynamic environment in which companies operate with emerging technologies has forced new companies to change for the better and maintain their business operations. Likewise, Kelderman (2021) highlighted that customer satisfaction is obtained with Quality Management through the arrangement of people, processes and technology during the product or service life cycle, customer satisfaction, in turn, has a positive outcome on customer loyalty, customer satisfaction, in turn, has a positive outcome on customer loyalty, financial performance and lower complaints and is based on good customer experiences, so mapping and measuring the customer service experience is a vital part of continually improving service quality, however, this is mainly studied from the point of view of external customers.

This article focused on the internal customer being people or departments in the same organization that receive goods or services from other departments or individuals in that organization, for example a department that receives public relations training and interviews from the communications department, or a manager who receives hiring assistance from the human resources department (Enblom et al., 2023).

The risk of losing internal customers cannot be related to competition, but to the ability to provide quality service between one supplier of another process, i.e., each one must satisfy the next, which leads to the satisfaction of external customer needs, however, there are few of studies on internal customer experience and previous research has stated dimensions of external customer experience, where it is mentioned that these and internal customers are related to each other, however others argue that the dimensions of internal customer experience are unique to external customers (Narteh, 2018).

A similar perspective comes from Strauss (1995) who defined the internal customer as organizational units or individuals working within the same organization, interacting with and providing services to other sections or individuals within that company, while Bergman and Klefsjö (2012) extended the definition of internal customer to include all processes and individuals within the organization that are the result of other internal processes, customers or individuals.

According to Kiran (2017) mentioned that the internal customer-supplier link between individuals, departments and functions builds the customer chain throughout an organization that connects each individual and function with external customers and consumers, characterization of the organization's value chain and general awareness of maintaining quality through customer satisfaction.

Swinehart and Smith (2005) stated that an internal customer is also an internal supplier and that the quality of service provided by those who interact directly with

external customers depends on the efficiency and effectiveness of the internal customer/supplier relationship. Likewise, Paradinas et al. (2023) explained that companies that focus on the internal customer, in addition to establishing conflict prevention and management mechanisms, try to train their employees in those competencies, not only cognitive, that can improve productivity, but above all the work environment and the feeling of belonging to the organization, the success of companies is determined in part by the people who are part of them, so it is essential to know their aspirations, needs and skills so that they can offer their best service in the most appropriate position.

When talking about service, Rytilahti (2019) mentioned that it is a large field of research with many definitions comprising at least three distinguishable characteristics, it is a process with repeated activities, it is produced and consumed at the same time and the customer is a co-creator in the service process. Thus, the nature of a service and the fact that the outcome is in the customer experience makes it difficult to control whether it meets the requirements and to advocate for it, therefore, quality control and promotion should take place at the time of service consumption (Grönroos, 2015).

It is important that service processes are flexible and adapt to changing situations, but it is also important that they are planned to handle moments of truth and avoid quality problems, under this context there are two dimensions of service: a technical one, which is what the customer receives, this dimension must be up to the needs and expectations of the customer and there is also a functional dimension, that is, the way in which the customer receives the service, therein lies the competitive advantage (Enblom et al., 2023).

Thus, Hallencreutz and Parmler (2021) highlighted that service quality overtook product quality as the driver of customer satisfaction in the last decade, and even when you buy a product, you buy a function, consequently, it is important to prioritize the development of service quality, but new approaches and tools are needed to improve customer orientation within the company and increase customer satisfaction.

Another common term when discussing service quality is value, which is always determined by the customer during the use of products or services, just as the level of service quality is decided at the moment the service provider meets the customer, i.e., the moment of truth. According to Medberg and Grönroos' (2020) study on value in use and service quality, which showed that, although these two concepts derive from different theoretical traditions, their dimensions are related to each other.

Similarly, it is important to indicate that high levels of customer satisfaction have a positive outcome on financial results, service and minor complaints and customer satisfaction in turn depends on good experiences (Worick, 2019). Therefore, Bernazzani (2022) defined customer satisfaction as the degree to which a customer is satisfied with a product, service or experience related to their business and is derived from the extent to which their needs and expectations are met and shows satisfaction with their most recent experience with the company.

On the other hand, Alharthy and Ajina (2023) identified the impact of implementing quality standards on the efficiency of internal operations in public sector institutions, through the measurement of effectiveness and efficiency of operations after implementing quality standards, so they adopted the methodology of continuous improvement that is the Deming cycle, and the definition of internal processes and their dimensions, likewise, data collection in a simple random sample of 115 that were analyzed using the scaled method and Cronbach's alpha for stability, the main results of

this study indicated that there is a difference between the requests for information on quality in the planning of operations, preparation and products.

Perkhidmatan et al. (2024) aimed to assess satisfaction levels among HRM customers regarding the quality of HRM services in a specialized public university in Malaysia, using a questionnaire with the key determinants of service quality and the dimensions outlined in the SERVQUAL model, with a Cronbach's coefficient of 0.957 reliability, they surveyed 17,000 people with a purposive sampling, the results underlined the importance of all dimensions responsiveness, safety, access, empathy and reliability in customer satisfaction, with the exception of tangible.

Similarly, authors Pathirana and Manjula (2019) identified the impact of Total Quality Management (TQM) implementation on internal customer satisfaction through a questionnaire in which they used Pearson's correlation coefficient to determine if there is a correlation between variables, they identified that leadership, employee empowerment, training and development and teamwork used to implement TQM practices have a considerable impact on internal customer satisfaction.

In Ecuador, Astudillo and Barragan et al. (2024) had the objective of analyzing the incidence of internal service quality on employee job satisfaction in a manufacturing process with seven manufacturing companies in the city of Cuenca, using a Likert scale with seven items and a sample of 364 respondents, the data analysis was performed using the SPSS program and showed a positive correlation and a moderate degree of association between the quality of internal service and employee satisfaction; in addition, the regression coefficient showed validity in the statement that the quality of internal service has a positive impact on employee satisfaction.

The internal customer satisfaction of the areas of Customer Service and Service and Billing Portfolio and Collection in the Municipal Public Company of Drinking Water and Sewerage of the canton Santo Domingo, maintains a high rate of complaints about the service through communication and restructuring and merger of units due to low performance, so, the impact of the implementation of Quality Management and the evaluation of the accuracy and reasons that lead to poor application of standards and failure to achieve the desired results was measured, this has been achieved by examining the reality and the impact of the application of quality specifications in the internal processes of the institution. Moreover, this study will highlight the major challenges and propose solutions that correspond to the needs of the context.

In short, this article analyzed the impact of the implementation of a Quality Management System (QMS), based on Deming's PHVA cycle, on the strengthening of internal customer service within the Commercial Sub-Management of EPMAPA SD. Through the design and execution of an improvement plan that includes key actions such as training, service level agreements (SLAs), infrastructure interventions, wellness activities and internal communication strategies, the effects on dimensions such as reliability, sensitivity, safety, empathy and perception of the tangible aspects of the work environment were evaluated.

Method

Target

The objective of this article is to measure the impact of the implementation of a quality management model to improve internal customer satisfaction in the Customer Service Area using the SERVQUAL model.

Theoretical and Methodological Background

The research methodology was based on a systematic approach that included the phases of exploration, data collection, analysis and data processing, which were subjected to a process of contrast through the comparison of performance indicators such as quality and customer satisfaction before and after implementing the Deming system, in addition to the comparison of the results with other similar companies that have not implemented this system or that have implemented other quality approaches, cross-checking was used to validate the results through different sources, thus a data triangulation was performed to compare data obtained from different sources such as internal customers, methodological triangulation by using quantitative methods such as SERVQUAL surveys and statistical analysis, triangulation of researchers involving several researchers to reduce interpretation biases and theoretical triangulation to interpret the findings under different theoretical frameworks such as ISO 9001, in addition to Deming. So, if everyone points to an improvement after implementing the Deming model, the conclusion gains strength.

To ensure the validity, reliability and robustness of the results, the information for the present article was relied upon from Scopus and Science Direct, as well as from academic reports and other relevant texts; with these considerations, the selected literature was rigorously evaluated according to the previously established objectives, considering also the potential benefits associated with its practical application in the elaboration of synthetic and well-founded conclusions. The data obtained regarding internal customer satisfaction were obtained from the Commercial Sub-Management, which is formed by the Billing, Service Management and Customer Service departments and can be replicated in various areas of EPMAPA SD.

Hence, a mixed, non-experimental, explanatory and cross-sectional design approach was applied, a diagnosis was made in the analysis of the perceived quality of the services to evaluate the satisfaction of the internal customer with respect to the quality of the services offered. The application of this study in the field of administrative services is aimed at identifying the level of dissonance between the expectations of the internal customer and the quality of the service actually provided by the commercial department (Chatterjee et al., 2023).

Thus, a non-probabilistic sampling was used for all the members of the Commercial Sub-Management, which generated a comprehensive and accurate understanding for EPMAPA SD, consequently, their opinion will contribute to the improvement of processes and communication between the areas.

Therefore, a survey was conducted using the SERVQUAL model with five dimensions and 22 items, being distributed as Tangibility contains 4 questions, Reliability contains 5 questions, Responsiveness contains 4 questions, Assurance contains 4 questions and Empathy contains 5 questions, each item contains a question and options about the research on a Likert scale of order 5 (Shi et al., 2020).

Next, with the data obtained from the SERVQUAL survey of 48 participants, the statistical processing of the data was carried out using the statistical package for the social sciences (SPSS), which made it possible to synthesize the results in tables and graphs that facilitated their interpretation in the results and discussion section. Subsequently, the information was validated with Cronbach's coefficient and the means of the dimensions such as reliability, sensitivity, security, empathy and tangible elements were determined, prioritizing their presentation in tabular and analytical form, likewise, it was evaluated if the implementation of the Deming system caused a significant improvement in the quality indicators, as well as comparing means or proportions before and after and determining if there is a correlation between variables such as the implementation of the system and customer satisfaction in order to derive relevant conclusions for the research.

After having a clear picture, the application of Deming's quality management style was executed and qualitative observations of important implementation initiatives were provided. The General Manager provided leadership by deciding to implement the Deming style of quality management in an effort to increase the company's performance. Finally, the initial survey was replicated to obtain feedback on service quality and internal customer satisfaction.

Results

In accordance with the Deming model, the PHVA cycle was applied, starting with the Plan phase.

Plan (P)

In this phase, a diagnosis was made in the area of Commercial Sub-management, with the SERVQUAL survey, where the results of the sample of workers evaluated determined that 27% of the participants are female, while 73% are male; in the same way, it was observed that the workers in the sample have an age ranging from 25 to 55 years and all workers work full time, for 8 hours a day, moreover, the daily activities have a systematic sequence and its processes are focused on customer satisfaction.

Similarly, the reliability of the results was obtained by means of a Cronbach's Alpha analysis (Table 1).

Table 1

Diagnostic reliability statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	N of elements
0.929	0.930	22

According to Mohd et al. (2020) in their research mentioned that obtaining a Cronbach's alpha of 0.70 or higher is considered acceptable in many social science contexts, therefore, the data obtained possess excellent reliability, since, in this case, the Cronbach's Alpha coefficient is close to 1. Next, the gaps between internal customer expectations and perceptions were identified in five key service dimensions: reliability, responsiveness, security, empathy and tangibles (Table 2).

It was observed that Sensitivity is the highest rated dimension, so it can be interpreted that the users perceive good disposition and friendliness of the personnel; on the other hand, the Tangible Elements received the worst score, which may indicate

dissatisfaction with facilities, equipment, materials or presentation of the personnel. Thus, for the quality system, priority was given to actions on tangible elements, such as: infrastructure, tools, cleanliness, staff presentation, in addition to strengthening reliability by ensuring that the service delivers what it promises on a constant basis and to maintain and reinforce sensitivity and safety, which could be differentiating elements if consolidated (Table 2).

Table 2
Mean of the SERVQUAL diagnostic model survey dimensions

	RELIABILITY	SENSITIVITY	SECURITY	EMPATHY	TANGIBLES
Media	2.974	3.412	3.225	3.080	2.720

Similarly, the gap between the internal customer's perception and expectations was estimated, and the level of attention required to develop strategies to increase the level of satisfaction of the key target was determined (Table 3).

Table 3
Estimated gap and internal customer satisfaction index

Dimension	Media	Estimated gap	Level of care required
Reliability	2.97	High (-1.0 to -1.5)	Consistency and compliance
Sensitivity	3.41	Mean (-0.6 to -1.0)	Promptness and willingness to help
Security	3.22	High (-1.0 to -1.3)	Confidence in treatment and decisions
Empathy	3.08	High (-1.2 to -1.4)	Personalized attention
Tangible elements	2.70	Very high (-1.5 to -1.8)	Urgent: physical environment and resources
Media	**3.08**	**High (-1.0 to -1.3)**	**Partially satisfied**

The results in Table 3 indicated an overall average of 3, indicating that the user experience is at a point that is moderately satisfactory or acceptable but with room for improvement. Likewise, the total estimated gap is high, i.e., the expectations of users exceed the perception of the service received; therefore, the level of care required is partially satisfied, but with critical areas that require priority intervention. Once the areas needing greater attention have been identified, objectives to be achieved with the implementation of quality management are established (Table 4).

It was found that the objective closest to being achieved is "Improve the agility and availability of attention between areas", which suggests relative strength in interdepartmental coordination (Table 4). On the other hand, the objective with the greatest compliance gap "Improve physical working conditions, equipment and presentation of the work environment" (54%) represents a critical gap of -26%, in line with the low results in the "Tangibles" dimension seen earlier.

Table 4
Objectives to be achieved with quality management

Objectives	actual %	% expected
Increasing the internal customer satisfaction rate	61.5	80
Increase the perception of compliance	59.4	80
Improving the agility and availability of service between areas	68.2	80

Strengthening trust and transparency in internal management	64.4	80
Increasing the level of personalized attention and understanding of individual staff needs	61.6	80
Improve physical working conditions, equipment and presentation of the working environment	54.0	80

In general, all the objectives are below the expected standard (80%), which shows the need to implement a quality management system to strengthen the Commercial Sub-Management. In this context, we recommend strategies such as: prioritizing resources and interventions in infrastructure and physical working conditions, since it presents the worst indicator, as well as strengthening communication actions and compliance with commitments, given the low 59.4% in perception of compliance, consolidating coordination between areas as a basis for promoting the rest of the objectives and establishing improvement plans by objective, using the PHVA cycle (Plan - Do - Check - Act). Consequently, an internal quality action plan was formulated as part of the strategic planning (Table 5).

The key actions reflect results obtained after 6 months to 18 months of implementation of quality management as is common in these processes, then: the current progress indicates that the objectives are still maturing, which is reasonable if the time is short, this is justified because quality systems do not produce immediate results, since they require cultural change, adaptation of personnel and adjustments in the processes (Table 5).

Table 5

Internal quality action plan

Dimension	Key Actions	Responsible	Deadline	Indicator
Reliability	Designing service level agreements (SLAs), establishing KPIs, compliance training, etc	Quality and Human Talent Management	6 months	% compliance with internal commitments
Sensitivity	Protocolize response times, service sensitization, request traceability	Area Coordinators	6 months	Average response time
Security	Implement secure communication channels, training in fair leadership and ethics	Management and Human Resources	12 months	% of confidence in internal decisions
Empathy	Empathy workshops, active listening workshops, improvement of manager-team interaction	Human Resources and Communications	12 months	Satisfaction with the boss-collaborator relationship
Tangibles	Intervention in infrastructure, improvement of equipment, beautification of spaces to improve physical conditions	Infrastructure and Administration	18 months	% improvement in perception of physical condition

Some improvements, such as those related to infrastructure or perception of compliance, require investment, planning and continuous monitoring; improvements in physical conditions or personalized attention depend on administrative and budgetary processes that take time. Likewise, roles and responsibilities were assigned with the participation of welfare, human talent and quality committees (Table 6).

Table 6
Internal quality action plan

Actor or Committee	Role in the Quality Management System
Labor Welfare Committee	Diagnosis of staff needs, organization of integration and welfare activities.
Human Talent	Design and implementation of training programs, organizational climate assessments, organizational development support.
Quality Committee	Monitoring and evaluation of the action plan, follow-up of indicators, inter-area coordination.
General Management	Approval of strategies and budget, alignment with the institutional plan, accountability.
Area Coordinators	Operational implementation of actions, constant feedback, promotion of service culture.

Each actor has a complementary and necessary role within the QMS, the articulation between them ensures the effective implementation of the improvement plan, the continuous monitoring based on indicators and the promotion of a quality-oriented organizational culture. Thus, the Labor Welfare Committee plays a key role in addressing the empathy and tangible dimensions, since it improves the work environment and reinforces the sense of belonging, which directly affects the quality of internal service.

Likewise, the Human Resources department is a transversal actor that strengthens personnel competencies, manages cultural change and provides support in dimensions such as reliability, sensitivity and safety. Likewise, the Quality Committee represents the technical core of the QMS, thus ensuring that the PHVA cycle is correctly applied, allowing for the verification and control of gaps and promoting continuous improvement. The General Management has a substantial commitment and visible leadership and resource allocation are enabling conditions for the system to function. It also ensures that quality is aligned with strategic objectives. Finally, the Area Coordinators are the direct executors of the QMS, and their role is fundamental for putting plans into daily practice, managing teams and ensuring the continuity of the process.

Lastly, in the Planning phase, a budget was prepared for training, integration and organizational development (Table 7).

Table 7
Annual budget

Concept	Estimated Cost (USD)
Internal customer service training (external/internal)	5,000,00
Soft skills workshops (empathy, communication, leadership)	4,000,00
Labor integration and welfare days	3,500,00
Recognition and motivation activities	2,000,00
Diagnosis and improvement of physical conditions	10,000,00
Organizational climate evaluations (annual)	1,500,00
Internal communications (campaigns, signage, media)	2,000,00
Total Estimated Annual	**28,000 USD**

The budget is balanced and well aligned with the priorities detected in the quality diagnosis; more than 50% is invested in tangible and formative aspects, which is consistent with the weakest dimensions of Tangibles, Reliability and Empathy. Thus, a

balanced distribution was observed between structural intervention of physical spaces and human development such as training, climate and recognition; therefore, it reflects a progressive and sustainable organizational transformation strategy.

In order to implement what was planned, the second phase continued.

Do (H)

In the case of the Do phase, significant changes were generated within the study area, so that the planned strategies and actions generated tangible changes, which allows the strengthening of processes, in addition to improving internal customer service and, ultimately, transforming the work environment with a more collaborative, efficient and satisfactory degree for all team members.

In the context of internal quality improvement within a public entity, the results of this phase are reflected in the execution of key actions related to training, implementation of service level agreements (SLAs), improvements in physical working conditions, integration and wellness activities, and strengthening of internal communication. These actions seek not only to address the gaps identified in the SERVQUAL diagnosis, but also to foster a solid organizational culture based on respect, trust and commitment to quality.

The results obtained from the implementation of the planned actions are presented below, highlighting the progress made in each key area, the indicators of success achieved and the areas in which further work is required to ensure continuous improvement and the sustained success of the internal quality action plan (Table 8).

The actions implemented in Staff Training analyze the results of participation and perception of empathy, which are adjusted to the contents or methodologies (Table 8); on the contrary, if there is little improvement, the strategy is modified or new didactic tools are integrated, so that what worked well is documented as a standard. Similarly, the SLA and internal protocols are adjusted for response times or commitments; if SLAs are not met or if they generate friction between areas, clarity is improved, processes are optimized and changes in procedures are formalized. On the other hand, the infrastructure and physical conditions, if after the improvements the expected level of satisfaction is not reached, new investments or adjustments such as the redistribution of spaces or improvement of ventilation are evaluated to consolidate the practices that increased comfort and perception of quality. For welfare and integration activities, based on the participation and perceptions collected, it is decided whether certain activities should be repeated, change their format or be integrated into the institutional plan as permanent cultural strengthening practices. Lastly, internal communication, if the channels or messages did not achieve the desired effectiveness, the formats, frequency or media are adjusted; if they were successful, they are integrated as part of the communication model of the QMS.

Table 8

Actions planned in each key area

Stage	Target	Shares	Responsible	Deadline	Indicator
Staff Training	Improve staff skills in key areas such as internal customer service, empathy, and leadership.	• Training materials. • Workshops and training sessions. • Post-training tests to measure effectiveness.	Quality and Human Resources Committee.	3 months	% participation in trainings, improvement in the perception of internal empathy
Implementation of Service Level Agreements (SLAs) and Response Protocols	Establish clear expectations on response times and commitment of each area.	• Internal SLAs for each area such as response time and quality of service. • Response protocols. • Standardization of operating procedures to ensure consistency in service. • Internal communication on SLAs.	Area Coordinators and Quality Committee.	4 months	% compliance with SLAs, reduced response times.
Interventions in Infrastructure and Physical Working Conditions	Optimize working conditions to increase internal customer satisfaction and well-being.	• Infrastructure diagnosis. • Improvement of work spaces with painting, cleaning, reorganization of offices, purchase of appropriate furniture. • Investments in technology.	Infrastructure and Administrative Committee.	6 months	% of satisfaction with physical working conditions
Wellness and Integration Activities	To foster a sense of belonging and improve the work environment, contributing to empathy and psychological security of employees.	• Wellness days, sports, team building events. • Periodic sessions to listen to staff suggestions and concerns. • Formal and informal recognition system to reward good performance.	Labor Welfare and Human Resources Committee.	3 months	Participation in activities, perception of well-being and internal motivation.
Internal Communication	Improve communication within the organization so that all employees are aligned and well informed.	• Internal communication strategy such as newsletters, signage, and key messages on internal quality commitments. • Formal and informal communication channels to ensure that information flows freely among all hierarchical levels. • Periodic organizational climate surveys to know the state of communication.	Internal Communication and Human Resources Committee.	2 months	Degree of satisfaction with internal communication, effectiveness of channels.

Verify (V)

During the VERIFY stage, emphasis was placed on the evaluation and follow-up of the actions implemented to ensure compliance with the objectives proposed in the DO phase. In this way, the performance of the activities carried out was reviewed and an assessment was made as to whether the improvements achieved were sufficient to close the quality gaps identified in the diagnosis. In addition, the results were analyzed and contrasted with previously defined indicators to determine the degree of internal customer satisfaction. In order to achieve the expected impact on internal customer satisfaction, it is essential to verify the actions implemented, mainly the dimensions evaluated using the SERVQUAL model. In this way, those deviations that were present were identified and the necessary corrective decisions were made to ensure continuous improvement (Table 9).

Table 9

Verification of compliance

Stage	Indicator	Formerly	Then
Staff Training	% participation in training courses	48%	100 %
	Improved perception of internal empathy	61.6 %	75.92%
Implementation of Service Level Agreements (SLAs) and Response Protocols	% compliance with SLAs	62.5%.	84%
	Reduced response times.	9.60 min	7.62 min
Interventions in Infrastructure and Physical Working Conditions	% of satisfaction with physical working conditions	54%	73%
Wellness and Integration Activities	Participation in activities	100%	100%
	Perception of well-being	59.82%	75.78%
	Internal motivation	62.37%	76.77%
Internal Communication	Degree of satisfaction with internal communication	17.48 eNPS	25.91 eNPS
	Channel effectiveness.	25%	85.42%

The results obtained show a significant improvement in all key indicators, which reflects the positive impact of the implementation of the Quality Management System (QMS) on internal customer service and organizational management, in staff capacity, participation in training went from 48% to 100%, suggesting high acceptance and involvement. In addition, the perception of internal empathy increased from 61.6% to 75.92%, indicating that the training activities contributed to strengthening the culture of respect and understanding. In terms of SLAs and response protocols, there was an increase in compliance from 62.5% to 84%, and a reduction in the average response time from 9.60 to 7.62 minutes, which demonstrates greater operational efficiency and better alignment between areas; interventions in infrastructure improved satisfaction with the physical working conditions from 54% to 73%, reflecting that the adaptations in the environment directly influence the perception of internal service quality.

On the other hand, wellness and integration activities maintained 100% participation, and significantly improved the levels of wellbeing perception (from 59.82% to 75.78%) and internal motivation (from 62.37% to 76.77%), which reinforces their strategic value as drivers of organizational commitment. Finally, in the internal communication axis, the satisfaction index rose from 17.48 to 25.91, and the effectiveness of the channels increased from 25% to 85.42%, indicating that the improvements in the internal media and messages had a clear impact on the perception of transparency, access and communication alignment.

Another feature to note is the SERVQUAL survey after the implementation of Quality Management, in order to measure the internal satisfaction of employees in relation to the implemented actions, as indicated in Table 10, this survey should be repeated every 3 months, to follow up on the improvement.

Security is mentioned with 3.990 as the highest rated dimension, which indicates a high level of staff confidence in institutional decisions, organizational ethics and consistency in the actions of the leaders, thus reflecting an internal environment that generates stability and support. Likewise, Sensitivity with 3.911 is the second best rated and shows that employees perceive that their requests are handled promptly and with consideration; therefore, actions in terms of response times and traceability were effective. For the Empathy dimension with 3.796, it is well positioned and there is evidence of progress in boss-collaborator relations, active listening and mutual understanding, as a result of workshops and integration activities. In addition, Reliability with 3.716, although positive, is relatively lower, suggesting that there is still room for strengthening the constant fulfillment of internal commitments and agreements. Tangible Elements with 3.651 continues to be the dimension with the lowest average, indicating that, although there have been improvements in infrastructure and equipment, there is still room for improvement in the perception of the physical aspects of the work environment (Table 10).

Table 10

SERVQUAL survey after implementation

	RELIABILITY	SENSITIVITY	SECURITY	EMPATHY	E_TANGIBLES
Media	3.716	3.911	3.990	3.796	3.651

Similarly, to obtain an indicator of success, the results were compared with previous measurements to evaluate improvements. Table 11 compares the results obtained.

Table 11

Comparison of internal customer satisfaction

	Diagnosis			Current		
Dimension	**Value**	**%**	**Gap**	**Value**	**%**	**Gap**
Reliability	2.97	59.4	High (-1.0 to -1.5)	3.72	74.4	Low (-0.3 to -0.8)
Sensitivity	3.41	68.2	Mean (-0.6 to -1.0)	3.91	78.2	Low (-0.1 to -0.6)
Security	3.22	64.4	High (-1.0 to -1.3)	3.99	79.8	Very low (-0.0 to -0.5)
Empathy	3.08	61.6	High (-1.2 to -1.4)	3.80	76.0	Low (-0.2 to -0.7)
Tangible items	2.70	54.0	Very high (-1.5 to -1.8)	3.66	73.2	Low (-0.3 to -0.8)
Media	**3.08**	**61.6**	**High (-1.0 to -1.3)**	**3.81**	**76.2**	**High (-0.2 to -0.7)**

The implementation of the Quality Management System led to a significant reduction in internal service perception gaps, from mostly "high" or "very high" to "low" or "very low" values, especially in critical dimensions such as safety, tangibles and reliability. This indicates that the corrective and preventive actions, promoted from the "Act" phase of the PHVA cycle, were effective not only in execution, but also in the cultural change towards evidence-based continuous improvement.

Act (A)

From the Verify phase, those actions that did not work properly were corrected and standardized, in order to strengthen the culture of continuous improvement in the well-being and motivation of the internal customer.

In this way, the gaps detected in reliability (2.97), tangible elements (2.70) and empathy (3.08), made it possible to generate an implemented action plan: training, integration, strengthening of leadership, improvements in physical conditions (Table 12).

Table 12

Corrective actions to improve internal customer satisfaction

Action	Description
Standardization of best practices	It was formalized in successful procedures or instructions such as active listening days, periodic acknowledgements and internal communication channels.
Adjustments to the management system	The internal quality management system was modified to include motivation and well-being indicators in the institutional dashboards.
Reformulation of ineffective actions	Interventions that did not generate impact were redesigned, as the integration strategy was poorly received and was reformulated with the active participation of the personnel.
Review of roles and responsibilities	Redistribute tasks if necessary, incorporating learning from the DO phase and feedback from the CHECK phase.
Implementation of new improvement cycles	A new PHVA cycle was initiated for the dimensions with minor improvements.
Institutional recognition of positive results	Progress was shared with personnel, recognizing achievements and generating ownership of continuous improvement.

The Act phase of the PHVA cycle played a key role in the consolidation and sustainability of the progress achieved during the implementation of the Quality Management System. At this stage, effective practices such as active listening days and internal recognition systems were institutionalized through their formalization in official procedures and channels. The system was also strengthened by including motivation and well-being indicators in the institutional dashboards, ensuring that these aspects are monitored on an ongoing basis. The phase also allowed for a critical review of actions that were not effective, such as initial integration strategies, which were redesigned with the active participation of personnel, increasing their legitimacy, adjusting roles and responsibilities based on previous learning, and giving way to new improvement cycles, especially in the dimensions with the least progress. Finally, by institutionally recognizing the achievements attained, a culture of continuous improvement was promoted that reinforces the sustainability of the system and ownership by the personnel, closing the cycle with a participatory and evidence-based approach.

Discussion and Conclusions

According to the results, it was noted that there was a significant improvement in all dimensions, with the current scores being higher than those of the diagnosis, which indicates a more favorable perception of the service after the actions taken. Similarly, it was observed that in the past, the gaps were more pronounced, i.e., more negative, denoting greater differences between expectations and perceptions. Currently, although the gaps continue to exist, they are narrower, reflecting an improvement in the perceived quality of service.

Within the analysis, the dimension of tangible elements that refers to facilities, equipment and appearance of personnel was the most critical initially, with the highest

gap and the lowest score in the diagnosis of 2.70, although it continues to be the dimension with the highest gap from -0.3 to -0.8, it improved notably +0.96 points. On the contrary, the best evaluated dimension currently is Security concerning staff knowledge and courtesy, ability to inspire confidence with a current highest score of 3.99 and lower gap to 0.0 at the extreme.

The expected impact was to reach 80% internal customer satisfaction after implementing quality management, however 76.2% internal customer satisfaction was achieved, within the Plan phase there was better alignment between staff expectations and organizational processes, this coincides with Milovanović et al. (2023) where they found that more than 70% of ISO 9001 certified organizations reported improvements in internal communication and role clarity as a result of more rigorous planning under the PDCA cycle. Likewise, in the Do phase, an increase in motivation and commitment was observed, as employees better understand their tasks and feel supported by a formal structure, similar to Hao and Oliva (2016) documented that a disciplined implementation of "OD" generates better work environments and reduces occupational stress, thanks to standardization and training.

While in the Verify Phase, greater staff empowerment was found, as employees feel listened to when participating in evaluation processes, similar to what Liu et al. explained. (2021) observed that organizations with systematic CHECK practices have more engaged employees, seeing their suggestions impact organizational decisions. Finally, during the Acting phase, the development of a participative organizational culture can be distinguished, where internal clients perceive that their experiences drive real changes, as Syahdan et al. (2023) explained that effective corrective action strengthens staff trust in management, raising their satisfaction and perception of organizational justice, and that when organizations act on feedback and improve systems, employees develop greater identification with the company's goals and values.

Under this context, EPMAPA SD has managed to improve the perception of service quality in all the dimensions evaluated, although the gaps have not been completely eliminated, their reduction shows a positive progress, where the next step could be the prioritization of specific actions to close the residual gaps, especially in "Tangible elements", as well as to consolidate the improvement in Safety and Sensitivity, maintaining practices that have been well valued.

Likewise, it is concluded that the implementation of a Quality Management System based on the Deming Cycle (PDCA) not only improves operational efficiency, but also acts as a catalyst for labor welfare and internal customer satisfaction. This relationship is supported by recent scientific evidence and becomes even more relevant in public organizations such as EPMAPA SD, where service results are directly linked to employee engagement.

It is important to emphasize that the implications for EPMAPA SD or similar organizations is mainly the cultural transformation, being that the Deming Cycle can be a tool to migrate from a reactive and hierarchical culture to a more participatory and employee-centered one, adaptability, since the PDCA is flexible enough to be applied both in technical processes such as water treatment, customer service and administrative processes in human talent and purchasing. In addition to staff empowerment, in public contexts, where economic incentives may be limited, recognition of the employee's voice becomes a key motivational factor.

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ACCESS TO HEALTH SYSTEMS IN HIGHLY DISPERSED AREAS IN COLOMBIA

ACCESO A LOS SISTEMAS DE SALUD EN ZONAS ALTAMENTE DISPERSAS EN COLOMBIA

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ABSTRACT

The following article aims to correlate how dispersion influences access to health services in a locality or region. According to a research process conducted in the eastern Vichada region of the Colombian plain, bordering neighboring Venezuela and with a quality that sets it apart from the rest of the Colombian regions, within its political and administrative component, it has the municipality with the largest land area in the country, thus generating marked limitations for inhabitants' access to frontline health services or Primary Health Care (PHC). The municipality of Cumaribo-Vichada is one of the largest in the country, with a high rurality and dispersion of over 65,000 km2, making it a significant challenge when planning health services in the region. With a highly rural and exponentially growing population, planning for timely and quality access to health services in the department of Vichada is complex. It is a challenge for the health system to plan appropriately in highly dispersed areas and select strategies to improve precarious access to services, while also working with the Colombian government to increase access through governance in local health systems.

Palabras clave:
atención primaria en salud, red de servicios, modelo de atención y acceso.

RESUMEN

El siguiente artículo tiene como finalidad hacer una correlación de cómo influye la dispersión en el acceso a los servicios de salud en una localidad o una región. De acuerdo a un proceso investigativo que se dio en la región del vichada, oriente de la llanura colombiana, limítrofe con el vecino país de Venezuela y teniendo una cualidad que la hace diferente al resto de las regiones del país colombiano, posee dentro de su componente político-administrativo el municipio con mayor extensión de tierra del país, de esta manera generando unas limitantes marcadas para que los habitantes accedan a los servicios de salud de primera línea de frente o de Atención primaria en salud (APS). Siendo el municipio de Cumaribo-Vichada de los más extensos del país con alta ruralidad y dispersión con más 65.000 km2, convirtiéndolo en un total reto al planear los servicios de salud en la región. Con una población altamente rural y en crecimiento exponencial hacen que

	en el departamento del vichada sea complejo la planificación del acceso oportuno y con calidad en los servicios de salud, siendo todo un reto para el sistema de salud que en zonas altamente dispersas se planifique de manera correcta y se escoja una estrategias para mejorar el precario acceso de los servicios, articulando de igual manera con el estado colombiano para aumentar el acceso desde la gobernanza en los sistemas de salud locales.

Introduction

The research conducted by the research team in the Department of Vichada in eastern Colombia, based on the quality attributes that must be in place for a network of health services in a geographical context such as the one presented in the Department and its municipalities to have the solvency to provide services at the time that the population in their episodes of illness, which are characteristic of the analysis of the health situation of the population of Vichada distributed in their municipalities respectively.

Based on some research Alba et al. (2016), as well as in instruments to measure access, efficiency, timeliness and inclusion in the health care received by the population of Vichada in its different health service providers, it was possible to establish some health determinants that affect morbidity and mortality in the different municipalities of the department of Vichada. Using a geographic orientation of the current service provision network, it was necessary to determine the clusters in rural areas in order to locate the closest points of care that could be found when consulting health services in the Department; likewise, an arithmetic calculation was made relating the consultations by atareo group that would allow evaluating the service consumption of the inhabitants of Vichada for each of the municipalities that administratively make up the Department according to certified sources of information (RIPS).

The purpose of this article is to show the research conducted in the Department of Vichada regarding the access to services that the inhabitants of a territory with high rurality and dispersion may have, also taking into account the supply or availability of services that should be available in territories with these characteristics to optimize access to services and thus generate actions aimed at strengthening primary health care (PHC), thus in a quantitative research (descriptive cross-sectional), which allowed defining the installed capacity in a region with areas of high rurality and dispersion by the research.

Authors such as Escalona and Diez (2004) indicate that health services are directly related to whether they are basic or specialized according to the level of rurality and dispersion, which is a starting point when analyzing the network of services in areas with dispersion characteristics. The research leads us to make pressures on the capacity of a health system to provide services depending on the geographical location of the user, especially in a country like Colombia where the heterogeneity of the territory implies a planning based on geography.

Scale Back, or concentration of the network of services, is directly related to the location of the provision of services according to the market (supply vs. demand), which makes it possible to reduce the cost of the health care transaction, which in highly dispersed areas generates a market asymmetry or an imperfect relationship that affects the planning of services and the execution of primary health care activities (Escalona and Diez, 2004).

Social inequalities and health effects in any population occur when health systems do not identify the factors that generate harm in the protection of the health of the users of a system; these violations are not only related to health care as such, but also to the provision of services or the inability of services to reach where they are needed (Juárez et al. 2014).

The research to determine the installed capacity and access to health services in the department of Vichada is based on the determinants that can be evidenced and measured.

In the research conducted by Molina et al. (2006), in which he states that the non-utilization of health services is a product of the lack of accessibility of health services due to economic, cultural or geographic reasons. With this theory, the research conducted in Vichada, being a department where the geographical extension of the territory is conducive to the low medical attention that can be obtained in both private and public health centers authorized to provide health services, taking into account that the complexity of the network in the Department does not exceed the medium complexity centralized only in the public network, it is a matter of concern that the low access to health services is linked to the dispersion and rurality, in addition to the lack of having a comprehensive care model that is articulated with a network of services that can be strategically located so that the population can consume them in a better way, all this articulated with a weighty variable such as having within the network factors of differential approach to allow better access by the indigenous population.

The research focused directly on quantifying and analyzing the number of Vichadans who attend the health services that are provided for both rural and urban health care, as well as the access to services by the indigenous population through services and health care programs and traditional medicine.

For Valbuena (2015), in the study conducted in the city of barranquilla indicates that one of the great weaknesses of the local health system in the Caribbean city was to improve access to health services, therefore, established that the health walking strategy. They are a group of professionals who are in charge of visiting the neighborhoods house to house, in order to detect possible health problems in the community, fulfilling the role of promotion and prevention. This strategy seeks to stimulate the demand for health services by the low-income population by collecting information about the general conditions of this population that will help to target disease promotion and prevention programs in particular communities. The articulation of these three strategies, Caminantes, Pasos and Caminos, in coordination with the hospital network.

For the Banco de la Republica (2014), in a report presented, it states that when services are not provided in a timely manner, concerns arise about the supply of health services: Is it a shortage problem? Not enough hospitals? Are they poorly distributed throughout the national territory? One element that can help to understand the situation is a balance sheet or inventory of the health service providers in the country, which will make it possible to know precisely where they are located and the quality of their activities.

The utilization of health services in highly dispersed or rural areas is directly related to the capacity of the territory to organize the supply of services; therefore, Piñeres et. al (2013) state that the utilization of services is determined by the sociodemographic variables of the population that has a health need. In this same study, some theories are proposed, such as Anderson's, which suggests the use of other variables such as: a) health care needs (from the individual point of view, as well as that of the service provider); b) predisposing factors (made up of sociodemographic variables associated with attitudes and beliefs about health and disease, such as sex, education, family composition and occupation, among others) and enabling factors associated with socioeconomic conditions, whether in the family (income, health insurance) or community (accessibility, availability).

Method

Research Design

For some researchers, such as Cassiri (2020), quantitative cross-sectional research is valuable because it makes it possible to define variables that make it possible to solve problems of value to humanity. According to the type of research, we used a descriptive cross-sectional method that allows estimating the health conditions of the people of Vichada in a determined period of time, using independent variables (care provided) and dependent variables (health centers). During the time of the research, we also measured some determinants that allow relating it to the unsatisfied demand in the department due to the lack of access to health services that are transformed into disease.

The definition of the type of research establishes what type of objectives can be achieved or at least what paradigms can be broken, for this purpose Hernández et al. (2014), states that; "The problem must express a relationship between two or more concepts or variables (characteristics or attributes of people, phenomena, organisms, materials, events, facts, systems, etc., that can be measured with numerical scores" (pp. 69). With this, the research made it possible to correlate the phenomena observed in the territory in relation to the non-provision of services and to use variables specific to the provision of services in order to achieve the objectives that were presented at the end of the research.

Methodological design

To establish the types of sources that were used in the research to collect the data, they were divided as follows;

Primary sources. The primary source of the research has several components as main data: The surveys that allowed us to collect information from the field would give us the ability to analyze the determinants that affect the population of Vichada's lack of access to health services. The RIPS that were processed to visualize the amount of services consumed in Vichada in a given period of time, allowing for access analysis. The information collected from the Ministry of Health's REPS website allowed us to analyze and quantify the network of services in the municipalities and specifically in the Department.

Secondary sources. The secondary sources were bibliographic references that allowed us to visualize how a health care model should be built based on the specific needs of the population. We were able to take as references different articles, guides from the Ministry of Health and international references from a Central American country (Guatemala) as well as the WHO.

Based on the number of inhabitants according to the DANE 2020 projection, we can identify that the statistical study for the selection of the population is probabilistic with simple random sampling, where we seek to obtain a defined population that will allow us to carry out the statistical intervention by being surveyed by a part of the research. Direct interviews will be conducted by support personnel for the research team, most of whom are indigenous personnel, in order to achieve optimal performance in data collection.

Population and Sample

Bearing in mind the type of research chosen by the work team, survey-type tools were defined to capture and evaluate aspects such as: accessibility, requests made, final product of care, advice from the medical team, economic aspects, among others. Taking into account the sampling technique according to Hernández et al. (2014), a random

selection was made of the population to be intervened where the confidence level had 95% to reduce biases within the research where at the level of the Department 383 surveys were distributed to collect the information, the research team took into account the number of inhabitants to distribute the surveys being Cumaribo the municipality where the largest number of surveys (60%) should be applied because it is the largest and most populated municipality in Vichada.

Also within the techniques used by the research team, direct observation with arithmetic counting of the RIPS for some variables previously defined according to the morbimortality of the Department, which was contrasted with the ASIS 2015. All the information that was processed was submitted by the providers, in the RIPS worked on, 100% of the population consulting health services in Vichada are grouped as PUBLIC-PUBLIC PROVIDER-PUBLIC NETWORK and PRIVATE-PRIME PROVIDERS-indigenous-private network, the public network obtained the information provided by the Secretary of Health of Vichada in the area of information systems, while the indigenous network provided the information by the general direction, all this was consolidated in counting instruments designed by the research team.

Variables

The researchers defined the type of research, which is quantitative in nature, with which a reasonable answer to the problem statement will be sought, for this reason it is defined as follows;

Independent Variable: An independent variable is a variable that represents a quantity that is modified in the investigation and number of health care services that will be processed from the RIPS source (Sousa et al. 2007).

Dependent Variable: A dependent variable represents a quantity whose value depends on how the independent variable of the research is modified, which is divided into two; health centers that are enabled for care in Vichada and indigenous translators that are provided by the IPS enabled in the network of services (Sousa et al. 2007).

Research Instrument

The data processing techniques have two ways that allow access to the analysis of information, for some research the data collection techniques or instruments used in scientific research are of great variety, but quantitative research generally uses surveys, interviews, systematic observation, content analysis, checklists, among others (Hernández and Duana, 2020).

The research focused on a two-way survey-type data collection instrument: 1). The first was the application of surveys that made it possible to capture variables related to the provision of services, such as accessibility, requests and supplies, products (results) and advice (information). 2). The second component of the survey activities was: socio-demographic and economic conditions.

The second component of data collection focused on the systematic observation of the individual health service provider records (RIPS) of licensed providers who in one way or another offer services in the department of Vichada.

The first stage of the research should have clearly identified the problem, which is the main possibility to count on the success of the results to be obtained. For the study conducted, the health situation analysis ASIS of the department of Vichada 2016 was taken into account, with the aim of being able to visualize relevant data for the research as indicated by authors such as Useche et al. Al (2019), where all the most updated information concerning the integrated network or effective service provision should be compiled in order to apply all the routes or documents that could be related to the

organization of the service provision network or the installed capacity of the Department by geographically defined areas, this being a systematic data collection activity that the research used. For this purpose, the research group divided the data collection method into several phases as follows:

The mission of this first phase of the research work is to compile the greatest number of factors that can affect the variables and have an impact on the results. Taking into account the problem identification phase that would be based on the tangible reality of the Department taking ASIS-2015 and the network of enabled health services delivery (REPS) by municipalities.

After having identified the problem that will be visualized in a timely manner in the approach of the research, a geographical demarcation of the health services network will be made for each municipality of the Department (Santa Rosalía, Primavera, Puerto Carreño and Cumaribo) taking into account its nature, in addition, the municipality of Cumaribo will be taken into account, which is one of the four municipalities with the largest population (50% of the Department, mostly indigenous), with the largest geographical extension where the dispersion of the population becomes an important factor to frame the research.

The research team designed a second phase of data collection to design a geographic framework of the network in the Department in order to measure attributes such as (timeliness, accessibility and quality in the provision of services), to guide the existing health services network and redesign the one offered to the population of Vichada, if necessary. The second phase of the research would have the purpose of having a structural mapping geographically of the service units that would provide health care (intramural and extramural) that would allow for a greater presence of health services in the population clusters of the Department.

The third phase of the proposed research study is related to directly taking the voice of the user through a survey type tool that allows quantifying some variables that should be taken into account to propose the design of the network of services both intramural and extramural, the survey will be applied to the population of Vichada both the subsidized health regime, as well as the contributory regime, the exception regime and the uninsured poor population, all this allowing the study to have more information related to the network that is consulted by the ordinary citizen.

The fourth phase corresponds to the analysis of the information gathered from the survey-type tool designed for the study. The main purpose of the survey is to listen directly to the users of the existing network, which will allow the research team to compare some other factors that have been previously documented, in this phase, what is proposed is to provide the different actors with a tangible suggestion of what could be the design of the network of the Department of Vichada, both intramural and extramural, to improve the health conditions of the people of Vichada, taking into account factors of the highest relevance that will be pointed out by the research team in the results and conclusions.

Results

The general objective of the research was to determine the sufficiency and accessibility of the municipal and departmental hospital network in Vichada. In order to develop the research in an integral, efficient and pertinent manner, data collection techniques were used as mentioned above in the methods section, where in this section we will show the results obtained to validate the research.

Table 1

Authorized service providers in Vichada

Type of Provider					
Municipalities	**PRIVATE**			**PUBLICA**	
	IPS	**Independent Professional**	**Total, General Private**	**IPS**	**Total, General Public**
CUMARIBO	3	1	4	2	2
SPRING	0	2	2	1	1
PORT CARREÑO	1	10	11	1	1
SANTA ROSALIA	1	0	1	1	1
Total, General			18	**Total, General**	5

Note. Source: Special registry of health service providers (REPS years 2020).

Table 1 shows that the research, taking as a reference the REPS-registry of health providers of the Ministry of Protection and Health as of November 2019, tabulates the network of services that is authorized to provide health services in Vichada, in a total of 18 providers between IPS and independent professionals of private nature, discriminated in the following way; in Cumaribo (3 IPS) and (1 Independent Professionals) totaling 4; in the municipality of La Primavera there are (2 Independent Professionals); in Puerto Carreño which is the capital of the department we found (1 IPS) and (10 Independent Professionals); in Santa Rosalía we found (1IPS). This marks a service network made up of 23 health care providers, including IPS and independent professionals.

For the research it was also important to establish within the data analysis and systematic observation that was carried out, to be able to identify the type of provider as well as the nature of the same, given the conditions that in areas with high rurality and dispersion require a local health system and likewise the responsibility of the state to provide sufficient installed capacity to provide access, timeliness and relevance in the provision of health services, for this reason the following table is presented.

Table 2

Authorized service providers in Vichada

Locations in the Department according to their nature			
Municipality	**Private**	**Publicas**	**Total**
CUMARIBO	3	1	4
SPRING	3	1	4
PORT CARREÑO	11	1	12
SANTA ROSALIA	1	1	2
Total, General			22

Note. Source: Special registry of health service providers (REPS years 2020).

Table 2 shows that in the department of Vichada there are 22 health service providers in each municipality, both private and public. Among the IPSs referenced in the department, it should be noted that only 2 are of an indigenous nature and both are only located in the urban area of the municipality of CUMARIBO, according to the REPS as of November 2019.

For the research it was important to locate how the network was conformed being the main input to provide health services in the territory, for this reason the demographic result of the population is now shown.

Figure 1
Place of origin of the consultants to services

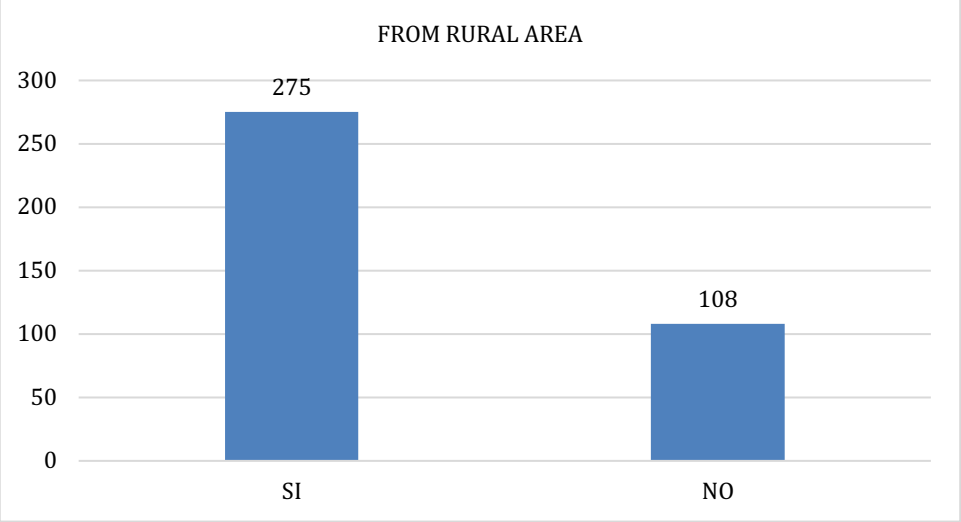

Figure 1 shows the surveys applied in the different health service providers in Vichada, where out of 383 surveys applied, 275 responses indicate that they come from rural areas, representing 71.80% of the result, and 108 responses indicate that they do not come from rural areas, equivalent to 28.19%.

Figure 2
Place of origin of the consultants to services

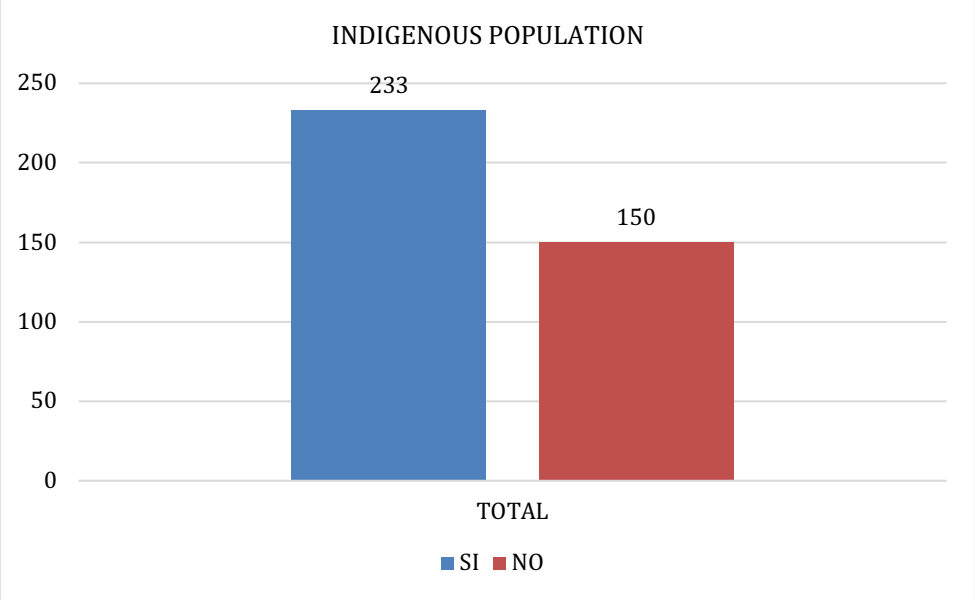

Figure 2 shows the results obtained in the survey item, where we can see that of the 383 surveys that were applied and that had the question whether they were indigenous yes or no, 233 people marked that they belonged to an indigenous group. With

this we can say that 61% of the population that consults the health services in the department of Vichada belongs to indigenous groups, being more than half of the people who consult the health services. In the same way, a total of 150 surveys of population that does not belong to the indigenous population, equivalent to 39.16% of the colonist population.

The research shows that the total indigenous population in the department of Vichada is as important as the same service delivery network that may be required to conform in an efficient manner, taking into account their ancestral beliefs in the research work it was necessary to establish how much the indigenous peoples consumed health services with Western medicine. The municipality with the highest proportion of indigenous people is CUMARIBO, which is also the municipality with the largest population in the department, with an average of 40 thousand people, 50% of whom have declared that they belong to some ethnic group in the department. In order to evaluate how many of the indigenous population consulted the health services available to them in any of the 4 municipalities, a survey was conducted to determine whether they were part of the indigenous population.

One of the main results of the research was to identify that first more than 50% of the consulting population was indigenous population, then to keep in mind that 71% of the total consulting population is from the rural area (Figure 1), with another factor that was identified was the multiculturalism that was identified as one of the most representative of the research, taking into account the existing peoples throughout the territory, which are: the GUAHIBO, the SIKUANI, the PIAROA, the PIAPOCO, the CUBEO, the PUINAVE, the AMORUA and the SALIVA are the indigenous groups present in Vichada. This generates an additional challenge, given that each indigenous people has its own ancestral characteristics, in the same way for the planning of differential health services.

Table 3

Authorized service providers in Vichada

Municipalities	Type of Transportation from the municipality to Puerto Carreño and Villavicencio	Arrival time to the main city (from the farthest community) in minutes	Distance in km to the main city from the farthest city
Puerto Carreño	Air and Ground to Villavicencio.	60 minutes to Villavicencio by air and 48 hours by land.	Carreño to Villavicencio by air 718 km
La Primavera	By land, river and air to Villavicencio. Land and river to Puerto Carreño	Primavera-Carreño by land 12 hours, by water 7 hours. Primavera-Villavicencio by air 2 hours, by water and/or land 9 hours	415 km by land from primavera to Carreño. 378 km from spring to Villavicencio by air.
Cumaribo	By air and river to Puerto Carreño and by air and land to Villavicencio. The latter only in summer.	To Puerto Carreño by air 105 minutes, by river 24 hours. By air to Villavicencio 120 minutes and by land to Villavicencio 13 hours in summer and 2 to 3 days in winter.	Cumaribo to Villavicencio 305 km by air and overland by land 481 km
Santa Rosalia	Villavicencio to Santa Rosalía, Vichada, takes approximately 8 hours and 49 minutes driving, covering a distance of 391 km	From Puerto Carreño to Santa Rosalía by air takes about 120 minutes, by river about 12 hours and by land about 14 hours	Approximately 415 km to Puerto Carreño and 200 km to Villavicencio

Note. Gobernación del Vichada (pp.59-63).

In table number 3 the investigation contextualized as a result the access to the department by where you look at it is a difficult task bearing in mind the reference that is in the table, we found that the capital Puerto Carreño is closer to Venezuela than to the nearest municipality of Meta, where access is subject to the state of the weather during the year in this way making complex mobility within the department. In the interior of the department, referencing municipalities such as Cumaribo, we see that it is almost impossible to travel by land during half of the year, the distances that a patient should assume would be more than 48 hours by land for any type of referral, now if it is a referral that exposes the patient's life the only way to be able to address the management plan.

Talking about access to Vichada is a bit complex when viewed from anywhere in the country. The current situation of the road and transportation system, both urban and rural, in the municipality of Puerto Carreño, is framed by the precarious conditions in which it is found; land transportation of both cargo and passengers is limited only to the summer season; river transportation is deficient due to the lack of continuous flows of cargo and passenger vessels that operate at all times of the year. There is currently a road from Villavicencio to Puente Arimena, passing through Puerto López and Puerto Gaitán. From Puente Arimena to Puerto Carreño, land communication is only possible during the summer season; a road has not been built to allow year-round transit, and there is only a trail marked by the tracks left by vehicles as they pass through. This road is used by trucks and truckers during four months of the year. River transportation, especially on the Meta and Orinoco rivers, is used during the winter season. Air transport is the most used means of transport for passengers and delicate and perishable cargo to and from the interior of the country, which is why the results in Table 3 are so important, as they bring us closer to the reality of highly dispersed areas.

In the municipality of La Primavera, the most important branch roads are the national highway with an approximate length of 15 km, which enters and exits at the Nueva Antioquia Inspectorate. It has a ferry that provides service in Puerto Esperanza and Casanare.

Figure 3

Type of insurance of the population consulted

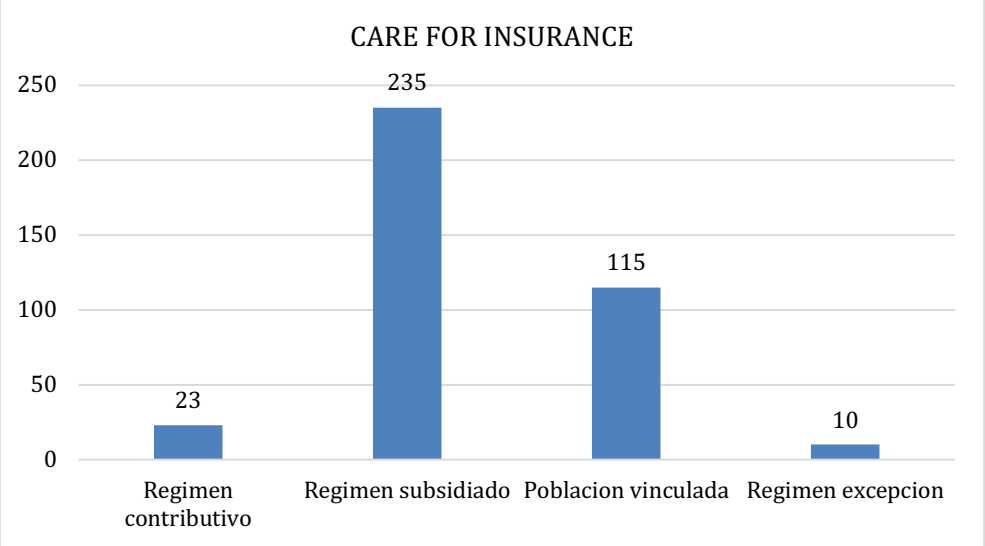

Figure 3 shows how the population in the department of Vichada is covered by the SGSSS. Once the research had identified the capacity of the health system in highly dispersed areas such as the department of Vichada, it was important to show the type of

insurance coverage of the population in the department. The research team was able to determine what type of insurance coverage the sample population had by means of the survey that was applied, yielding important results to determine access and the impact it would have on each of its components. First and foremost, it was determined that 61% of the population seeking health services belongs to the subsidized regime, which means that they have access to the services offered in the department. Another component of relevance in the result was the number of uninsured poor population or linked population that consult to health services, which total 30% of the sample, meaning that the SGSSS insurance has not been able to channel these inhabitants of the territory and due to the administrative connotation of the uninsured population, they would have problems in accessing health services.

Similarly, one of the main results of the research was to establish that 69.97% of the total population that sought health services in the 383 surveys applied was insured, making the insurer responsible for managing the population's risk, a situation that leads to organizing the network of services based on the needs of the patients.

For the research it is of vital importance to know the amount of services consumed by the inhabitants of Vichada in the providers that are enabled, being difficult to obtain the information, the research team will work with the RIPS of two providers of the department that agreed to measure the data.

In addition to this, the department has an underreporting of information that does not allow for adequate traceability of the consultations. For the providers in question, it should be taken into account that they are the ones with the largest number of affiliates in the department with a database of 50,000 affiliates, which corresponds to 68% of the total population that accesses health services in Vichada.

Table 4

Services provided by the network in the department

CARE PROVIDED BY PYP PROGRAMS IN VICHADA-2017	
PROGRAM	# TOTAL ANNUAL
PRENATAL CHECKUPS	QUANTITY
PRIVATE LENDERS	1164
PUBLIC LENDER	1061
TOTAL	2225
GROWTH AND DEVELOPMENT UNDER 10 YEARS OF AGE	QUANTITY
PRIVATE LENDERS	5992
PUBLIC LENDER	7911
TOTAL	13903
ORAL HEALTH	QUANTITY
PRIVATE LENDERS	1655
PUBLIC LENDER	5571
TOTAL	7226
FAMILY PLANNING	QUANTITY
PRIVATE LENDERS	9400
PUBLIC LENDER	3697
TOTAL	13097
CYTOLOGIC EXAMINATION	QUANTITY
PRIVATE LENDERS	725
PUBLIC LENDER	17
TOTAL	742
YOUTH CONSULTATION	QUANTITY
PRIVATE LENDERS	9743
PUBLIC LENDER	109
TOTAL	9852
ADULT CONSULTATION	QUANTITY
PRIVATE LENDERS	1117
PUBLIC LENDER	192

TOTAL	1309
VISUAL ACUITY	QUANTITY
PRIVATE LENDERS	91
PUBLIC LENDER	4
TOTAL	95

Note. Note. Result of the analysis of the RIPS versus the care provided in 2017, own elaboration.

The previous table number 4 shows us a consumption of services by the inhabitants of Vichada with an average total population of 73,000 thousand inhabitants according to DANE figures for 2017 allowing us to establish some situations such as: 1). If the population pyramid presented during the investigation with its respective age group for children under 10 years of age represents an average value of 18,000 infants for the department that require at least 2 visits in 12 months, which would give at least 36,000 thousand visits for the period, we refer to table number 4 of the RIPS where 13,903 visits are reflected, showing a lack of access to medical consultations for at least 62% of the infants in the Department, in the calculation only 38% of the children in Vichada would have access. 2). For the age group of inhabitants of fertile age from 14 to 44 years described in the research, there are about 31,000 people between men and women, in the table described, it can be seen that 1,3907 inhabitants of Vichada of fertile age received some family planning consultation in the 12 months of the period, resulting in 44.9% of the population, leaving 55.1% of the population without access to planning services, being of vital importance birth control in territories such as Vichada. 3). The definition of adult is given in the legal regulations in force **and** that pointing out the population group of Vichada we can refer to 45 to more than 60 years, corresponding to a population of 13318 inhabitants, evaluating the RIPS table the number of consultations is 1309, this allows to establish that 90% of adults in the department do not access to consult and that only 10% have a control or consultation for what is related to adulthood.

Figure 4

Proposed network model for the provision of health services in the department

Note. Note. Proposed reorganization of the network in Vichada, prepared by the company.

In figure 4 and as a result of the research according to the variables defined in the general objective to Determine the sufficiency and accessibility of the municipal and

departmental hospital network of Vichada, Thinking about the construction of a functional and operative proposal that allows generating the greatest possible access to the health services offered in the department, it is of vital importance to start with a network of services according to the needs of the population, a health care team related to the needs and a care model with tools that allow a better access to the services by the population of Vichada.

Discussion and Conclusions

The great discussion of the research process is directly related to how even the population is insured within the SGSSS, the indicators do not show improvement, being clearly a weakness of the local system, it is also important to mention that even the UPC is differentiated by territory and population, the territory has some geographical characteristics that makes the provision of services increases the cost in the production of each service.

The research was thought about how the provision of health services would be organized, it cannot be subject exclusively to the offer provided in local hospitals or health centers; from the data obtained by the research, several components should be organized, which could be given by; expansion of providers in areas where there is no health institution, extramural teams, formation of community health teams in areas of the department where there is no SGSSS actor and reorganization of the existing offer in the department so as not to duplicate services per provider.

In the same way, the research determined that due to the distance and geographic space to be covered, it is important to start a telehealth pilot plan to connect the communities that may have connectivity, energy flow and spaces to at least provide access to primary health care to the population (PHC). In the same way

It is also important to mention that the steering role in the department should be strengthened in order to reorganize the existing installed capacity and build a model of care with the differences inherent to the territory, where the creation of a single system can be explored in relation to the existing providers in the territory, as well as to establish the needs that are not being met from the contractual component with the existing insurers in the territory, all this understanding the administrative capacities of the territorial entity of the department.

Finally, it is important to establish with the Colombian Ministry of Health and Social Protection, local indigenous organizations, academia and territorial entities how to establish a plan to design a model of care according to the geographic and cultural needs and differential factors of the territory.

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METHODOLOGY FOR CIVIL PROJECT MANAGEMENT BASED ON THE PMBOK, ISO 21500 STANDARD AND THE PRINCE2 METHOD: CASE STUDY ANTOQUIA, COLOMBIA

METODOLOGÍA PARA LA GESTIÓN DE PROYECTOS CIVILES BASADA EN EL PMBOK, LA NORMA ISO 21500 Y EL MÉTODO PRINCE2: CASO DE ESTUDIO ANTIOQUIA, COLOMBIA

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ABSTRACT

Project management contributes to the improvements of an organization, implementing actions that meet its requirements. In the management of civil works, analyzed for this study, it was determined that there is no consensus on the management model, appreciating that: some entities apply standards, without an adequate relationship; the participation of specialized managers with particular contributions and, finally, the development of goods aligned with international standards. Therefore, literature of methodologies that lack the inclusion of areas of social, environmental, archaeological and accounting management was analyzed. It was noted that economic and growth indicators of the sector have been created, but not specific to project management. In this work, a methodology applicable to all types of works was developed, based on the ISO 25000, PMBoK and PRINCE2 standards. The proposed methodology manages the necessary and sufficient information for timely decision-making. For its development, 26 different construction and auditing projects were studied, in 25 companies in Antioquia, and applied to 4 of them, resulting in a methodology that provides multiple technical contributions, better clarity in the definition of roles, more effective planning and more efficient execution of projects. In the cases applied, the management of time, resources and the satisfaction of stakeholders were improved. The scope and costs were stabilized and the possibility of adding budget was improved, without delays in the execution time,

benefiting the management of civil projects in the companies studied.

Resumen

Palabras clave:
gestión, proyectos civiles, estándares de administración, metodología.

La gestión de proyectos contribuye a las mejoras de una organización, implementando acciones que satisfagan sus requisitos. En la gestión de obras civiles, analizadas para este estudio, se determinó que no existe un consenso de modelo de gestión, apreciando que: algunas entidades aplican estándares, sin una relación adecuada; la participación de gerentes especializados con aportes particulares y, por último, el desarrollo de bienes alineados a estándares internacionales. Por lo anterior, se analizó literatura de metodologías que carecen de inclusión de áreas de gestión social, ambiental, arqueológica y contable. Se observó que se han creado indicadores de orden económico y crecimiento del sector, pero no específicos de gestión del proyecto. En este trabajo se desarrolló una metodología aplicable a todo tipo de obras, con base en los estándares ISO 25000, PMBoK y PRINCE2. La metodología propuesta gestiona la información necesaria y suficiente para la toma oportuna de decisiones. Para su desarrollo se estudiaron 26 proyectos diferentes de construcción e interventoría, en 25 empresas de Antioquia, y se aplicó sobre 4 de ellos, resultando una metodología que brinda múltiples aportes técnicos, mejor claridad en la definición de roles, planificación más efectiva y ejecución más eficiente de proyectos. En los casos aplicados se mejoró la gestión de tiempos, recursos y la satisfacción de interesados. El alcance y los costos se estabilizaron y mejoraron la posibilidad de adicionar presupuesto, sin presentarse atrasos en el tiempo de ejecución, beneficiando la gestión de proyectos civiles en las empresas estudiadas.

Introduction

It is common to find the indiscriminate use of the words administration, management, management, development, control, direction, and project management, giving rise to what is known as the jungle of administrative theory (Krezner, 2022). Some authors agree that the terms administration, direction, and management are accepted as having a common essence, (Alanis, 2021) as they refer to the same activities of planning, organizing, directing, evaluating, and controlling, in a specific way and with the purpose of delivering the consolidated or objective of a project. Project management has the double connotation of serving companies as the basis for their economic development (profits for the fiscal year) and as the basis for the development of their own work functions (fulfillment of their social function), and civil projects are the ones that most closely approximate the forms of current management.

Initially only the Objective-Cost-Time triad prevailed, with time values such as Scope-Quality were incorporated; now elements such as human resource, social, environmental and archeological management are added; all of them making a substantive part of a current project.

In Colombia, civil project management basically focuses on three aspects: costs, time, and human resources, without methodologies that integrate the other areas. However, despite all the methodologies adapted for civil project management, we found deficiencies, weaknesses, inadequacies, or unnecessary complexities in their development. That is why the formation of a unique body of knowledge in the common language and management among professionals and specialties is so important and representative. There are several methodologies that aim to unify projects, but there are few applied to the civil sector. In addition, it has to be specific to Colombia, there is none.

In order to solve the problem, the research takes the information without previous alterations and interpretations by the interviewees (Yuni, 2021), focusing on projects that promote regional development and guarantee the efficient investment of resources in infrastructure projects (Simonaitis A. D., 2023). In addition, the management process groups, knowledge areas (EAE Bussines School, 2020) and the new PMBOK approach were analyzed (Project Management Institute, 2021), as well as the contributions of ISO 21500 (ISO, 2021) and the PRINCE2 method generating improvements in terms of timely delivery, cost control and stakeholder satisfaction. Their comparison made it possible to identify their advantages and challenges (Rueda Urrea, 2023), addressing in a more comprehensive manner the specific challenges faced by civil projects in this region (Tamayo Monsalve, 2022). Applying a single methodology for the search for differences and similarities between them so that the elements (variables, processes, etc.) that really apply to a generic civil project can be identified and developed in such a way that any work group under similar circumstances can obtain the same or better results in its execution (Nossa, 2021).

The objective of the project focused on the importance of critically evaluating updates of methodologies for continuous improvement (Herrera Sanabria, 2019), adapting them to local needs for more successful infrastructure outcomes. (Andrade Quintero, 2022). The implementation of this methodology in construction projects in Colombia will represent a significant competitive advantage, allowing compliance with quality standards, time, resource optimization and improved risk management (Alarcón C., 2020).

In Colombia, specific methodological approaches from the PMBoK have been used in major infrastructure projects such as the development of mass transit systems in cities

like Bogotá and Medellín (Simonaitis, Daukšys, & Mockienė, 2023); from (Faraji, Rashidi, Perera, & Samali, 2022) PRINCE2 in the urban expansion project in Cartagena; and from ISO 21500 in the urban renewal project in downtown Cali. Approaches that ensured compliance with regulations and the achievement of sustainable development and social responsibility objectives, while respecting the cultural and environmental diversity of the area (Camargo Sierra, 2020). Effectively managing frequent changes in project requirements and logistical challenges, resulting in more efficient execution of resources (Fobiri, Musonda, & Muleya, 2022).

The implementation of management methodologies in the construction sector faces significant challenges and requires cultural adaptation to align them with local practices and the local environment (de Almeida Barbosa Franco, Domingues, de Almeida Africano, Deus, & Battistelle, 2022). The challenges presented by the adaptation of these methodologies also offer opportunities for innovation in project management (Departamento Nacional de Planeación, 2023).

Methodology

Project Management (civil)

Project management methodologies have been developed with very different and distant approaches, moments and spaces, creating fundamental tools for the successful planning and execution of civil infrastructure projects (Management I. J., 2018).

Since the Second World War, entities have been created to rationalize the practice of project management, creating guidelines and standards with their own techniques, methodologies, tools and programs that are still in use today. They contribute international standardized knowledge to constantly changing projects (Cicmil, 2006), and are applied with different dimension and depth to civil projects.

Table 1

Summary of some project management standards

YEAR	METHODOLOGY	COUNTRY	APPROACH	BENEFIT - SCOPE
1953	APM BoK	UK - India	Projects	Practical improvement for project management in a variety of industries and sectors.
1960	BS 6079	England	Projects	He guides various aspects of project management (planning, execution, control) in a variety of industries.
1965	IPMA Competence	Switzerland - Netherlands	Projects - People	Focuses on the competence and skills of professionals.
1987	PMBoK	USA	Projects	It focuses on key areas such as scope, time, cost and quality, among others.
1989	PRINCE2	UK	Organization	Focuses on achieving project performance goals (profit, cost, time, quality, scope, sustainability, risk, and others) Seeks ongoing business justification.
1991	ECITB	UK	Persons	It focuses on developing skills in the construction and engineering industry.
1996	NCSPM	Australia	Persons	Defines skills and knowledge necessary for project management in a variety of industries and sectors.

YEAR	METHODOLOGY	COUNTRY	APPROACH	BENEFIT - SCOPE
1997	ISO 10006	Switzerland	Projects	Provides guidelines for quality management in projects.
1997	SAQA	South Africa	Persons	It establishes the necessary standards to guarantee management competence.
1998	OGC PMMM	UK	Organization	Evaluates the maturity of project management in government entities: Provides standards to improve project management in the public sector.
2001	P2M	Japan	Projects	It focuses on integrated project and program management, approaching management holistically and maximizing the value delivered.
2002	PMI© PM CDF	USA	Persons	Focuses on the development of project management competency. Provides detailed guidance to improve the skills and knowledge required for management.
2002	OPM3™	USA	Organization	Focuses on improving project management at the organizational level.
2012	ISO21500	Switzerland	Projects	Provides guidance for project management. Designed for a variety of industries and sectors. It offers a framework aligned with other international standards.

However, it lacks specific application for civil projects in Colombia and therefore in the achievement of objectives and scopes, as desired in practice.

Development of the Unified Methodology

The proposed methodology was developed based on the three predominant project methodologies in Colombia, but specifically oriented to the civil infrastructure sector (Management I. J., 2018). The integration of these three methodologies offers a holistic approach, combining the flexibility of PMBoK, the structure of PRINCE2 and the international standards of ISO 21500 (Prebanić, 2017) and is thought of the appropriate applicative (Lozares, 2012):

Table 2

Comparative summary of the methodologies studied and proposal.

METHODOLOGY	SUMMARY OF THE IDEOLOGY - STRUCTURE
PMBoK	Comprehensive approach that establishes standards and best practices for project management; it is a comprehensive guide detailing best practices in project management. The PMBoK, 5th - 6th edition, distributes this knowledge in 5 process groups, 10 management areas and 49 management processes. The proposal for the 7th edition (2021) emphasizes 12 Principles and Domains (Cagua, 2021), seeking flexibility, adaptability and the achievement of results, without being contrary to the process approach of previous editions. They do not cover particular topics as the areas do, but allow autonomy in choosing best practices, tools and techniques

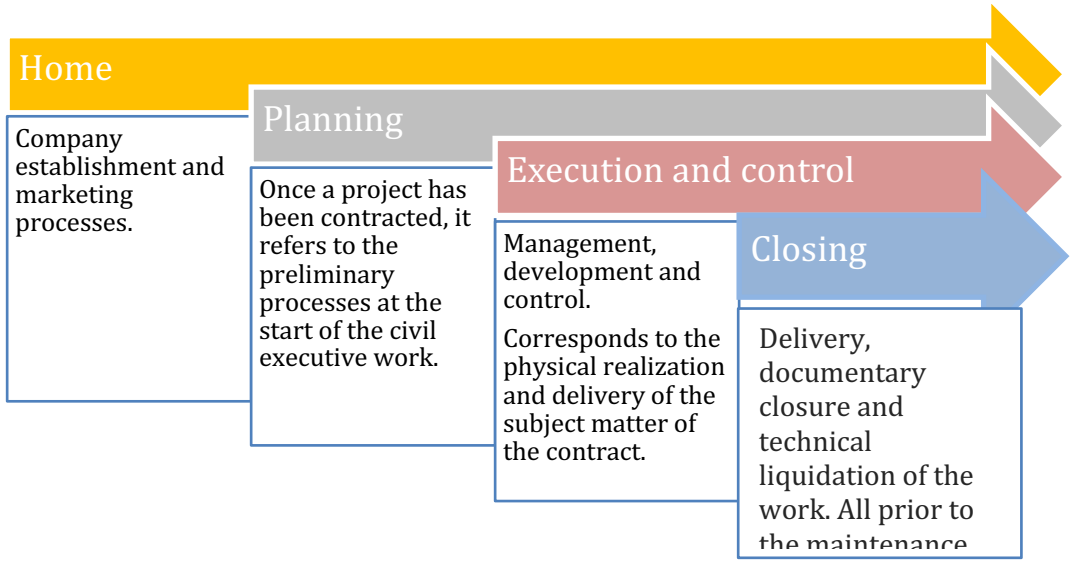
METHODOLOGY	SUMMARY OF THE IDEOLOGY - STRUCTURE
PRINCE2	Adaptable and controlling through clear stages and roles, relevant in large civil projects (Management I. J., 2018). It is detailed and specific, adhering to defined standards, templates and roles. It is characterized by being pragmatic and focused, not on knowledge, but on the success of the project. PRINCE2 seeks to convert uncertainty and variability into controlled environments, by means of themes, justified in the feasibility study of a case (Business Case) permanently reviewed in the project life cycle. PRINCE2 is based on 7 management principles of recognized effectiveness, describes 7 management processes (groups of processes or phases) and 7 themes (knowledge areas),
ISO 21500	Provides an international framework, aligning with PMBoK and PRINCE2. It does not define tools or techniques, it only defines the project life cycle. It is a simpler and friendlier version. It does not plan risk management. It is a highly detailed version, which distributes this knowledge in 5 process groups, 10 management areas and 39 management processes.
Proposed Methodology	It is presented for the project execution cycle, connecting 4 dimensions: • 4 Phases: it relates the times within the execution of the project. • 15 Areas: relates sets of analogous knowledge. • 43 (Groups of) Processes: relates processes within an area or between them. • 265 Records (System inputs and outputs): relates data demand and information output under process management. Thus, the body of knowledge is unified, with the necessary and sufficient processes for the management of civil works.

Relationship in the Phases of a Civil Project

The first knowledge and documentary dimension relates groups of processes applied over time, whether independent or not:

Figure 1

Phases of a civil project

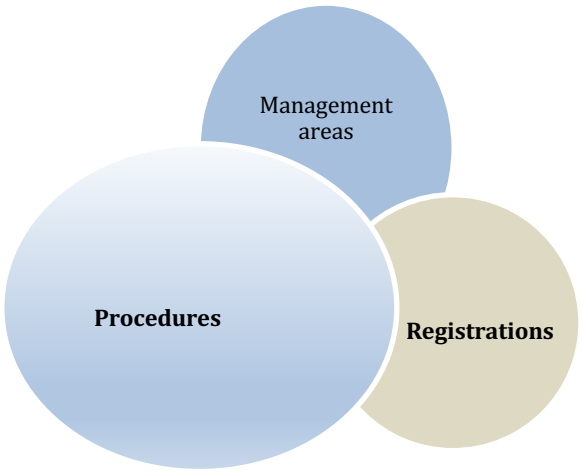


Relationship in Areas, Procedures and Records

The second knowledge and documentary dimension relates specific topics of knowledge, developed by personnel specialized in each topic and necessary for the overall

sum of the project, making available through this methodology sufficient, necessary, timely and coherent information for the identification of problems and decision making:

Figure 2
Relationship in areas, procedures and records



It divides each civil project into 15 distinct but interrelated areas of knowledge

Each area establishes sufficient and necessary procedures, avoiding repetitions of information and results in the processes (43 procedures in total).

Not all mandatory procedures generate a Register· 265 records are defined covering all areas.

The defined areas of knowledge are:

(1). Objective and scope.
(2). Business organization.
(3). Marketing and service improvement.
(4). Costs and budgets.
(5). Timing and scheduling.
(6). Human resources.
(7). OSH Occupational health and safety.
(8). Communications.
(9). Suppliers and warehouse.
(10). Quality control.
(11). Project management (administrative technician).
(12). Social and stakeholder management.
(13). Environmental and archaeological management.
(14). Risk management.
(15). Accounting.

Application of the Proposed Methodology

To verify the performance of the proposed methodology, companies were selected that met the following criteria:

Table 3
Inclusion and exclusion criteria

CRITERIA	INCLUSION	EXCLUSION
Infrastructure Project	Within the department of Antioquia	Outside the department of Antioquia
Type of Company	Public or Private	Mixed or foreign economy
Resource availability	Total shareholders' equity	Not self-financing by sales or developed in stages
Type of contract	Interventory or construction	Design or consulting
Type of selection	Open public bidding	Unique selection
Valuation of costs	Adjustable unit prices	Any other type (Turnkey, etc.)
Company Size	Median[1]: Staff of fifty (50) to two hundred (200) workers. Assets between 5,001 and 30,000 SMMLV[2]	Small or large company: Personnel and/or assets outside the defined margin.
Project Value	Between U$A 50,000 and U$A 10 million of dollars	Outside the specified range
Project duration	4 years or less	More than 4 years

The field study was conducted on a sample of 26 projects of various genres, with companies that met the above criteria. The projects studied are presented in Table 2:

Manuals, processes and records for the planning and development of civil projects were studied, identifying common models, in order to develop a single methodology and validate a complete information system. The selection of 26 companies, representing the average construction company and typical state contractor, under Law 80 - Colombia's state contracting law.

Table 4
Projects studied

	CRITERIA	INCLUSION	EXCLUSION
1.	Commune 7	Urbanism	Auditors
2.	Home improvements	Housing	Auditors
3.	Path of Life	Urbanism	Auditors
4.	Metro Plus	Acu. Y Alc.	Construction
5.	Educational Centers	Buildings	Construction
6.	Envigado - V. S. Catalina	Acu. Y Alc.	Construction
7.	Vial Linares 2	Vias	Construction
8.	Las Mirlas Road Circuit	Vias	Construction
9.	Potrillo Village	Sewer	Auditors
10.	Urb. Niquia Village	Urbanism	Construction
11.	Decameron Rionegro	Urbanism	Construction
12.	Éxito Parking Lot - La Ceja	Urbanism	Construction
13.	Alc. Panorama	Urbanism	Construction
14.	Urb. Bracamonte	Urbanism	Construction
15.	Rionegro	Water and Sewerage	Construction

[1] In Colombia, Law 905 of August 2, 2004, amending Law 590 of 2000, promotes the formation of companies of different sizes (micro, small and medium), including family businesses and Simplified Joint Stock Companies, defining them as units of economic exploitation in any sector.
[2] SMMLV, acronym for Minimum Monthly Legal Minimum Wage in Force

	CRITERIA	INCLUSION	EXCLUSION
16.	Bridges	Maintenance	Construction
17.	Perpetuo Socorro Square	Park	Construction
18.	Robledo Diagnostic Center	Building	Construction
19.	La Estrella	Water and Sewerage	Auditors
20.	San Carlos	Sewer	Auditors
21.	Classrooms El Bagre	Building	Auditors
22.	Segovia Sports Unit	Coliseum	Construction
23.	Santander Park	Park	Construction
24.	Mine Sedimenters	Tanks	Construction
25.	Sandra K	Substation	Construction
26.	Commune 3	Platforms	Construction

The companies studied are located in the department of Antioquia (Medellín), Cundinamarca (Bogotá D.C.), Valle (Cali), the central or Andean zone of Caldas, Risaralda and Quindío (Manizales, Pereira and Armenia) and the Atlantic coast in Bolívar, Atlántico and Magdalena (Cartagena, Barranquilla, Santa Marta), areas that account for 70% of the country's infrastructure investment, and of these Antioquia alone accounts for at least 36%, surpassed only by Cundinamarca.

However, the research focuses on projects carried out in the so-called Metropolitan Area of the Aburrá Valley, which includes 10 municipalities in the department of Antioquia, with the city of Medellín as its capital. The projects are of medium cost and complexity, being those between US$ 50,000 and US$ 10 million, since this value covers most of the civil projects developed in the country, including the fourth generation roads, which represent the most expensive projects and which are normally developed in sections. In general, projects are developed in periods of less than four years, with an average duration of two years.

In addition, the methodology incorporates, among others, the following national and local standards: NTC ISO 9001:2015 Quality Management Systems, NTC ISO 10005:2018 Quality Management, NTC ISO 14001:2018 Environmental Management Systems, NTC ISO 45001:2018 - Occupational Health and Safety Management System, NTC ISO 27001:2013 Management System for Information Security. For the archeological management of the project, Law 397 of 1997 on Cultural Heritage, promotion and encouragement of culture is considered, being the competent authority the Colombian Institute of Anthropology and History - ICANH.

For social and environmental management, the company complies with Law 489 of 1998, which assigns social management of civil projects, framed for the department of Antioquia and its municipalities with Decree 673 of 2006 through the Social and Environmental Management Guide for the construction of public infrastructure works. For the integration of accounting areas, with the registration and support of accounting information according to Law 145/60, Law 43/90, Law 222/95, Decree 410/71, among others.

Projects with positive development

The projects in which the proposed methodology has been applied are as follows:

Table 5
Projects with proposed methodology applied

	PROJECT	TYPE	INTERVENTION
23	Santander	Park	Construction
24	Settling tanks	Tanks	Construction
25	Sandra K	Substation	Construction
26	Commune 3	Platforms	Construction

Projects Withdrawn Due to Negative Development

There is an additional project where the methodology was applied, and although the role of the researcher was in the auditing, the contracting company was NOT willing to continue the review process under the proposed methodology, for multiple cost reasons, so its use and the results of their analysis were stopped, but not before it was clear that the project would enter into early termination due to economic incapacity of the project.

This is due to the fact that from the beginning of the execution, the unit price analysis (APU's of execution costs) were reviewed and the economic unfeasibility of the project was reported under the offer submitted by the contractor and accepted by the contracting entity. The analysis indicated that at least 43% of the project should have been executed in eleven months, and hardly 2.6% had been executed; and the execution costs were on average higher than 50% of what was expected, in addition to the fact that the invoicing for the work executed would never cover the execution costs. It is clear of the reason for his retirement.

Results

Two groups were formed with the companies analyzed: the first group was taken as a sample where there is no clear methodology applied, but of projects that finally met their objective, and a second group of companies in which the proposed methodology was applied. They showed the following improvements and achievements that did not resemble those of the initial companies:

Table 6
Achievements in the company and its projects

Improved infrastructure	For the solution
• Low investment in hardware and software. • Greater control of minor equipment. • Improved management through the use of the Internet. • Low need for updating.	Simplified procedures. Rationalization in the use of resources. Development of programs, plans, and information records of unified content. Articulation of different plans.
Technical contributions achieved	**Internal achievements**
• Unification of criteria. • Common language in projects. • Applicable to all construction companies. • Gathering of sufficient and necessary information for administrative management. • Active, flexible and adaptable methodology. • Synthesis of operating manuals, processes and records. • Permanent and hierarchical availability of information to identify problems and active decision making. • Correct creation of databases. • Savings in resource management. • Compliance with contractual standards.	• Unification of methodologies and databases. • Duality of information is prevented. • Unification of manuals, procedures and registration. • Management of sufficient and necessary information, • Increased customer and user reliability. • Maximization of administrative personnel management. • Increased staff adherence and commitment. • Real-time information management and agility in decision making. • Improvement in audit processes. • Orientation of the company to continuous improvement.
Transactional system improvements	**Strategic improvements**
• Agility in the capture of records. • Permanent record of activities. • Access by third parties (workers, suppliers, other stakeholders). • Real-time information management. • Increased productivity. • Remote access.	• Process identification and simplification. • Flexibility in modifications, changes, adjustments and updates. • Ease of growth in its management. • Increased efficiency in the allocation of resources. • Increased speed of response to internal and external requirements, as well as the company's competitive advantages.

Indicators

Indicators included measures of delivery time, budget variances, stakeholder satisfaction surveys and the degree of compliance with the proposed unified methodology (Axelos, PRINCE2® (Projects IN Controlled Environments), s.f.). They were also categorized into two components:

- Indicators specific to the methodology: they evaluated the relevance of each procedure and its possibility of modification, change or withdrawal.
- Indicators specific to the project being monitored: evaluated its development.

Discussion

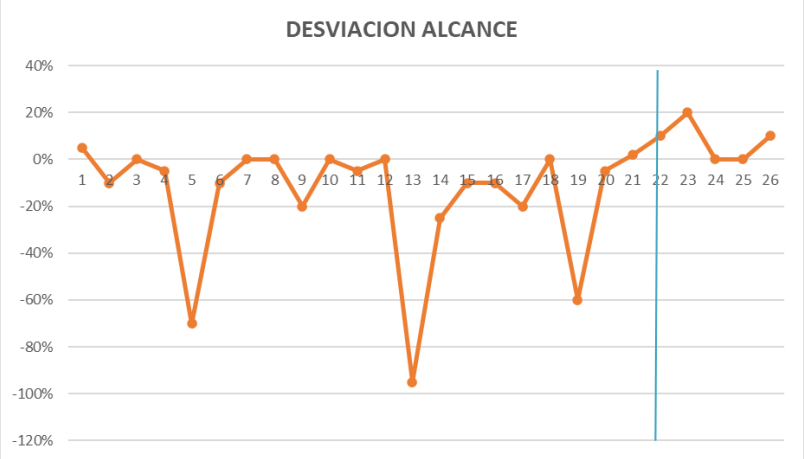
The projects developed with the proposed methodology result in the settlement in the deviation curves of the three main control elements: scope, budget and execution time. The quality element was not evaluated since, in the acceptance of the work by the contractor, compliance with the contractual specifications is evidenced, which is the basis for quality, therefore, it is considered satisfied.

Deviations in scope

The scope of each project is reduced or increased with the possibility of adding or not the budget[3], and depends on the capacity of each contracting entity to obtain resources and justify these additional investments in a timely manner.

Figure 3

Deviations projects studied VS. initial scope



In the case of projects in which this methodology is applied, the scope tends to stabilize with the budget and is improved if the budget increases and only for the improvement of the end users of the contracting entity.

Budget variances

It is commonly due to price increases that occasionally force a reduction in scope or an increase in the budget for the same scope. The latter is not always the case, so the projects remain "lame". In projects where this methodology is applied, the budget tends to stabilize with the contracted budget and is improved only if the scope increases, for the betterment of the end users of the contracting entity.

[3] In the case of public works in Colombia, Law 80 allows for additions of up to 50% of the initial budget

Figure 4
Deviations of projects studied VS. initial budget

It should be clarified that when there are deviations in the budget due to increases or contractual additions, it is due to the improvement in the costs of execution that allows the contractor's acceptance with the evident increase in the scope of the contract, but not due to the need to achieve the initial scope.

Budget additions that were convenient for the contracting company, but inconvenient for the contractor, were not accepted. This is due to the analysis of the activities identified as economically convenient and inconvenient, which allows for the orientation of the expenditure[4].

Deviations Over Time

It obeys the same dynamics of increasing the contractual term in case of increasing the initial scope of the project. In the projects under this methodology, there were no delays due to the contractor's own reasons, let alone those of the contracting party.

Contract extensions that were convenient for the contracting company, but inconvenient for the contractor, were not accepted. In some cases, part of the contractual additions to the budget, or rather, part of the time required by the budgetary addition, were executed at the same time as the contractual term. This is due, again, to the timely analysis of the performance and unit costs of execution per executed activity of the economically convenient and inconvenient activities identified.

[4] This means that the contractual additions can be oriented in favor of the contracting company, reconciling activities that are beneficial for the execution of the project, but economically viable for the contractor's execution.

Figure 5
Deviations of studied projects VS. initial time

The results demonstrate the viability and effectiveness of the unified methodology in the management of civil projects in Antioquia. However, it is recognized that this research may be limited by data availability and project participation in the case study (Creswell, 2018). The unified methodology led to better clarity in the definition of roles, more effective planning and more efficient execution of projects. The case studies showed improvement in time management, resources and stakeholder satisfaction (Isacás-Ojeda, Intriago-Pazmiño, Ordoñez-Calero, Jácome, & Sánchez-Ocaña, 2018).

Once the results are presented, the three relevant elements are considered solved and it is established that the proposed methodology does offer higher quality results for civil project management, timely, consistent and efficient management of information and resource savings.

Conclusions

Of the companies analyzed, 88% had changes in both the execution budget and expected profits; 82% had changes in the contractual term (60% required additions and only 26% delivered ahead of schedule, after variation in the scope of the project). Similarly, 88% had smaller but consistent variations in scope. The projects associated with state-owned companies are those with the greatest variations in time or budget and led to variations in the scope of each project, which, however small they may have been, also meant changes in the budget and/or execution time

The projects under the management of the proposed methodology were fully developed, resulting in a settlement in the deviation curves of the three main control elements of a project: scope, budget and execution time, and compliance with the contractual specifications is evidenced, which is the basis of quality and, therefore, is considered satisfied. It is clarified that no record is kept of post-sales due to the impossibility of being linked to these companies once the project is completed, in addition to the fact that this information was not shared.

With the application of the unified methodology, deviations in scope are reduced and only increase with the possibility of adding or not budget by the contracting companies to the project. The scope is improved if the budget increases and only for the improvement of the end users of the contracting entity.

With respect to deviations in the cost (budget) is improved only if the scope increases, also for the betterment of the end users of the contracting entity.

It should be clarified that when there are deviations in the budget due to increases or contractual additions, it is due to the improvement of the execution costs that allows the contractor's acceptance, with the evident increase in the scope of the contract, and the initial scope has already been achieved. Budget additions that were convenient for the contracting company, but inconvenient for the contractor, were not accepted.

With respect to time deviations, there were no delays in the projects under this methodology due to the contractor's own reasons or those of the contracting party. Contract extensions that were convenient for the contracting company, but inconvenient for the contractor, were not accepted. In some cases, part of the contractual additions to the budget, or rather, part of the time required by the budgetary addition, were executed at the same time as the contractual term.

For integrated project management, we highlight the inclusion of new areas of knowledge and management (occupational health, social, environmental, archeological and accounting) and the refinement of existing processes.

The Colombian construction industry is a very representative sector for the nation, accounting for between 10% and 40% of Colombia's GDP. Like any economy, it has had ups and downs due to its own and exogenous factors of many subsectors, but it has always been representative for the national industry, always growing.

For this reason, it is necessary to be more rigorous every day in the specific investment of the sector and to minimize the investment, operational and execution risk factors in each project, through the application of appropriate management methodologies. It is necessary to close the uncertainty gap and increase the indicators that allow expeditious and timely decision making for conflict resolution.

The proposed methodology, like any other, does not ensure the success of a project, but it does ensure proper project management and timely decision-making with the required information, including the possibility of closing a project in advance in the event that its objective, scope or costs cannot be met[5], by providing for the early or permanent review of these elements in the development of the project, expanding the control scheme of resources, reducing their inadequate management, corruption and the creation of "white elephants" to provide the best results in the management and social and economic investment of resources.

The study concludes that the combination of PMBoK, ISO 21500 and PRINCE2 is beneficial for civil project management in Antioch, providing an adaptable and robust framework. A gradual implementation of this integrated methodology is recommended, with emphasis on training and skills development of project managers. Future research could explore the application of this integrated methodology in other regional contexts and types of projects, such as the social, archaeological and other functions.

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[5] It may be due to cost variations from the time of the proposal to the date of execution, beyond the control of the contractor and the contractor, which in our case was applied to a project, as mentioned above.

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Annexes

Annex 1

Table of projects studied

Table 5

Projects studied

No.	*PROJECT*			*Budget*			*Weather*		*Scope*		Quality
					Millions	Desv.	*Months*	Desv.	*Final*	Desv.	
1	Vial Linares 2	Vias	Construction	$	1.923,50	30%	5,0	10%	105%	5%	100%
2	Las Mirlas Road Circuit	Vias	Construction	$	6.847,50	40%	8,0	-5%	90%	-10%	100%
3	Potrillo Village	Sewer	Auditors	$	394,00	0%	5,0	20%	100%	0%	100%
4	Urb. Niquia Village	Urbanism	Construction	$	342,90	34%	3,0	15%	95%	-5%	100%
5	Decameron Rionegro	Urbanism	Construction	$	1.500,00	-65%	8,0	-60%	30%	-70%	100%
6	Éxito Parking Lot - La Ceja	Urbanism	Construction	$	794,40	30%	4,0	15%	90%	-10%	100%
7	Alc. Panorama	Urbanism	Construction		$ 562,90	-14%	4,0	30%	100%	0%	100%
8	Urb. Bracamonte	Urbanism	Construction	$	2.431,00	10%	7,0	30%	100%	0%	100%
9	Rionegro	Acu. Y Alc.	Construction	$	24.236,30	45%	8,0	50%	80%	-20%	100%
10	Vehicular bridges	Maintenance	Construction	$	2.609,70	10%	5,0	20%	100%	0%	100%
11	Perpetuo Socorro Square	Park	Construction	$	1.526,10	-5%	6,0	20%	95%	-5%	100%
12	Robledo Diagnostic Center	Building	Construction	$	1.014,30	30%	6,0	100%	100%	0%	100%
13	La Estrella	Acu. Y Alc.	Auditors	$	4.641,17	100%	12,0	50%	5%	-95%	5%
14	San Carlos	Sewer	Auditors	$	281,06	0%	5,0	-25%	75%	-25%	100%
15	El Bagre	Building	Auditors	$	861,90	20%	8,0	20%	90%	-10%	100%
16	Commune 7	Urbanism	Auditors	$	151,40	20%	8,0	5%	90%	-10%	100%
17	Home improvements	Housing	Auditors	$	86.786,40	-15%	9,0	-10%	80%	-20%	100%
18	Path of Life	Urbanism	Auditors	$	3.661,00	-1%	7,0	0%	100%	0%	100%
19	Metro Plus	Acu. Y Alc.	Construction	$	1.328,70	-50%	6,0	10%	40%	-60%	100%
20	Educational Centers	Buildings	Construction	$	1.385,70	30%	8,0	10%	95%	-5%	100%
21	Envigado - V. S. Catalina	Acu. Y Alc.	Construction	$	5.911,20	35%	7,0	30%	102%	2%	100%
22	Segovia	Coliseum	Auditors	$	855,90	20%	12,0	20%	110%	10%	100%
23	Santander	Park	Construction	$	575,10	30%	4,0	30%	120%	20%	100%
24	Mine Sedimenters	Tanks	Construction	$	166,30	0%	7,0	0%	100%	0%	100%

No.	*PROJECT*			*Budget*			*Weather*		*Scope*		Quality
					Millions	Desv.	*Months*	Desv.	*Final*	Desv.	
25	Sandra K	Substation	Construction	$	528,90	0%	5,0	0%	100%	0%	100%
26	Commune 3	Platforms	Construction	$	2.175,90	10%	6,0	0%	110%	10%	100%

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ADAPTIVE MANAGEMENT AS AN APPROACH TO IMPROVE THE PERFORMANCE OF RURAL DEVELOPMENT PROJECTS IN CAMEROON

LA GESTIÓN ADAPTATIVA COMO ENFOQUE QUE AYUDA A MEJORAR EL DESEMPEÑO DE LOS PROYECTOS DE DESARROLLO RURAL EN CAMERÚN

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ABSTRACT
The main objective of this article is to respond to the need for improvement of development projects performance, from there, contributing to the effectiveness of public development aid. This question is at the heart of the Cameroon Government concerns which faces the permanent challenge of improving the living conditions of its rural population. The study approach is explanatory focuses on identifying the causes of the problem in order to make proposals that take into account the uncertainty encountered by most development projects. Following the review of the literature, the state of the art and the diagnosis, the analysis of the data highlights the need to face risks in the management of development projects. The emphasis is therefore placed on adaptive management which offers a managerial framework whose performance depends on the ability of the project team to deal with risks and uncertainties throughout the project life cycle. Far from ignoring the technical aspects and the merits of the traditional standard approaches such as the Logical Framework used in most development projects in Cameroon, adaptive management is a managerial approach which adapts to complex projects such as rural development projects with an emphasis on learning and structured decision-making to solve problems in contexts of permanent uncertainty. By integrating performance-based management approaches, it is possible to improve the impact of interventions in order to effectively address specific Sustainable Development Goals (SDGs), such as eradicating poverty (SDG 1), providing access to quality education (SDG 4) and promoting gender equality (SDG 5).

Palabras clave:
Proyecto de desarrollo rural, gestión adaptativa, incertidumbre, riesgo, desempeño.

RESUMEN
El principal objetivo de este artículo es dar respuesta a la necesidad de mejorar el desempeño de los proyectos de desarrollo, contribuyendo desde allí a la eficacia de la ayuda pública al desarrollo. Esta cuestión está en el centro de las preocupaciones del Gobierno de Camerún, que se enfrenta al desafío permanente de mejorar las condiciones de vida de su población rural. El enfoque del estudio es explicativo y se centra en identificar las causas del

problema para poder realizar propuestas que tengan en cuenta la incertidumbre que enfrentan la mayoría de los proyectos de desarrollo. Tras la revisión de la literatura, el estado del arte y el diagnóstico, el análisis de los datos pone de relieve la necesidad de afrontar los riesgos en la gestión de proyectos de desarrollo. Por lo tanto, se hace hincapié en la gestión adaptativa, que ofrece un marco de gestión cuyo desempeño depende de la capacidad del equipo del proyecto para hacer frente a los riesgos e incertidumbres a lo largo del ciclo de vida del proyecto. Lejos de ignorar los aspectos técnicos y los méritos de los enfoques estándar tradicionales como el Marco Lógico utilizado en la mayoría de los proyectos de desarrollo en Camerún, la gestión adaptativa es un enfoque de gestión que se adapta a proyectos complejos como los proyectos de desarrollo rural con énfasis en el aprendizaje y la estructuración toma de decisiones para resolver problemas en contextos de incertidumbre permanente. Al integrar enfoques de gestión basados en el desempeño, es posible mejorar el impacto de las intervenciones para abordar eficazmente Objetivos de Desarrollo Sostenible (ODS) específicos, como erradicar la pobreza (ODS 1), brindar acceso a una educación de calidad (ODS 4) y promover la igualdad de género (ODS 5).

Introduction

It includes the presentation of the paper and the analysis of the literature on the subject, with special emphasis on previous research that justifies the study and that will be contrasted in the discussion of the results.

With a view to achieving its Vision 2035 which aims to make Cameroon an emerging country, democratic and united in its diversity, the country adopted in 2020 a new reference framework for its development action during the next decade. This is the National Development Strategy (NDS30) which is based on the lessons of the implementation of the Growth and Employment Strategy Document (GESD) 2010-2019. This strategy is based on four main pillars, including i) structural transformation of the national economy through the development of industries and services, agricultural productivity and production, productive infrastructure, regional integration and facilitation of exchanges, the revitalization of the private sector, the transformation of the financial system; (ii) development of human capital and well-being; iii) promotion of employment and economic integration; iv) governance, decentralization and strategic management of the State (MINEPAT, 2020). NDS 30 is a consolidation of sectoral strategies including the Rural Sector Development Strategy and the National Agricultural Investment Plan (RSDS/NAIP) 2020-2030.

To implement its various development strategies and respond to its innumerable challenges, Cameroon has always resorted to Public Development Assistance. The interventions of multilateral and bilateral technical and financial partners (TFPs) in the rural sector are respectively 17.37% and 5.35% of their aid (DAD-Cameroon Report on Development Assistance 2012-2013). According to the same report and during the period 2009 to 2018, 18 financing organizations made their commitment to the rural sector, for a total of 83 projects spread across the ten regions of the country. Notwithstanding the intervention of these multiple TFPs, most rural development projects do not achieve their objectives. Disparities between cities and rural areas are getting worse. The poverty rate in urban areas fell from 12.2% to 10.8%, a drop of 1.4 points, while that in rural areas increased sharply from 55.0% to 59.2% (FMI, 2014).

According to estimates from the International Finance Corporation (IFC), one in two projects fails. Furthermore, one of the phenomena that characterizes the management of rural development projects today in Cameroon is that of extension, proof of the inability of the project to achieve its results within the prescribed deadlines. The problems of managing development aid projects in developing countries are legion (Ika, 2011). Traditionally, the Logical Framework Approach (LCA) is the management methodology generally used by planners and implementers of these projects, who adopt the optimistic assumption that the project will evolve in a stable environment. However, in practice, the volatility and uncertainty of socio-economic conditions, even political, are potential events which appear at least once during the life cycle of a project requiring project teams to have a certain level of adaptation.

In response to the imperfections of traditional approaches which often reveal limits in difficult economic environments characterized by a high level of uncertainty, it would be important to adopt a management approach which takes into account all these hazards. In this article, we propose an agile approach to managing development projects that takes advantage and eliminates the disadvantages of traditional management approaches in order to effectively contribute to the achievement of the development objectives contained in NDS 30.

Method

The methodological approach of this study is based on literature review and participant observation. The literature review served as a basis for the various works to not only understand the context and challenges of the development of the Cameroonian rural sector, but also provide sufficient knowledge on adaptive project management and the main arguments of the authors who have experienced or studied it. Participatory observation, for its part, facilitated our immersion in the field of development project management in Cameroon in order to observe the behaviors, interactions and managerial practices in progress in this type of project. It also allowed us to take notes on attitudes, language, norms and values, conduct informal interviews with stakeholders to better understand their thoughts and lived experiences.

In doing so, by using these two qualitative methods as part of our study, we do not claim to manipulate the variables, we rather seek their connection. The aim is to contribute to improving the performance of rural development projects in Cameroon, by proposing a managerial approach which takes into account the uncertainties and the dynamic nature of the environment in which these projects evolve.

Results

Uncertainty: implicit characteristic of project management

A project is defined as a unique set of activities with more or less clearly defined objectives, carried out within a limited budget and duration. Generally, project management requires particular attention to two main areas of responsibility: (i) task management; and (ii) management of relationships with stakeholders. Development projects tend to present many uncertainties due to the lack of information or the provision of unreliable information, the emergence of new technologies, the complexity of the project, the multitude of stakeholders, divergence in the perception of satisfaction and expectations of stakeholders or even unpredictable factors. What makes it difficult for most Project Coordinators is the complexity and uncertainty of the project.

According to Simon (1965), complexity can be defined as "a system consisting of a large number of parts which interact in a non-simple manner… [such that] given the properties of the parts and the laws of their interactions, it is not trivial to deduce the properties of the whole." We commonly observe two main sources of complexity in projects: task complexity and relational complexity. In general, task complexity is defined as an objective characteristic of the task from a structuralism and resource requirements perspective, determined from the subjective experience of task performers from an interaction perspective. For example, it refers to the number of interacting components of the project. Regarding relational complexity, it is the result of the existence of multiple stakeholders with conflicting interests. These conflicting interests can lead to disagreements over project objectives and priorities between project tasks and outcome characteristics. This type of complexity can be managed using linear responsibility tables or force field analysis.

According to the ISO 31000V2018 standard "uncertainty is the state, even partial, of lack of information concerning the understanding or knowledge of an event, its consequences or its likelihood". Project risks originate from the uncertainty present in any project (PMI, 2017). Chapman and Ward (2003) explain that uncertainty is generated not only by variability, but also by ambiguity (ambiguity on project objectives, priorities

or the basis for estimating project parameters). Uncertainties are therefore considered potential risk triggers. Risk being the impact or possible outcome of an uncertain situation. Any uncertainty produces exposure to risk, which, in project management terms, can lead to failure in either meeting the budget, reaching the required completion date or meeting the required performance.

With the aim of coupling risks to organizational objectives, the ISO 31000 standard considers risk as the effect of uncertainty on an organization's objectives. Organizations perceive risks as the effect of uncertainty on project objectives resulting in a lack of information in any phase or activity of the process. This means that some relevant information about the outcome of a process or future decision is not known or knowable. Information is therefore an essential resource for decision-making, because it reduces the organization's uncertainty regarding a given situation or problem. Lack of available information or knowledge is one of the causes of uncertainty in a project. Indeed, the implementation of project activities is subject to numerous uncertainties of various origins: unavailability of certain resources, delay in delivery of components or materials, change in the scope of the project, failure in carrying out a study, new unplanned activities to be carried out, etc.

There are many ways to categorize different types of uncertainty. Meyer et al. categorize them based on their impact, expected uncertainty, unforeseen uncertainty and chaos. Some researchers categorize uncertainty based on their sources. This is the case, for example, of Perminova et al. (as cited Kreye & Balangalibun, 2015) which describe the following sources of uncertainty: technological, resource, competitive, supplier, consumer and political uncertainty. Ward & Chapman (as cited Kreye & Balangalibun, 2015) focused on uncertainties that have a great influence on project management such as design, logistics, objectives, priorities and relationships between project parties to define the different categories of uncertainties. Kreye & Balangalibun (2015) state that project uncertainty refers to the uncertainty surrounding the objectives set by the project. It is mainly related to project performance measures such as time, resources and quality and arises from the variability of estimates. This variability may arise from a lack of clarification of specifications or requirements due to inexperience in the project, the complexity of the project processes, the parties involved, unexpected events, or biases of designers and decision makers. Another source of uncertainty may reside within the organization. Organizational uncertainty is related to strategic issues, such as the future direction of the organization, and structural issues, such as organizational structure, functions of different departments, business processes, and changes in organizational structure or introduction of new technologies. Uncertainty can also arise from the project partners and the relationship between them, leading to relational uncertainty. Relational uncertainty includes understanding stakeholders, their influence and their interest in the project. It includes the quality and reliability of the work of the partners, their ability to align their objectives with the general objectives of the project. This is particularly important when the success of the project depends on the quality of the services provided by its partners.

Chapman and Ward (2003) explain that the uncertainty, inherent in any project, is considerable and most project management activities involve managing uncertainty early in the project life cycle, clarifying what can be done, to decide what needs to be done and to make sure it gets done. Uncertainty is partly linked to variability in performance measures such as cost, duration or quality. It is also an ambiguity associated with a lack of clarity due to the behavior of project stakeholders, lack of data, lack of detail, lack of

structure to take into account problems, working hypotheses and formulations used to take into account problems, known and unknown.

According to Chapman and Ward (2003), aspects of uncertainty may be present throughout the project life cycle, but they are particularly evident in the pre-execution stages. In reality, a project will generally exhibit a mixture of these different types of uncertainty. Uncertainty is therefore an intrinsic variable in the life of any project. The need to manage uncertainty is inherent to most projects that require formal project management. Table1 summarizes and describes the different categories of uncertainty in projects, proposing a management style adapted to each category of uncertainty.

Table 1

Different types of project uncertainties

Uncertainty category	Description	Management style	
Variation	Levels of cost, time, and/or performance vary uncertainly within a range.	- Scheduling with buffers; - Disciplined execution.	Planning
Expected uncertainty	Major influence on the project based on a few individually identifiable factors. The factor is known, but we do not know what value it will take.	- Identification of risks; - Prevention; - Emergency planning.	
Unforeseen uncertainty	Major influencing factor (or a few) is not at all anticipated by the project team, nor planned nor expected.	Learning: new problem solving, with modifications to targets and execution.	Learning
Turbulence, chaos.	The project objective, strategy and approach are completely invalidated by unforeseen events and the project must be redefined.	Repeated complete redefinition of the project	

Note. Adapted from Arnoud et al. (2002, p.27).

Thus, one of the main challenges for the project team lies in determining an acceptable degree of uncertainty in order to maximize the creation of value, an objective considered as the basic postulate in the concept of risk management. Uncertainty management in projects is an ongoing activity focused on identifying and managing all sources of uncertainty that constitute threats or opportunities.

Traditional project management approaches

Traditional project management is a methodology for managing projects that occurs in a sequential (or cascading) cycle of stages that generally includes: initiation, planning, execution, monitoring and control, and closeout (Szreder et al., 2019). Each of these steps is described in the management guidelines. Traditional project management is assimilated to push management in which the objectives and the way in which the project must be carried out are defined by senior management. This leads to a high level of planning and coordination effort, little room for maneuver and low adaptability of the project implementation team.

There are several standards in the field of traditional project management. This is the case of the Project Management Body of Knowledge (PMBOK), the best-known repository, the first publication of which was made in 1996 by the Project Management Institute (PMI). The PMBOK is organized into knowledge areas and provides guidelines, rules and specifications for managing projects, programs and portfolios. Alongside PMBOK, we have Projects In a Controlled Environment (PRINCE2), a traditional project management framework adopted by government institutions in Great Britain and other countries, but also by private organizations. PRINCE2 emphasizes dividing projects into

manageable and controllable stages. In addition to these two traditional management approaches, we have HERMES, which is the Swiss method of project management in the IT fields but which can be adapted to all types of projects for the development of services/products and the adaptation of the organization of the company. In the field of development cooperation, the most well-known traditional management approach is the Logical Framework Approach (LFA) used as the main tool of Project Cycle Management (PCM) applied since 1992 by the European Commission. Project Cycle Management is an expression used to define management activity and decision-making during the project cycle (European Commission, 2004).

The LFA is one of the methodologies most used by multilateral or bilateral aid agencies, international NGOs and by many institutions. The LFA and corresponding tools are used during the project cycle to facilitate analysis, decision-making and ensure the results of a development action. It defines the structure of the project, the indicators and the assumptions relating to the project, in the form of a matrix whose rows represent the results chain. Under PCM, the project is subdivided into phases such as programming, identification, development, financing, implementation and evaluation. The project, the main PCM instrument, is used in planning development cooperation activities. It includes interrelated and coordinated activities designed to achieve clearly defined outcomes ranging from policy change to practical direct action (ILO, 2015). It helps to solve a specific development problem within a given time frame and budget.

All of these traditional project management approaches use more or less similar tools and techniques to implement management processes. Once the formulation and planning phases have been completed and a business plan or financing proposal has been submitted for approval, interventions to make changes become limited. It is only after the control phase that necessary adjustments can be made. The project manager is responsible for coordinating the contributions of all project stakeholders to meet the various needs and expectations. However, this could be very complex in nature and involve intense negotiations and conflict resolution, as different stakeholders could have different expectations. Furthermore, for political and other reasons, project decision-makers may fail to adequately take into account (or take into account belatedly) environmental impact assessments or abrupt changes in the national or international context. This is the case, for example, with the advent of the COVID-19 pandemic, which caused a global health and socio-economic crisis whose consequences are unprecedented throughout the world.

PMBOK, PRINCE2 or LFA are predictive project management benchmarks. They focus on planning the project, executing the project according to the plan, checking for variances and taking action if necessary. According to Cooke-Davies (2002), these benchmarks work well, provided the requirements are very stable and the technology is familiar. Although these standards highlight the importance of soft skills, these project management models are particularly mechanistic. In other words, this implies that project management is based on the assumption that future outcomes can be accurately predicted based on current information and actions. Those approaches also assume that project events are predictable, tools and actions are understandable. The conclusion of a given phase means that it is no longer exposed to any new analysis or change.

In the traditional approach, the final product or result is only visible by the customer or beneficiary towards the end of the project (tunnel effect). In this case, the product is rigid because it is difficult for a customer to change his mind on a product functionality during execution. Traditional project management methodologies are effective for construction projects, where the entire project can be completed in a single

cycle, and success is determined by achieving expected results on time and within project budget (NEAGU 2013). However, it is implicitly recognized that human actions and interactions (and their consequences) can be objectively observed and then corrected or controlled Cooke-Davies et al. (as cited Szreder et al., 2019). One of the factors in the failure of development projects is the inability to identify all the needs of the beneficiaries, especially since these needs, which are identified and analyzed during the formulation phase, can change at a frequency which depends on several factors, among others, the dynamic context, the life cycle of the project, the time between the formulation phase and the effective implementation phase of the project... In addition, planning is continually influenced by political inputs from a wide variety of stakeholders and actors. Due to political dynamics, development complexities, resource constraints, and risks, project managers typically find themselves in a hostile environment where detailed advance planning and full implementation of pre-established plans are virtually impossible.

If for a long time the emphasis was on the technical aspects in the management of development projects, nowadays voices are being raised to draw attention to the importance of managerial and especially human factors through the adoption of managerial practices that aim to be agile. Managing projects under conditions of complexity and uncertainty requires the project team to be creative and adaptable. This requires a change in thinking about how development projects, including those in the rural sector, should be planned, programmed and executed.

Complexity and uncertainties: main characteristics of rural development projects

A development project can take the form of donations, loan at a preferential rate or debt cancellation and is generally implemented jointly by a donor and local actors in the beneficiary countries through a life cycle. The activities that make up this type of project are not simple repetitive tasks, such as painting the rooms of a home or washing a vehicle. Contrary, they are complex. Indeed, the project must sometimes cover more than one geographical area during the same period and the expected change must take place among beneficiaries whose socio-economic characteristics are different. In this context, the success of rural development projects are characterized by ambiguity given their distinct characteristics (Cooke-Davies, 2002).

The logical framework or results framework defines the sequence of activities to be carried out to achieve the desired change following the implementation of a development project. These different activities are interdependent because the result of one activity is an input data for another, necessary for the achievement of one or more results measured by objectively verifiable indicators. This interdependence adds a level of complexity and communication that must be managed to ensure the progress of the project, the effective and efficient use of financial resources, the satisfaction of the various stakeholders and sustainability before its completion date. . The implementation of any activity or batch of activities by the project team is subject to prior obtaining of a no objection notice from the donor.

Development projects are low maturity organizations (Khan & Zahid, 2013) because their organization, relatively new in formal management, generally do not implement a systematic project risk management process due to certain constraints or difficulties. This is the reason why “outsourcing” is used to implement certain components in most development interventions, because the project generally does not have enough human resources to implement all the activities within the allotted time frame. This involves entrusting the implementation of a certain number of project activities to private or public service providers. This principle of intervention aims not only to guarantee the institutional anchoring of providers, but also the sustainability of support by

strengthening the capacities of local actors in the provision of services in the field of socio-economic development at the grassroots level. However, the application of this principle is a source of uncertainty due to the quality of services provided sometimes as a result of the unavailability of local expertise.

According to the ISO 31000V2018 standard, "uncertainty is the state, even partial, of lack of information concerning the understanding or knowledge of an event, its consequences or its likelihood". It is generated not only by variability, but also by ambiguity (Chapman and Ward, 2003) and project risks originate from the uncertainty present in any project (PMI, 2017). For Wysocki (2014) these two terms are inseparable. Indeed, the higher a project's level of complexity, the more it is accompanied by a level of uncertainty. Due to numerous hazards and uncertainties which affect it, we note that the realization of the activities of a development project nowadays becomes more and more complex and uncertain in view of the appearance of unforeseen unfavorable events which influence the achievement of results. It is therefore up to the project team to adapt its project management methods to deal with uncertainty, so that the latter can not only adjust to change, but also accept it and consequently move towards greater performance.

Adaptive project management

Rural development projects generally operate in complex and dynamic environments that involve many unpredictable elements with various stakeholders and are characterized by a high degree of uncertainty. Most of these projects fail to achieve their expected objectives, largely because traditional or conventional project management approaches do not adequately adapt to a constantly dynamic environment. In such an environment, an adaptive approach to planning and managing complex projects is necessary to enable the project team to be creative in the execution of all their activities.

The term "adaptive management" is not new. Historically, it has its origins in adaptive management of natural resources which dates back to the work of Beverton and Holt (1957) in fisheries management (Williams, 2011). The concept became common when C.S. Holling, considered the "father" of adaptive management, published his work "Adaptive Environmental Assessment and Management" in 1978 (Holling, 1978). At this period, adaptive management was a method for probing the dynamics and resilience of systems while continuing management through management experiments developed to improve learning and reduce uncertainty (Allen et al., 2011). Following Holling, whose work aimed to bridge the divide between science and practice, Carl Walters (1986) treated management activities as experiments designed to reduce uncertainty. In the field of development cooperation, it was from 1983, faced with numerous problems linked to the uncertainty of development work, Dennis Rondinelli advocated the use of more iterative and adaptive approaches which favor progressive learning (Michael, 2020). Since then, the concept of adaptive management has been applied in several fields of activity, in different socio-political contexts and by several actors.

Also known as "agile" project management, adaptive project management is a structured, iterative process of making robust decisions in the face of uncertainty (Michael, 2020). It is a set of project life cycle models that can be used to manage complex projects whose objectives are clearly specified but whose solutions are not known at the start of the project (Wysocki, 2014). For Walters (as cited Allen et al., 2011) adaptive management is a resource management approach that emphasizes learning through management, based on the philosophy that knowledge is incomplete and that much of what we think we know is actually wrong, but despite the uncertainty, managers and

policymakers must act. It is a program cycle implementation approach that seeks to better achieve desired results and impacts through the systematic, iterative and planned use of emerging knowledge and learning throughout the implementation of strategies, programs and projects.

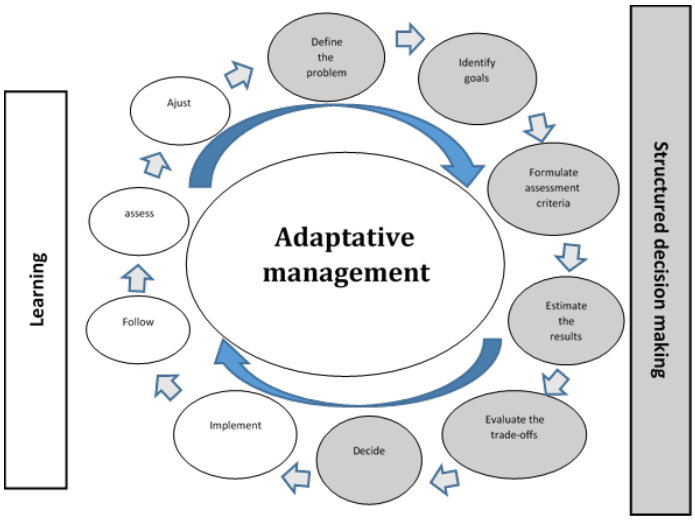
Referring to these different definitions, adaptive management is an approach which allow project teams to make decision in order to anticipate the advent of risks and make adjustments necessary to achieve results. According to Michael (2020), adaptive management is based on the following five principles:

- Acceptance of uncertainty about what works or not in order to meet challenges;
- Focus more on the why? And less on the how? the important thing is to achieve the goals with the available resources;
- Short cycles and iterative decision-making to be able to adapt quickly and make adjustments based on lessons learned;
- Continuous and rapid learning through trial and error and/or testing different approaches;
- Particular attention to relationships by putting people at the heart of the processes because, the more complex a situation, the more important are the skills, motivation and interpersonal skills of people.

These different principles summarize the elements of an interactive process of continuous improvement focused on structured decision-making and learning (see figure 1).

Figure 1

Adaptive project management process



Note. Adapted from Allen et al. (2011, p.1340)

As illustrated in Figure 1, the adaptive management process is composed of two main phases (structured decision-making and learning) which allows practitioners to learn by doing. Structured decision making is a problem-solving approach borrowed from sociological fields, used to identify and evaluate alternative resource management options by involving stakeholders, experts and decision makers in the decision process and addressing the inherent complexity and uncertainty to manage resources in a proactive and transparent manner. The structured decision-making framework provides an ideal model to facilitate the decision-making process inherent in adaptive management. The key objective of adaptive management is the identification and reduction of uncertainty wherever possible. This reduction is made possible through management experiences

that enhance learning. Thus, adaptive management is characterized by a flexible methodology that involves testing, monitoring, feedback and adjustments as necessary. This is what characterizes the adaptive approach from the traditional approach which is more linear and mechanical.

Differences between the adaptive approach and the traditional approach

Leau et al. (2012), Nerur et al. (2005) as well as Nerur & Balijepally (2007) identified characteristics adapted to each approach allowing a clear distinction to be made.

Table 2

Differences between traditional approach and adaptive approach

Criteria/aspects	Adaptive approach	Traditional approach
Requirements analysis	Iterative approach	Detailed requirements profile
Change in costs	Weak	Pupil
Management Development	Can be changed at any time	Fixed
Test	After each iteration	When the development phase is completed
Interaction with the customer or beneficiary	Strong	Weak
Project scaling	Small to medium sized project	Extended projects
Target	Adaptation, flexibility, responsiveness	Optimization
Environment	Turbulent, difficult to predict	Stable, predictable
Rationality	Substantial	Technical/Functional
Organizational structure	Organic (flexible, cooperative and participatory)	Mechanical (bureaucratic with high formalization)
Management	Leadership and collaboration	Command and control
Focus	Human-centered	Process-centric
Role of the customer	Critical	Important
Knowledge management	Tactical	Explicit
Type of learning	Double loop, generative	Single loop, adaptive
Project cycles	Guided by product functions	Guided by tasks and activities
Development models	Scalable delivery model	Life cycle model (cascade, spiral, etc.)
Distribution of roles	Self-organized teams	Individual, Preferred Specialization
Resolution of problem	Learn by experimenting and constantly reframing the problem and solution	Selection of the most appropriate means to carry out and carry out a given and largely planned and formalized activity.

As we mentioned in the previous paragraphs, the adaptive approach is suitable for complex projects and is unique to each project. However, the implementation of this management approach which continually adapts to the evolution of the situation and its environment requires the prior creation of an agile environment. The agile environment is based on a quality human resource with a team spirit within an adapted organizational culture.

Human resources. Taking into account the fact that the attitude towards uncertainties and changes differs from one individual to another, the project manager, in the process of establishing his team, must be able to respond effectively to the following main concerns: What are the skills fundamental to support an agile intervention? How to

develop global skills favorable to agility such as confidence, relationships and critical thinking? Michael (2020) identified the main personal skills and attitudes likely to facilitate the construction of agile management, in particular: the ability to anticipate to think about potential development scenarios; curiosity; strong communication and listening skills; the critical thinking essential in the process of fact-based decision-making; Being able to adapt in the face of uncertainty and change.

Team spirit is the second pillar that supports an agile environment. To the extent that the advent of uncertainties and changes have an impact on general organizations, and human resources in particular, the strengthening of human links between the members of a project team is a determining resilience factor for the continuity of the implementation of project activities. Collective awareness and a culture of risk in the face of issues and challenges must be built to be able to respond to the issues and adapt to complexity.

The organizational culture that guides the actions and behaviors of members of an agile team must be built around values such as: resilience, flexibility, self-confidence, innovation, transparency, social responsibility, performance, ethics and security. It allows cohesion in the project team which promotes improvement in the company's performance and adaptation to uncertainties and changes. To do this, the project coordinator must create an environment that facilitates interpersonal communications, transparency, encouragement with meaningful rewards, personal development and flexibility.

Within the framework of development projects, the implementation of adaptive project management does not depend only on the project teams. It is strongly influenced by the sources of financing, each of which has operating or financing methods or procedures which have a significant impact on the operational management of development projects. Apart from the beneficiaries, there are generally two main sources of financing for a rural development project: the government and the donor. In Cameroon, the counterpart funds which represent the share borne by the State as part of the implementation of a jointly financed project, in application of a loan or grant agreement, sometimes face delays in mobilization resulting in a low disbursement rate. Michael (2020) offers a series of proposals that donors can initiate to ensure the agility of financing, planning and performance management systems. These include:

- Accept uncertainty at the start of an intervention as to the results that could be obtained by allowing, for example, the refinement of objectives and indicators during a launch period;
- Adapt financing instruments to the complexity of a situation and/or strategic objectives;
- Integrate “crisis funds” into contracts, i.e. crisis adjustment provisions that allow the budget allocation to be modified or additional funds to be provided without modifying the grant agreement;
- Allow greater decision-making by donor staff closest to the implementation of the intervention;
- Include proposals verifying an organization's capabilities to adjust at different times of the intervention in the selection criteria;
- Simplify and streamline processes for validating requests for changes to budgets, activities and results frameworks (e.g. adding a start-up period after which more refined results can be specified);
- Appropriately finance monitoring and learning mechanisms in budgets;

- Adapt results monitoring frameworks to better recognize the success of complex interventions, looking for the contribution to changes as appropriate, rather than results that can only be attributed to a single intervention.

Discussion and conclusions

In recent years, discussions have increased on how development aid should effectively contribute to transformative change. This transformation aims to meet the major development challenges through sustainable change in management systems. It is not a question of absolutely renouncing the traditional approach standards or increasing new tools and techniques which could burden development projects management. Rather, it is a question of putting in place a system that facilitates the creation and implementation of an adaptive environment that contributes to the achievement development results while improving the capacity to cope with changes or uncertainties advent.

At the end of this study, we can conclude that the application of adaptive management in the rural sector in Cameroon requires certain changes in the project management cycle, in particular:

- The culture of agile thinking. To successfully implement adaptive approach, teams involved in the life cycle of a development project must adopt an agile mindset. Whether it concerns the staff of the steering committee, the upstream technical and financial partner or the downstream implementation team, the agile mindset which is a process of reflection involving understanding, collaboration, learning and flexibility to achieve successful results must be shared. It is only by combining this agile mindset with processes and tools that these teams can adapt to changes and produce relevant results. The agile mindset is therefore the perfect approach to dealing with turbulent and difficult environments because it teaches how to embrace change rather than avoid it;
- Fostering innovation within a project team. Instead of systematically referring to manuals and other execution procedures for the implementation of project activities, the adaptive approach promotes the establishment of organizational arrangements that promote innovation by allowing members of a team to provide collaborative and constructive feedback, to produce new ideas leading to experiments that could transform the team culture as a whole. This is made possible when sufficient time and space is allowed to experience creativity and the opportunity to think freely;
- Implementation of continuous improvement. Continuous improvement is the very essence of a sustainable learning process. Since every activity implemented in a project seems to be something new, and therefore a learning opportunity, teams must strive to find ways to optimize, solve problems, reflect and continually improve processes to claim to obtain a certain mastery over time:
- Continued satisfaction of beneficiaries. The objective of a development project is to satisfy the needs of the targeted population by delivering value to them as quickly as possible. Given that the needs analysis is carried out in the identification phase of the project and that sometimes a lot of time passes between the formulation phase and the implementation phase of the project,

it is important to carry out an update frequent update of needs in order to reassure that the solutions provided by the project remain relevant. This often involves systematizing feedback mechanisms, complaints and responses in the organization of development projects. This allows an agile team to anticipate a certain number of problems related to beneficiaries and provide frequent solutions adapted to their needs. A system of constant communication with beneficiaries thus helps to define their real needs, which may change over time, and challenges them to design a relevant offer.

- Continued capacity building. Being complex projects that evolve in difficult, dynamic environments and subject to risks of all kinds, rural development projects must equip themselves with human resources whose capacities must be continually strengthened to respond to the various challenges and issues. In addition to technical areas, capacity building of the members of an agile team must focus on themes related to risk and change management, communication management, technology and leadership. This fits with the principle of continuous improvement, essential to ensure the improvement of a project team's performance.

This article invites the global development assistance community to explore the role that agility can play in driving transformational change. To effectively address major challenges such as climate change, poverty, inequality, violence and conflict, we must revolutionize our practices, adopting new perspectives and methodologies. Faced with a constantly changing socio-economic environment, most researchers and practitioners in project management admit that, with the exception of the simplest projects or projects that are frequently repeated, It is difficult, if not impossible, to specify complete requirements at the beginning of a development project cycle and execute activities exactly according to established plans.

Given all these limitations and despite the existence of traditional approach standards which have so far proven their worth, the need for agility is essential to substantially improve the performance of development projects. Without being a miracle solution, adaptive project management is a management approach that we propose as part of our study to improve the results of development interventions in the rural sector. Without neglecting the technical aspects, this approach emphasizes to the attitude and ability of human resources to deal with uncertainties and changes throughout the life cycle of a project. Structured decision-making and learning support the effectiveness of the adaptive management process whose existence depends on the harmony of the three pillars of the agile environment.

Information unavailability on the formal practice of the adaptive approach in the implementation of development projects in Cameroon constitutes the main limitation of our article. Existence of such information would made it possible to better understand the approach, to bring out the lessons learned necessary for better capitalization of experiences for factual dissemination.

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A CRITICAL REVIEW OF KOTTER'S CHANGE LEADERSHIP MODEL: RELEVANCE, LIMITATIONS, AND INTEGRATION WITH CONTEMPORARY MODELS

UNA REVISIÓN CRÍTICA DEL MODELO DE LIDERAZGO DEL CAMBIO DE KOTTER: RELEVANCIA, LIMITACIONES E INTEGRACIÓN CON MODELOS CONTEMPORÁNEOS

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ABSTRACT

This paper critically reexamines John Kotter's Eight-Step Model for leading organizational change, exploring its enduring relevance and limitations in the context of today's dynamic, technology-driven business environment. While Kotter's framework has become a foundational reference in leadership education and change management practice, its linear and top-down orientation faces challenges when applied to continuous transformation efforts requiring agility, cross-functional coordination, and decentralized decision-making. By contrasting Kotter's model with contemporary approaches such as Agile, Lean, and adaptive leadership, the analysis highlights areas where the framework must evolve to remain effective. The paper draws on both scholarly literature and applied frameworks from major consulting firms to examine how Kotter's principles have been embedded, adapted, and extended in practice. It also explores theoretical intersections between Kotter's leadership emphasis and modern paradigms such as servant, transformational, and adaptive leadership, arguing that these approaches enrich Kotter's original model by promoting distributed authority, continuous learning, and systemic responsiveness. Through this updated lens, the study proposes a hybridized view of change leadership that integrates Kotter's structured process with flexible, people-centric strategies to address the current realities of business transformation. The result is a nuanced perspective on how organizations can pursue sustainable change by balancing strategic discipline with adaptive capacity, preserving the strengths of Kotter's vision while enhancing its practical relevance.

Key words:
change management, leadership, organizational transformation, agile, Kotter's model

RESUMEN

Este artículo reexamina críticamente el modelo de ocho pasos de John Kotter para liderar el cambio organizacional, analizando su relevancia continua y sus limitaciones en el contexto del entorno empresarial actual, caracterizado por su dinamismo y orientación tecnológica. Aunque el marco de Kotter se ha convertido en una referencia fundamental en la formación de liderazgo y en la práctica

Palabras clave:
gestión del cambio, liderazgo, transformación organizacional, agile, modelo de Kotter

de la gestión del cambio, su enfoque lineal y jerárquico enfrenta dificultades cuando se aplica a procesos de transformación continua que requieren agilidad, coordinación interfuncional y toma de decisiones descentralizada. Al contrastar el modelo de Kotter con enfoques contemporáneos como Agile, Lean y el liderazgo adaptativo, el análisis pone de relieve las áreas en las que dicho marco debe evolucionar para seguir siendo eficaz. El artículo se apoya tanto en la literatura académica como en marcos aplicados desarrollados por grandes firmas de consultoría para examinar cómo los principios de Kotter han sido incorporados, adaptados y ampliados en la práctica. Asimismo, explora las intersecciones teóricas entre el énfasis de Kotter en el liderazgo y paradigmas modernos como el liderazgo servicial, transformacional y adaptativo, argumentando que estos enfoques enriquecen el modelo original al promover la autoridad distribuida, el aprendizaje continuo y la capacidad de respuesta sistémica. Desde esta perspectiva actualizada, el estudio propone una visión híbrida del liderazgo del cambio que integra el proceso estructurado de Kotter con estrategias flexibles y centradas en las personas, con el fin de abordar las realidades actuales de la transformación empresarial. El resultado es una perspectiva matizada sobre cómo las organizaciones pueden lograr un cambio sostenible al equilibrar la disciplina estratégica con la capacidad de adaptación, preservando las fortalezas de la visión de Kotter y, al mismo tiempo, mejorando su aplicabilidad práctica.

Introduction

John P. Kotter, in his influential article Leading Change: Why Transformation Efforts Fail, noted that "a few of these corporate change efforts have been very successful. A few have been utter failures. Most fall somewhere in between, with a distinct tilt toward the lower end of the scale" (Kotter, 1995). This candid observation set the stage for what became one of the most referenced models in the field of organizational change management. Based on a decade of research across over 100 organizations, Kotter introduced an eight-step framework aimed at addressing the frequent shortcomings in transformation initiatives (Kotter, 1996; 2012).

The model's structured sequence, from establishing a sense of urgency to embedding new practices into the organizational culture (Kotter, 2012), has since been widely applied in both corporate and public sectors (By, 2005; Yi, 2025). Its impact on managerial thinking and strategic execution remains significant, offering a repeatable structure for navigating complex change (Abumohor, 2025). Over time, it has become a foundational reference for leaders seeking to drive change in structured, often hierarchical, environments (Vale et al., 2022).

Central to Kotter's argument is the notion that sustainable transformation cannot be achieved through planning or communication alone; it requires strong leadership, clear vision, and a deliberate process to overcome inertia and resistance (Appelbaum et al., 2012). His framework was conceived at a time when change was often episodic and led from the top, making it particularly effective in stable, well-defined settings (Yi, 2025). However, the context in which organizations now operate has shifted dramatically.

As organizations grapple with rapid technological change, evolving work arrangements, and shifting customer demands, questions have emerged about whether Kotter's linear model can still keep pace with the complexity of modern transformation (Carreño, 2024). The urgency for organizations to be agile, responsive, and inclusive in how they lead transformation has prompted the adoption of alternative methodologies. Approaches such as Agile and Lean emphasize iteration, decentralized execution, and feedback loops, offering a more fluid model for change (Womack & Jones, 2003; Koudriachov, Tam, & Aparicio, 2025). Recent studies suggest that successful transformations increasingly rely on continuous sequencing, disciplined leadership, and adaptive capacity rather than one-time structural overhauls (Mankins & Litre, 2024).

This paper critically examines Kotter's eight-step model in light of these evolving demands. It assesses the framework's enduring value and explores how it may be reinterpreted or augmented to better align with the current challenges and conditions for organizations facing change.

Background and context: The evolution of change management

The field of organizational change management has evolved alongside shifts in markets, technologies, and stakeholder expectations (Burnes, 2017). One of the earliest and most influential models is Kurt Lewin's three-stage process (unfreezing, changing, and refreezing), developed in the 1940s. This model conceptualized change as a linear, top-down process designed to embed new behaviors into an organization's cultural framework (Lewin, 1947). Although foundational, Lewin's model reflects assumptions of

environmental stability and managerial control that have become increasingly challenged in today's fluid contexts (Yi, 2025).

As organizational environments grew more complex in response to globalization and technological acceleration, change management frameworks began to shift away from purely structural interventions (Hiatt & Creasey, 2012). Among these, Prosci's ADKAR model, introduced in the 1990s, reframed change through an individual lens. It emphasized the importance of personal transitions by focusing on five essential elements: Awareness, Desire, Knowledge, Ability, and Reinforcement. This framework recognized that employee readiness and participation are critical to achieving lasting transformation (Hiatt, 2006).

Building on the growing recognition that change efforts require more than task execution, John Kotter introduced his 8-Step Change Model in Leading Change (1996; 2012), offering a structured process rooted in leadership, vision, and momentum-building. Kotter's model emphasized the need to create urgency, form powerful coalitions, and secure early wins to drive large-scale transformation. Widely adopted across both private and public sectors (Appelbaum, 2012), the model became emblematic of what Yi (2025) classifies as a classical change model, one that assumes a sequential, top-down flow of decisions and actions. These classical models, according to Yi, are designed for well-structured environments and emphasize managerial authority, strategic planning, and controlled execution.

However, Yi (2025) also notes the limitations of classical approaches when applied to environments characterized by ambiguity, rapid change, and decentralized decision-making. The rise of transitional and transformational models, which stress feedback loops, employee empowerment, and adaptive capacity, reflects a broader shift in organizational thinking (By, 2005). These models respond to the need for flexibility and continuous learning, particularly in settings driven by business and digital transformation and global interdependence.

As organizational environments grow increasingly volatile and digitally driven, newer change approaches advocate for continuous transformation over episodic initiatives. Rather than treating change as a bounded project, these models emphasize adaptive cycles, dynamic capabilities, and sustained alignment across evolving priorities (Azagury & Close, 2024).

In this evolving landscape, Kotter's model remains a critical milestone but must now be reconsidered in light of frameworks that prioritize adaptability and emergent strategy (Appelbaum et al., 2012).

Kotter's Eight-Step Model

John Kotter's eight-step model has come to define one of the most structured and actionable approaches to leading organizational change. Each step builds upon the previous one, ensuring a comprehensive strategy that addresses the common challenges of organizational change. Below is a detailed breakdown of each step, emphasizing the critical roles of leadership, communication, and strategic planning.

Table 1
Kotter's Eight Steps for Leading Organizational Change

Step	Description
1	Establishing a Sense of Urgency
2	Forming a Powerful Guiding Coalition
3	Creating a Vision
4	Communicating the Vision
5	Empowering Others to Act on the Vision
6	Planning for and Creating Short-Term Wins
7	Consolidating Improvements and Producing Still More Change
8	Institutionalizing New Approaches

Note. Source: Adapted from Kotter, J. P. (2012). *Leading change*. Harvard Business Review Press, p. 23.

Establishing a sense of urgency

The change process begins with cultivating a genuine sense of urgency that is not confined to leadership circles but shared throughout the organization. This urgency must be grounded in a clear-eyed assessment of current realities: shifting market dynamics, emerging threats, performance gaps, or missed opportunities. When these factors are left unarticulated, complacency can take root, weakening the momentum for change before it even starts.

Employees at all levels must grasp why change is not just necessary but imperative. This means moving beyond abstract messaging and directly engaging with the risks of inaction and the potential value of transformation. Urgency becomes effective only when it prompts reflection, sparks motivation, and connects individual roles to broader strategic needs.

Without a strong sense of urgency at the outset, even well-designed change efforts are likely to face resistance, hesitation, or disengagement. As a result, progress may stall before meaningful transformation can begin.

Forming a powerful guiding coalition

Driving meaningful change requires more than senior sponsorship. It demands a cohesive alliance of individuals with the credibility, influence, and trust needed to lead across the organization. This coalition should span multiple levels, incorporating executives, middle managers, and informal influencers who can collectively represent the organization's diverse perspectives.

Beyond formal authority, the strength of the coalition lies in its ability to shape the narrative, model the desired behaviors, and maintain alignment through periods of uncertainty. As the transformation unfolds, this group must remain dynamic, adjusting to emerging needs while continuing to project unity and resolve.

When such a coalition is absent, or lacks internal legitimacy, efforts to mobilize the organization can falter. Without a strong, aligned leadership core, change initiatives risk becoming fragmented, with competing priorities eroding focus and trust across teams. Establishing a resilient coalition from the outset is not optional; it is the structural backbone of sustained change.

Creating a vision

At the heart of any successful transformation lies a vision that not only clarifies direction but also evokes purpose. More than a slogan or goal statement, the vision serves as an organizing principle employees can connect with, interpret through their own roles, and work toward collectively.

Kotter underscores the importance of simplicity and clarity in this step. The vision must articulate a realistic yet aspirational future, one that aligns with strategic priorities while remaining accessible to employees at every level. When well crafted, it becomes a source of momentum, offering coherence amid disruption and giving meaning to the effort required.

Importantly, the process of shaping the vision should not occur in isolation. Involving a broad mix of stakeholders brings in vital perspectives, increases relevance, and builds early ownership. A vision developed this way is more likely to endure, as it reflects the organization's realities and resonates across its culture. Without it, change initiatives may proceed, but without the cohesion or energy needed to sustain them.

Communicating the vision

For a vision to guide meaningful change, it must be communicated in ways that reach, engage, and mobilize the entire organization. This involves more than simply stating objectives. It requires sustained, deliberate effort to ensure the vision is understood, remembered, and acted upon.

Communication should be continuous and multichannel, combining formal messaging with informal conversations, leader behaviors, and everyday decisions. Consistency matters, not just in words, but in tone, timing, and alignment between what is said and what is done. When leaders embody the vision through their actions, they reinforce its credibility and significance.

To foster genuine engagement, communication must also leave space for dialogue. Creating opportunities for feedback and open discussion allows employees to clarify doubts, express concerns, and connect the vision to their own experience. Emotional resonance matters as much as rational clarity; the vision should inspire as well as inform.

Moreover, how the message is delivered should reflect the diverse contexts and roles across the organization. Tailoring communications to specific audiences increases relevance, while sustained exposure helps embed the vision into the cultural fabric. Without this level of intentionality, even the most compelling vision risks being lost in the noise of daily operations.

Empowering others to act on the vision

For change to move beyond intention and into action, individuals throughout the organization must be equipped and trusted to contribute meaningfully. Empowerment, in this context, is an operational necessity and not merely a leadership posture.

Removing barriers to action is essential. This may involve flattening hierarchies, simplifying approval processes, or addressing cultural norms that discourage initiative. Leaders must ensure that the necessary tools, information, and authority are distributed to those responsible for executing change at the ground level.

True empowerment also requires a shift in mindset, from control to trust. When employees feel confident that their decisions are aligned with the broader direction, and when they are encouraged to experiment without fear of blame, participation deepens.

Cross-functional collaboration and decentralized problem-solving often emerge as a result, accelerating momentum and uncovering innovation from within.

Rather than pushing change from the top, empowerment allows the vision to take hold at every level, transforming it from a directive into a shared endeavor.

Planning for and creating short-term wins

Early achievements are critical to building the case for change. When transformation efforts yield visible, meaningful results in the short term, they create momentum and demonstrate that progress is not only possible, but already underway.

These wins should be intentionally designed, targeting areas where success can be clearly observed, quickly realized, and directly tied to the broader vision. They serve a dual purpose: validating the strategy and energizing the workforce. When people see real improvements, confidence grows, resistance softens, and broader engagement tends to follow.

Short-term gains also function as strategic checkpoints. They allow organizations to assess what is working, adjust where needed, and reinforce behaviors that align with the desired future state. Publicly recognizing these outcomes boosts morale and sends a clear message that the change effort is not abstract, but it is delivering.

Consistently sharing these wins across the organization helps sustain interest, keeps goals visible, and counters the fatigue that often sets in during longer transformation journeys.

Consolidating improvements and producing still more change

Initial victories, while energizing, mark only the beginning of meaningful transformation. Real change requires persistence beyond early success. Declaring the effort complete too soon risks a return to old habits and erodes the credibility of the initiative.

To maintain momentum, organizations must build on what has worked. This means systematically extending successful practices into other areas, tackling root causes of inefficiency or resistance, and reinforcing behaviors that support the new direction. As transformation deepens, attention must shift from isolated improvements to structural alignment, ensuring that processes, policies, and performance systems support the desired change.

Leadership presence remains vital during this phase. Strategic recalibration, ongoing communication, and visible commitment signal that the transformation is not a one-off campaign but a sustained shift. The consolidation of gains sets the stage for additional progress, helping the organization move from episodic change to continuous evolution.

Institutionalizing new approaches

Lasting change is not secured until new behaviors become part of the organization's cultural fabric. This final stage requires more than formal procedures. It demands reinforcement at every level. Leaders must exemplify the desired ways of working, ensuring that policies, systems, and daily practices all reflect and support the transformation.

Embedding change means aligning performance management, incentives, and decision-making with the new approach. Recognition systems should reward behaviors

that reflect the vision, and structural changes must remove legacy practices that risk pulling the organization backward.

Sustaining change also hinges on leadership continuity. Preparing future leaders who understand and uphold the transformation ensures that progress endures across cycles of turnover or external disruption. Through regular communication, institutional memory, and cultural reinforcement, new approaches evolve from initiative to norm.

Kotter's model concludes not with closure, but with continuity, positioning change as a capability rather than a phase. Sustained transformation depends not only on execution but on the extent to which new behaviors are lived by leaders and woven into the cultural fabric of the organization, a focus central to the framework's enduring impact. It invites organizations to treat change not as a project with an endpoint, but as a capability that must be nurtured, adapted, and preserved over time.

Critical analysis of Kotter's framework

While widely recognized for its influence on modern change management, John Kotter's eight-step model warrants critical examination when applied in diverse organizational contexts. Celebrated for its structured progression and emphasis on leadership, the framework has shaped how many organizations approach transformation. Yet, its effectiveness depends not only on the clarity of its design but also on how well it adapts to varying conditions, cultures, and complexities. The following analysis explores both the model's core strengths and the potential limitations that emerge in practice.

Strengths

Despite its age, Kotter's framework has become a widely adopted framework for leading change, and continues to offer enduring value in navigating organizational change. Its continued relevance must be evaluated in light of evolving organizational realities. The strengths of Kotter's framework lie not only in the structured logic of its sequential steps but also in its strong emphasis on leadership, clarity of purpose, and broad applicability. These characteristics have made it a go-to reference for practitioners seeking order and direction in times of uncertainty. The following are the most widely recognized contributions to the practice of change management:

Structured process with strategic clarity

One of the enduring strengths of Kotter's model lies in its structured, sequential approach, which offers more than just procedural guidance. It provides a strategic lens through which change can be conceived, communicated, and executed. Each of the eight steps builds upon the previous one with intentional logic, helping organizations move from initial awareness to cultural integration. This clarity of progression makes the model especially valuable in large, hierarchical environments where ambiguity and fragmented initiatives often threaten alignment. When transformation efforts are diffused across functions or geographies, having a coherent framework can serve as an anchor point, helping leaders synchronize priorities and maintain directional focus.

Leadership as the engine of change

Kotter's insistence on leadership as a central pillar of transformation elevates the model beyond operational checklists. Change is not positioned as a project to be managed, but

as a process to be led. From forming a guiding coalition to modeling new behaviors, the framework reinforces that transformation must be championed and sustained by individuals who hold both formal authority and informal influence. This emphasis on leadership reflects an understanding of organizational dynamics where people follow signals more than slogans. When leaders visibly align their actions with the envisioned change, trust grows, resistance diminishes, and execution becomes more coherent across the enterprise.

Applicability across contexts and industries

Another important strength of Kotter's model is its broad relevance. The core principles of urgency, vision, communication, empowerment, are applicable across sectors, whether in healthcare, education, government, or corporate environments. Case examples from fields such as public health and digital innovation show how the model can be tailored to context without losing its structure. Its flexibility also extends to scale: while well-suited to enterprise-wide change, it has also been adapted for smaller departmental or initiative-based transformations. This cross-context adaptability has contributed to its continued use in academic settings and practitioner circles alike.

In sum, Kotter's framework remains influential not only because of its intuitive logic, but because it addresses key dimensions of successful change: clarity, leadership credibility, and cultural traction. These qualities make it especially valuable in complex transformations where alignment, trust, and sustained commitment are essential for achieving long-term strategic impact.

Limitations

As transformation efforts increasingly unfold in fast-moving, decentralized, and culturally diverse environments, certain aspects of Kotter's model may prove less adaptable or incomplete. The following are the key limitations that have emerged in both theory and practice, particularly concerning the model's structural rigidity, top-down orientation, and assumptions about cultural universality:

Sequential rigidity in dynamic environments

While Kotter's model offers clarity through its sequential structure, its linear progression may fall short in organizational environments that demand continuous iteration. The model assumes a step-by-step unfolding of change, from urgency to institutionalization, yet many modern organizations operate in contexts where change is neither discrete nor episodic. As noted by Mankins and Litre (2024), successful transformations increasingly depend on agility and responsiveness, requiring organizations to adapt strategies in real time rather than follow a predetermined roadmap.

In rapidly evolving sectors, such as technology, media, and digital services, transformation often unfolds nonlinearly. Feedback loops, emergent needs, and parallel initiatives are the norm, and frameworks like Agile or continuous transformation models provide greater flexibility. Within these settings, the rigidity of Kotter's sequential steps can risk delaying necessary pivots, constraining adaptive momentum, or artificially segmenting what is often a fluid and interconnected process. Although the steps remain conceptually sound, they may need to be reinterpreted as cyclical or overlapping rather than strictly linear to remain relevant in high-change environments.

Hierarchical bias and limited bottom-up engagement

Kotter's model presumes a transformation led by a guiding coalition of formal leaders. A structure that reinforces top-down authority and direction. While this leadership-centered approach can provide strong alignment and accountability, it may underutilize the potential of broader employee engagement, especially in flatter, decentralized organizations.

Modern organizational paradigms increasingly emphasize empowerment, self-organizing teams, and cross-functional collaboration. In such cultures, change often emerges from within, rather than being initiated solely by executive leadership. By focusing primarily on formal coalitions and leadership-driven visioning, Kotter's model may overlook the transformative capacity of bottom-up initiatives. This is especially pertinent in creative industries, agile organizations, and purpose-driven startups where distributed leadership and co-creation are essential. A more inclusive framework might integrate participatory structures that reflect how influence and insight flow horizontally, not just vertically, within the organization.

Cultural and contextual generalization

Although Kotter's framework has achieved global recognition, its foundational assumptions about urgency, leadership, and communication may not align with all cultural and organizational settings. The model's strong emphasis on assertive leadership and rapid mobilization is rooted in individualistic, action-oriented norms, which may clash with collectivist cultures or consensus-based decision-making environments.

In multinational organizations or culturally diverse teams, applying the model without adaptation can result in misalignment with local expectations. For instance, the creation of urgency may be interpreted differently in high-context cultures, where overt expressions of crisis can be counterproductive. Likewise, the reliance on visible leadership may diminish the perceived value of shared responsibility and group cohesion. As Yi (2025) and By (2005) argue, culturally sensitive change strategies must consider how authority, time, and communication are understood and practiced within different environments.

While Kotter's eight-step model remains a cornerstone in the field of change management, its utility is not without constraints. In its original form, the framework favors structure over flexibility, central leadership over distributed agency, and generalized applicability over cultural nuance. For organizations navigating constant disruption, decentralized governance, or multicultural dynamics, the model may require thoughtful adaptation. Recognizing these limitations is not a dismissal of the framework's value, but an invitation to use it critically and modifying its application to reflect the evolving nature of transformation itself.

Current relevance of Kotter's model

Despite the evolving demands of organizational transformation, Kotter's eight-step model remains a foundational reference point. Its structured, leadership-centered approach continues to offer clarity in navigating complex change initiatives. However, contemporary environments shaped by accelerated technological change, shifting stakeholder expectations, and growing pressure for agility, require a more adaptive application of the model.

Adapting to modern challenges

Modern organizations increasingly turn to iterative methodologies inspired by Agile and Lean approaches, which emphasize responsiveness, cross-functional collaboration, and continuous feedback. These practices do not replace Kotter's model but can enrich its application. For instance, short-term wins (Step 6 in Kotter's model) align naturally with Agile's focus on incremental delivery, while empowering employees (Step 5) resonates with Lean's emphasis on removing waste and decentralizing authority. In this way, Kotter's framework serves as a strategic scaffold, adaptable to newer models that prioritize learning cycles and emergent strategy.

As Koudriachov, Tam, and Aparicio (2025) argue, Agile's success hinges on its responsiveness, team empowerment, and continuous value delivery, factors increasingly vital to modern transformation efforts.

Ultimately, the model's enduring value lies in its flexibility. When applied not as a rigid checklist but as a dynamic framework, Kotter's eight steps remain relevant for leading transformation in a world where change is no longer episodic but continuous.

An essential aspect of evaluating Kotter's continued relevance lies in understanding how the model can be adapted to meet the demands of modern transformation, where change is ongoing, fast-paced, and shaped by evolving external pressures. The following are key areas where Kotter's model can be adapted or complemented to address the demands of modern transformation challenges:

Technological advancements

The accelerated rise of artificial intelligence, automation, and digital transformation has positioned technological adaptability as a strategic imperative. In this context, the early stages of Kotter's model, establishing urgency and articulating a compelling vision, remain especially relevant, as organizations must first recognize the implications of emerging technologies and rally around a clear path forward. However, the static nature of traditional change frameworks can limit responsiveness in fast-moving digital landscapes.

To meet this challenge, many organizations are supplementing Kotter's leadership-driven approach with Agile methodologies. Agile's emphasis on iterative development, rapid prototyping, and continuous feedback allows organizations to navigate digital disruption with greater flexibility. Rather than replacing Kotter's model, Agile enables faster execution of the vision and accelerates learning, helping organizations remain responsive without losing strategic coherence. In this hybrid approach, Kotter sets the direction, while Agile delivers the adaptability required for technology-led transformation.

Market volatility

In an environment defined by supply chain instability, political uncertainty, and economic disruption, market volatility has become a constant. Kotter's framework offers valuable direction and leadership alignment during such times, but its sequential structure may not always provide the operational agility required to react in real time. To address this gap, Lean methodologies offer a complementary layer by emphasizing continuous improvement, streamlined processes, and the reduction of inefficiencies.

Lean principles reinforce key aspects of Kotter's model, particularly in empowering employees and consolidating gains. By eliminating structural bottlenecks and enabling faster decision-making, Lean practices help sustain momentum during change and allow organizations to respond quickly to external shocks. When combined,

Kotter's strategic clarity and Lean's operational discipline provide a dual advantage, ensuring purposeful change that is both efficient and resilient under pressure.

The need for agility

While Kotter's model was developed for large-scale, stepwise transformation, the current landscape often demands ongoing, adaptive change. Industries characterized by rapid innovation cycles, such as technology, media, and professional services, must operate with agility as a core capability. In these settings, the rigidity of a linear process may constrain rather than support transformation.

Integrating Agile principles allows organizations to apply Kotter's model with greater flexibility. The coalition-building and vision-setting stages remain vital for creating alignment and momentum, but the execution of change can benefit from Agile's iterative loops and decentralized ownership. Successful Agile organizations are those that continuously realign plans based on learning and stakeholder feedback (Koudriachov et al., 2025). This integration fosters a more responsive environment in which strategic vision and tactical adaptability coexist. Rather than viewing Kotter's model as fixed, its relevance today lies in how well it can be adapted into a more fluid, collaborative, and iterative transformation framework.

How modern methodologies complement Kotter's framework

Although primarily associated with project management and process optimization, modern methodologies such as Agile, Lean, and continuous improvement offer valuable mechanisms to reinforce and operationalize the strategic intent outlined in Kotter's model. Rather than standing in opposition, these methodologies complement Kotter's vision-driven framework by addressing its limitations in adaptability and execution. Their integration enables organizations to remain responsive in fast-changing environments while preserving the structured guidance and leadership emphasis that Kotter provides. The following are key ways in which Agile, Lean, and continuous improvement methodologies can be integrated with Kotter's model to enhance its practical effectiveness:

Agile and Kotter's model

Agile methodologies are characterized by iterative development, rapid feedback loops, and decentralized decision-making. These principles offer an important counterbalance to the linearity and top-down nature of Kotter's model. While Kotter outlines a high-level path for transformation, Agile enables teams to respond dynamically to real-time changes and customer feedback during execution.

This complementary relationship becomes particularly evident during the stages of communicating the vision and empowering employees. Agile practices, such as sprint planning and retrospectives, provide structured mechanisms to translate strategic objectives into concrete actions while maintaining alignment with the broader change vision. As Koudriachov et al. (2025) emphasize, the success of Agile lies in its ability to maintain strategic coherence while empowering autonomous teams to deliver continuous value.

For instance, in a digital transformation initiative, cross-functional Agile teams can execute change in increments, deploying new features or capabilities iteratively, while senior leaders communicate and reinforce the overarching vision. Agile's responsiveness helps generate early successes that align with Kotter's short-term wins step, sustaining momentum and enabling learning. This synergy enhances both speed and cohesion across the transformation process.

Lean and Kotter's model

Lean methodology, with its focus on value delivery and waste reduction, reinforces the sustainability of change. During Kotter's stages of consolidating improvements and producing more change, Lean tools such as value stream mapping, root cause analysis, and continuous flow principles help embed the change deeper into operational processes.

Lean's emphasis on continuous learning and optimization aligns well with Kotter's call for embedding change into systems and behaviors. By focusing on efficiency and eliminating unnecessary effort, Lean supports the institutionalization of improvements, reducing the risk of regression once early wins are achieved. This alignment is particularly relevant in resource-constrained environments where transformation efforts must demonstrate immediate and ongoing value.

Continuous improvement methodologies and Kotter's model

Approaches like Kaizen and Six Sigma introduce a culture of ongoing, data-driven improvement that strengthens Kotter's final step: institutionalizing new approaches. These methodologies offer systematic tools for reinforcing change through metrics, standardization, and problem-solving cycles.

Where Kotter emphasizes the importance of cultural anchoring, continuous improvement frameworks ensure that transformation is not a one-time event but an embedded organizational habit. Feedback mechanisms inherent in Six Sigma and Kaizen also help sustain engagement by involving employees in evaluating and refining the transformation effort, fostering a shared sense of accountability for results.

Kotter's eight-step model remains a vital strategic framework for leading transformation. However, its effectiveness is significantly enhanced when integrated with contemporary methodologies that support agility, efficiency, and continuous refinement. As organizational environments become more complex and unpredictable, the ability to combine Kotter's structured leadership focus with the adaptive capabilities of Agile, Lean, and continuous improvement provides a more resilient and responsive approach to transformation. This integrated perspective enables organizations to navigate uncertainty without losing strategic coherence, a key requirement for sustainable change in the modern era.

Contrasting Kotter's framework with modern transformation practices

As organizations operate within increasingly complex and rapidly evolving environments, it becomes necessary to reassess how Kotter's eight-step model aligns with the demands of contemporary transformation efforts. While the model remains a foundational framework for initiating change, modern practices call for greater flexibility, iterative development, and the integration of both operational and financial dimensions to sustain long-term success (Kotter et al., 2021; Mouazen et al., 2024).

A primary point of divergence lies in the linearity of Kotter's model. Originally designed as a sequential progression from establishing urgency to institutionalizing new practices, the model assumes a relatively stable context in which one stage logically follows another. However, in fast-paced industries shaped by digital transformation and frequent market shifts, change is better understood as a continuous capability rather than a finite event (Mankins & Litre, 2024). Iterative frameworks such as Agile offer mechanisms for ongoing learning, enabling teams to respond in real time while still working within a broader strategic vision. Scholars have emphasized that integrating these adaptive methodologies can help organizations complement the structure provided

by Kotter's model with the responsiveness required in volatile environments (Koudriachov et al., 2025).

Another critical distinction concerns how organizational energy and change capacity are managed. While Kotter's model rightly emphasizes early wins and empowerment to build momentum, it does not explicitly account for the cumulative effects of change fatigue, particularly in organizations facing simultaneous transformations across multiple domains. Modern approaches emphasize the strategic sequencing of initiatives, recognizing that pacing and focus are essential to preserving employee engagement and organizational effectiveness over time (Mouazen et al., 2024).

Furthermore, contemporary transformation practices expand the leadership and vision-centric approach of Kotter by explicitly incorporating financial scaffolding. Transformations at scale often require substantial investment, and success depends not only on cultural and behavioral alignment but also on the availability and allocation of financial resources (Appelbaum, 2012; Mankins & Litre, 2024).

Finally, the growing prevalence of real-time decision-making in digitally enabled organizations underscores the limitations of prescriptive, one-directional models. While Kotter provides a valuable blueprint, its application must be adapted in contexts where responsiveness, decentralization, and continuous feedback are essential. Incorporating Agile and Lean methodologies helps organizations maintain the strategic coherence of Kotter's vision while allowing for dynamic execution and iterative refinement (Abumohor, 2025; Kotter et al., 2021; Vale et al., 2022).

Taken together, these contrasts highlight that while Kotter's model continues to offer a robust foundation for managing change, its full potential in today's environment is realized when combined with modern transformation methodologies that emphasize adaptability, resource alignment, and organizational resilience.

Theoretical implications and leadership integration: Situating Kotter's model within contemporary leadership discourse

Kotter's eight-step model is not only a practical guide for managing change but also a significant contribution to leadership theory. By positioning leadership -not management- as the central driver of transformation, Kotter reframes organizational change as a human-centered, vision-led process. This emphasis has influenced both academic discourse and leadership development practices, shaping how change is taught, studied, and executed across sectors. As leadership theory continues to evolve, Kotter's model invites renewed analysis, particularly in how it resonates with, or departs from, contemporary approaches like servant, transformational, and adaptive leadership.

Leadership as the engine of change: Kotter's theoretical contribution

One of the most significant theoretical contributions of John Kotter's model is the way it redefines leadership as the central engine of organizational change. Rather than treating leadership as a function tied to hierarchical authority, Kotter positions it as a dynamic and mobilizing force, responsible for generating urgency, crafting a shared vision, and inspiring collective action. This perspective reframes leadership as an active process of influence, grounded not only in strategic direction but also in emotional engagement and behavioral modeling.

Kotter's framework consistently places leadership at the forefront of change, beginning with the formation of a guiding coalition and extending through the sustained

communication of vision, the removal of obstacles, and the reinforcement of new behaviors. Unlike models that conflate management with leadership, Kotter clearly distinguishes between the two. Management, in his view, is largely concerned with planning, budgeting, and controlling complexity, whereas leadership is about motivating people, shaping culture, and navigating uncertainty.

This orientation represents a clear evolutive departure from classical management theories. Early theorists such as Henri Fayol and Frederick Taylor emphasized formal structures, operational control, and procedural efficiency as the foundations of effective management. Fayol's administrative framework prioritized discipline, unity of command, and hierarchical stability (Fayol, 1916/2013), while Taylor's scientific management advocated for task optimization through standardization and close managerial supervision (Taylor, 1911/2013). Even more contemporary frameworks, such as Michael Porter's focus on competitive positioning and strategic advantage (Porter, 1985), still emphasize analytical tools and structural levers rather than the human dynamics of change. Closer to Kotter's perspective, Peter Senge's concept of the learning organization emphasized the importance of shared vision, systems thinking, and continuous learning as drivers of sustainable transformation, principles that resonate with Kotter's later emphasis on leadership, engagement, and behavioral change (Senge, 1990; 2006). Kotter's model builds on this human-centric turn by positioning leadership not as directive control but as emotional engagement, belief, and collective behavioral commitment across all levels of the organization.

By elevating leadership to a central, human-centered role, Kotter's model anticipates the shift toward more relational and adaptive approaches to organizational change, laying a foundation that continues to influence contemporary leadership theory and practice.

Institutional influence: Enduring impact on leadership education and organizational practice

Kotter's eight-step model has become deeply embedded in the institutional architecture of leadership education and organizational development. Since its introduction in the 1990s, the framework has been widely adopted in MBA programs, executive education curricula, leadership development initiatives, and change management specific training programs, often serving as a foundational reference for teaching change management and strategic leadership. Its clarity, accessibility, and practical relevance have contributed to its widespread integration into both academic instruction and applied training.

In business schools, Kotter's model is frequently taught alongside broader leadership theories and case-based instruction, offering students a structured approach to understanding the dynamics of change. Beyond academia, many executive training programs and corporate leadership workshops use Kotter's framework to guide leaders through real-time transformation initiatives. Change leadership certifications, often designed for mid-to-senior level managers, incorporate Kotter's steps as a methodological backbone for understanding and managing resistance, aligning teams, and sustaining momentum. Major consulting firms have also adapted the model within their proprietary frameworks for diagnosing organizational readiness, facilitating stakeholder engagement, and structuring enterprise-wide change programs (Basford & Schaninger, 2016; Keller & Schaninger, 2020; Accenture, 2024; Deloitte, 2021; Michels, 2022; Litre & Murphy, 2013; Litre et al., 2018; Boston Consulting Group, n.d.; Ellmer et al., 2024).

Recent scholarship has further solidified the model's value in practice. Mouazen et al. (2024) and Vale et al. (2022) provide empirical evidence of how Kotter's model interacts with transformational and transactional leadership styles, as described by Burns (1978/2010), Bass (1985) and Flynn (2024), in organizational settings. Their study found that transformational leaders, those who inspire through vision, intellectual stimulation, and individualized consideration, tend to align more naturally with Kotter's emphasis on vision-building, coalition-forming, and empowering action. Conversely, transactional leaders, who focus on performance monitoring, contingent rewards, and corrective action, may be more effective during the implementation and consolidation phases, where discipline and accountability are critical to institutionalizing change. This interaction suggests that while Kotter's model is structurally consistent, its success often depends on how well leadership styles are aligned with the demands of each stage.

Together, these institutional adoptions and academic validations illustrate Kotter's lasting influence. His framework not only continues to shape how leaders are trained but also informs how organizations design and execute transformation initiatives in a wide range of industries and cultural contexts.

Convergence with modern leadership models: Servant, transformational, and adaptive leadership

Kotter's model of change leadership shares important conceptual territory with several modern leadership paradigms, including servant, transformational, and adaptive leadership. Although his eight-step framework is largely top-down in structure, its underlying assumptions about the role of leadership in driving change suggest a convergence with more participatory and relational models.

Servant leadership, as described by Greenleaf (1977/2002) and Eva et al. (2019) for instance, emphasizes empowerment, listening, empathy, and stewardship, values indirectly echoed in Kotter's calls to build guiding coalitions and empower broad-based action. These steps rely on the ability of leaders to foster trust, mobilize support, and remove obstacles that hinder engagement, aligning with the servant-leader's emphasis on enabling others to perform at their best.

Transformational leadership (Burns, 1978/2010; Bass, 1985), with its focus on inspirational motivation, intellectual stimulation, and individualized consideration, further resonates with Kotter's framework. Both models underscore the importance of articulating a compelling vision, aligning stakeholders through shared purpose, and sustaining momentum through meaningful recognition of early wins. Mouazen et al. (2024) show how transformational leadership behaviors are often instrumental in implementing Kotter's steps, particularly in energizing teams and embedding change into organizational culture.

Adaptive leadership (Heifetz, 1998; Heifetz & Linsky, 2002), by contrast, places greater emphasis on navigating complexity, encouraging distributed decision-making, and enabling organizations to evolve through experimentation and reflection. Kotter's model, while more linear and directive, does begin to touch on these dynamics, especially in its later iterations that stress agility and engagement across levels (Kotter et al., 2021). Still, Kotter's approach stops short of fully embracing the bottom-up and emergent qualities that define adaptive leadership, which are increasingly vital in fast-moving and unpredictable environments (Appelbaum, 2012; Vale et al., 2022).

Overall, Kotter's model implicitly supports many of the aims of these modern leadership frameworks but does not fully incorporate their relational, distributed, and systems-oriented dimensions. As leadership theory continues to evolve, integrating these

paradigms with Kotter's foundational principles offers a more holistic view of what effective leadership looks like in today's complex transformation landscapes.

Conclusion

Achieving sustainable organizational change requires more than short-term effort or isolated initiatives. It depends on strong leadership and a coherent, structured approach. Kotter's eight-step model remains a cornerstone in this regard, offering a systematic process to address common leadership and planning failures. The framework continues to hold relevance, yet it must be understood within the broader context of accelerating technological disruption, economic uncertainty, and the growing imperative for agility and innovation. Organizations that combine Kotter's disciplined methodology with adaptive, iterative practices are better positioned to navigate ongoing transformation and secure long-term success.

Key takeaways

Kotter's model provides a foundational roadmap for leading change, particularly in large and complex organizations. Its enduring value lies in several core strengths:

Leadership as the engine of change

The model positions leadership not merely as directive authority but as a dynamic force for mobilization. Visionary leadership, broad-based coalition-building, and consistent behavioral reinforcement are central to sustaining change efforts. Without this strategic leadership presence, transformation is unlikely to take root.

Process structure amid complexity

The eight-step sequence offers clarity in environments where change efforts can otherwise become fragmented. By delineating discrete, sequential stages, it enables leaders to anticipate challenges, maintain focus, and sustain alignment throughout the transformation journey.

Early wins to sustain momentum

One of the model's most actionable features is its emphasis on early, visible successes. These short-term wins play a critical role in reinforcing belief in the change, strengthening stakeholder commitment, and countering resistance, especially in lengthy or high-stakes initiatives.

Nonetheless, critical limitations also emerge when applying the model in contemporary settings:

Lack of iterative flexibility

Designed as a linear progression, the model may fall short in contexts requiring agile, real-time responses. Continuous transformation, common in digital and innovation-driven environments, demands a more cyclical and adaptive approach.

Inadequacy in highly dynamic sectors

In industries characterized by rapid disruption, such as technology, finance, and healthcare, the model's structured pace can hinder responsiveness. Flexibility in timing, decision-making, and experimentation is often needed to remain competitive.

Top-down bias

While effective in traditional hierarchies, Kotter's top-down orientation may conflict with leadership philosophies that prioritize inclusion, collaboration, and shared accountability. Servant, adaptive, and transformational leadership models suggest that enduring change also emerges from trust-building, distributed authority, and grassroots engagement.

Final thoughts

Kotter's eight-step model continues to serve as a foundational roadmap for orchestrating successful organizational change. Its clarity, structure, and emphasis on leadership make it a valuable tool for navigating complex transformations. However, the pace and volatility of contemporary business environment, shaped by fast technological disruption, evolving stakeholder expectations, and the imperative for continuous innovation, require a more fluid and adaptive approach to change.

Sustainable transformation now requires organizations not only to follow a structured plan but also to cultivate a mindset of continuous learning and responsiveness. Blending Kotter's framework with agile methodologies and adaptive leadership practices allows organizations to move beyond episodic change and embrace transformation as an ongoing capability. This evolution calls for feedback-driven iteration, distributed leadership, and cross-functional collaboration, elements that enhance organizational resilience while preserving strategic direction.

The trajectory of leadership theory will continue to influence how Kotter's framework is interpreted and applied. As leadership paradigms shift toward decentralization, shared accountability, and empowerment at all levels, the framework must adapt to remain effective. Integrating servant, transformational, and adaptive leadership perspectives into Kotter's model enriches its applicability, fostering inclusivity, psychological safety, and innovation across diverse organizational cultures.

In conclusion, the enduring value of Kotter's framework lies not in its rigidity, but in its ability to be thoughtfully adapted. By aligning its structured guidance with the demands of modern leadership and the reality of continuous transformation, organizations can remain strategically focused while flexibly navigating change. This balance is critical to achieving not only successful transitions, but also long-term, sustainable outcomes in an increasingly dynamic world.

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METHODOLOGICAL VISION IN ARCHITECTURAL DESIGN: TOWARDS A NEW INTEGRATIVE PERSPECTIVE

VISIÓN METODOLÓGICA EN EL DISEÑO ARQUITECTÓNICO: HACIA UNA NUEVA PERSPECTIVA INTEGRADORA

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ABSTRACT

In the field of architectural design, the evolution of methodologies has been an ongoing process, from traditional approaches focused on linear teaching and master-apprentice learning to the integration of design thinking and interdisciplinary approaches. This review study analyzes the need to transcend classical methodologies towards a new vision that responds to contemporary challenges, such as sustainability, digitalization and the personalization of spaces. Through the systematic literature review between 2018 and 2024, the limitations of traditional approaches are identified, and a renewed methodological vision is proposed that incorporates creativity, innovation and interdisciplinary collaboration, all under an integrative perspective. It is concluded that the adoption of new methodologies is essential to bridge the gap between theory and practice, ensuring that architectural designs respond to user expectations and current social demands. This article is a partial synthesis of a broader research developed within the framework of the doctoral thesis called "Methodological proposal for architectural design with a systemic approach applicable to the architect's project processes. ARCHITECTURAL DESIGN THINKING SYSTEM: Thinking System for Architectural Design".

Keywords:
classical methodologies, design thinking, creativity, interdisciplinarity, innovation.

RESUMEN

En el ámbito del diseño arquitectónico, la evolución de las metodologías ha sido un proceso continuo, desde los enfoques tradicionales centrados en la enseñanza lineal y el aprendizaje maestro-aprendiz hasta la integración del pensamiento de diseño y el enfoque interdisciplinario. Este estudio de revisión analiza la necesidad de trascender las metodologías clásicas hacia una nueva visión que responda a los desafíos contemporáneos, como la sostenibilidad, la digitalización y la personalización de los espacios. Mediante la revisión sistemática de literatura entre 2018 y 2024, se identifican las limitaciones de los enfoques tradicionales y se propone una visión metodológica renovada que incorpora la creatividad, la innovación y la colaboración interdisciplinaria, todo esto bajo una perspectiva integradora. Se concluye que la adopción de nuevas metodologías es esencial para cerrar la brecha entre teoría y práctica, asegurando que los diseños

Palabras clave:
metodologías clásicas, pensamiento de diseño, creatividad, interdisciplinariedad, innovación.

arquitectónicos respondan a las expectativas de los usuarios y a las demandas sociales actuales. Este artículo es una síntesis parcial de una investigación más amplia desarrollada en el marco de la tesis doctoral denominada “Propuesta metodológica para el diseño arquitectónico con enfoque sistémico aplicable a los procesos proyectuales del arquitecto. ARCHITECTURAL DESIGN THINKING SYSTEM: Sistema de pensamiento para el Diseño Arquitectónico”.

Introduction

Architectural design, since its origins, has reflected the aesthetic, social and technological aspirations of each era. However, the changes it has faced in recent decades have led to a rethinking of its methodologies. Traditionally, the design process was structured under rigid models, such as the master-apprentice method and sequential learning in workshops (López Terrazas, 2021; Morales-Holguín and González-Bello, 2020; Ozturk, 2020). These approaches, although effective at the time, have shown limitations in the face of contemporary challenges, such as sustainability, technological integration, and meeting the dynamic needs of end users (Rodriguez and Fiscarelli, 2023; Rodriguez et al., 2022).

During the 20th century, the Modern Movement, with figures such as Walter Gropius and the Bauhaus, promoted a functionalist approach, where hands-on learning in workshops and the standardization of construction processes dominated teaching (Salama and Burton, 2022). This approach had a great impact on architectural production, but it failed to establish a solid bridge between theory and practice, generating a significant disconnection between academic training and professional reality (Morales-Holguín and González-Bello, 2020). Despite attempts to integrate creative approaches, most traditional methodologies followed a direct line, with emphasis on the transmission of technical knowledge and the reproduction of established models.

The shift towards a more flexible and integrative methodological vision began to take shape with the emergence of design thinking and divergent thinking. These approaches have allowed the exploration of new ways of approaching architectural problems, prioritizing empathy towards the user, interdisciplinary collaboration and experimentation (Brown, 2008, 2019; Casakin and Wodehouse, 2021; Guamán et al., 2022; Guamán-Quintanilla et al., 2023). The adoption of these methodologies has proven to be key to address current challenges, such as climate change, massive urbanization, and the need to design inclusive and sustainable spaces (Rodriguez and Fiscarelli, 2023; Rodriguez et al., 2022).

The purpose of this article is to analyze the transition from classical methodologies to a new methodological vision, focusing on its justification and relevance. Through a review of recent literature, the factors driving this change are examined, highlighting the importance of integrating design thinking, creativity, and interdisciplinary collaboration into architectural design education and practice. The review also addresses how these new approaches can bridge the gap between architectural production and end-user expectations.

This article is a partial synthesis of the broader analysis developed within the framework of the doctoral thesis entitled *"Propuesta metodológica para el diseño arquitectónico con enfoque sistémico aplicable a los procesos proyectuales del arquitecto. ARCHITECTURAL DESIGN THINKING SYSTEM: Architectural Design Thinking System.*" The findings presented here summarize the most relevant aspects related to the need to adopt new methodologies in teaching and professional practice.

Literature Review

The evolution of classical methodologies in architectural design

Classical methodologies in architectural design were historically based on sequential learning and direct transmission of knowledge by the teacher. This approach was consolidated in the first decades of the twentieth century with the emergence of movements such as Art Nouveau and Art Deco, where design was oriented towards

aesthetics and ornamentation (Guarín, 2018). However, the Modern Movement marked a turning point by introducing functionalist principles and the use of industrial materials, which transformed both education and professional practice (Salama and Burton, 2022).

Throughout the 1960s and 1970s, alternative approaches such as Brutalism and Deconstructivism emerged, which introduced new forms and materials. However, the predominant teaching method continued to be that of the classroom-workshop, with a hierarchical and rigid structure that limited creative exploration (Morales-Holguín and González-Bello, 2020). This model was challenged in the 1980s and 1990s, when some scholars began proposing more dynamic and participatory approaches, incorporating teacher-learner learning models and alternative didactic sequences (Ozturk, 2020).

Despite these advances, the teaching of architectural design largely maintained its technical focus, resulting in an education centered on the reproduction of models and a scarce critical and creative capacity among students (López Álvarez, 2022; López Terrazas, 2021). This technical approach, although useful in stable industrial contexts, has been insufficient to respond to contemporary challenges, such as sustainability, digitalization, and the need for customization in architectural projects (Rodríguez Sandoval et al., 2022).

Limitations of Classical Methodologies

Traditional methodologies have been criticized for their linear approach and their reliance on direct transmission of knowledge. Authors such as Casakin and Wodehouse (2021) argue that this approach has generated a crisis of creativity in architecture, characterized by the replication of existing structures and the lack of time for experimentation. In addition, the disconnect between theory and practice has limited the ability of architects to develop innovative and adaptive solutions.

The impact of these limitations is especially evident in professional practice, where designs are often generic and repetitive, without adequately addressing the specific needs of end users (Park and Lee, 2022). Recent studies have highlighted how this gap affects the quality of the built environment, resulting in spaces that do not foster sustainability or the well-being of their inhabitants (Dash, 2021).

The COVID-19 pandemic also highlighted the shortcomings of classical methodologies by forcing many institutions to rapidly adopt remote teaching models and hybrid methodologies (Salama and Burton, 2022). This sudden transition highlighted the need for more flexible and adaptive methods to integrate emerging technologies and collaborative approaches to architect education.

Towards a New Methodological Vision: Design Thinking and Creativity

Design thinking has emerged as a direct response to the limitations of classical methodologies. This approach, popularized by authors such as Brown (2008) is based on problem solving with a focus on the end user, through empathy, experimentation and iteration. Unlike traditional linear approaches, design thinking encourages exploration of multiple possible solutions and continuous adaptation based on feedback (Pandey, 2021).

One of the key elements of this new vision is divergent thinking, which promotes the generation of innovative ideas and the evaluation of alternatives before converging on a final solution (Casakin and Wodehouse, 2021; Wodehouse and Casakin, 2022). This approach has proven to be effective in complex contexts, such as the design of sustainable and adaptive spaces, where it is necessary to consider multiple variables and future scenarios (Flores, 2020).

Interdisciplinary collaboration also plays a central role in this new methodological vision. The integration of architects, engineers, sociologists, and other professionals

allows architectural problems to be approached from diverse perspectives, enriching the design process and ensuring that the results are functional, sustainable, and socially responsible (Pilat and Person, 2022).

Benefits of the New Methodological Vision

The transition to methodologies based on design thinking offers multiple benefits. In the educational sphere, it fosters creativity and innovation among students, preparing future architects to face real and complex challenges (Rodriguez and Fiscarelli, 2023; Rodriguez et al., 2022). In professional practice, this new vision allows the development of more customized and sustainable architectural solutions, responding better to the expectations of users and to the context in which the projects are inserted (Park and Lee, 2022; Park, 2020).

In addition, the adoption of emerging technologies, such as 3D modeling and digital simulations, facilitates prototyping and early evaluation of designs, reducing the risk of errors and optimizing outcomes (Pilat and Person, 2022). These advances have been instrumental in overcoming the limitations of classical methodologies and establishing a new methodological basis for contemporary architectural design.

Method

Study Design

The present study adopts a qualitative systematic review approach, based on the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) guidelines updated in 2020 by Page et al., (Page et al., 2021). This approach is ideal for the comprehensive analysis of recent methodological contributions in architectural design teaching, research and practice. The method used is characterized by the collection, filtering and critical analysis of relevant studies, ensuring a rigorous and well-founded evaluation of the methodological transition in the field. In addition, the transparency and reproducibility of the selection and analysis process of the reviewed studies is guaranteed.

The systematic literature review presented in this article follows the guidelines and criteria applied in the development of the aforementioned doctoral thesis, where a broader and more detailed analysis of the methodological aspects of architectural design is carried out.

Systematic Review Design

The systematic review process was structured in four main phases:

1. Identification of relevant studies -Prisma-.
2. Selection and filtering of studies according to predefined criteria -Prisma-.
3. Detailed content evaluation -Prisma-.
4. Analysis of patterns, co-occurrences and methodological trends -Atlas.ti-.

To ensure the transparency and reproducibility of the process, a PRISMA flow chart was developed, similar to the one used in the original article, detailing the stages of study selection from the initial search to the final inclusion in the review. The design of this study not only made it possible to identify the most significant contributions in the methodological transition of architectural design, but also facilitated the comparison of approaches and the detection of areas where challenges remain.

Sources and Selection of Articles

The search for articles was carried out in recognized academic databases, such as Scopus, Web of Science and Google Scholar, guaranteeing access to high quality publications. Combinations of keywords in English and Spanish were used, such as "methodologies", "design thinking", "creativity in architecture", "innovation in architectural education" and "design education". The search was extended to books, peer-reviewed and open access articles.

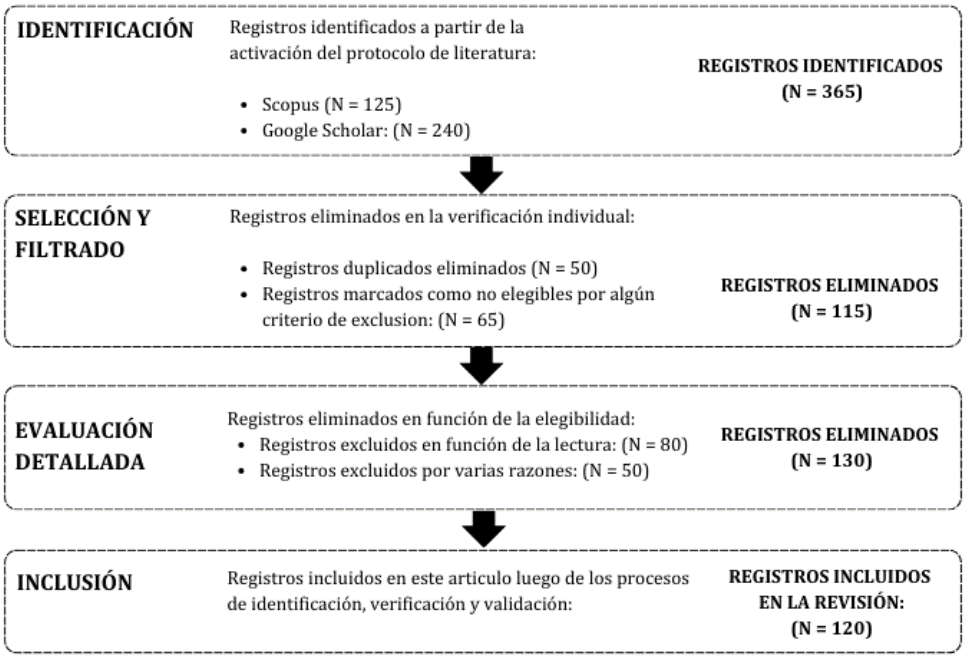
The initial search process resulted in the identification of 365 potential studies. After applying inclusion and exclusion filters and reviewing titles and abstracts, 170 studies were selected for further analysis. Finally, the corpus was reduced to 120 articles, which form the basis of the qualitative analysis presented in this article. This procedure ensures a broad coverage of the different methodological perspectives in the recent literature.

The diagram of the identification of studies from the PRISMA method (

Figure ***1***) shows the stages of the article selection process, from initial identification to final inclusion in the review.

Figure 1

Identification of studies based on the PRISMA method



Inclusion and Exclusion Criteria

To select the studies included in the review, specific criteria were established to ensure the relevance and quality of the corpus analyzed:

Inclusion criteria

- Articles published between 2018 and 2024 in high impact indexed journals in architecture, design and education.
- Studies focused on the teaching of architectural design, applied methodologies and pedagogical innovation.
- Papers that include empirical data, theoretical analysis or case studies relevant to the methodological transition.
- Studies that address the evolution of teaching, research or practice methodologies in architectural design.

- Empirical research or systematic reviews that provided significant data on the adoption of new methodologies, such as design thinking or interdisciplinary collaboration.
- Publications in Spanish and English, with access to the full text, i.e., open access.

Exclusion criteria

- Publications without peer review.
- Articles focused exclusively on technical aspects of construction, with no direct relation to the design methodology.
- Theoretical studies without empirical application.
- Publications focused on non-architectural disciplines.
- Work with lack of specific data or limited analysis.
- Studies that do not provide empirical evidence or critical analysis of architectural design methodologies.

This selection process made it possible to reduce the 365 articles initially identified to a final sample of 120 studies, which were analyzed in detail, and the results obtained represent an updated and significant panorama of the methodological evolution in the field of architectural design.

Data Organization

The selected studies were organized in a bibliographic analysis matrix, which contained essential information on the objectives, methods, results and conclusions of each study. This matrix facilitated the identification of patterns and recurring themes, as well as the comparison between different methodological approaches.

Qualitative Data Analysis

The selected articles were analyzed by thematic coding in Atlas.ti v24 software. This process allowed the identification of patterns, co-occurrences and trends related to the evolution of methodologies and their applicability in architectural practice, also allowed the categorization and coding of information through advanced content analysis techniques, facilitating the identification of patterns, trends and relationships between different methodological approaches (Niedbalski and Ślęzak, 2017).

Three main categories of analysis were initially defined, aligned with the objective of the study:

- Scope of application: Studies were analyzed according to their focus on teaching, research or professional practice.
- Methodological aspect: Key elements such as design thinking, divergent thinking and interdisciplinary integration were codified.
- Expected results: The benefits associated with the adoption of modern methodologies were identified, such as the promotion of creativity, innovation and improvement in the quality of architectural designs.

Each category was subdivided into specific codes by means of co-occurrence analysis, which made it possible to visualize the relationships between different concepts and methodological approaches. This coding process was iterative and was refined in several stages to ensure accuracy and depth of analysis (Casakin and Wodehouse, 2021).

Data Visualization and Synthesis of Results

The results of the qualitative analysis were synthesized using flow charts and Sankey plots, which illustrate the connections between categories and the magnitude of

these relationships. These diagrams allow a clear representation of how the new methodologies contribute to overcome the limitations of classical approaches.

Rigor and Validity of the Study

To ensure the validity of the results, several quality control strategies were adopted, including:

- Internal peer review during the coding and analysis process in Atlas.ti.
- Cross-comparison of the results obtained in different phases of the analysis.
- Preparation of partial reports to verify the coherence and consistency of the findings.

In addition, a triangulation of data obtained from different sources (articles, reviews and reference documents) was performed to strengthen the robustness of the conclusions.

Limitations of the Method

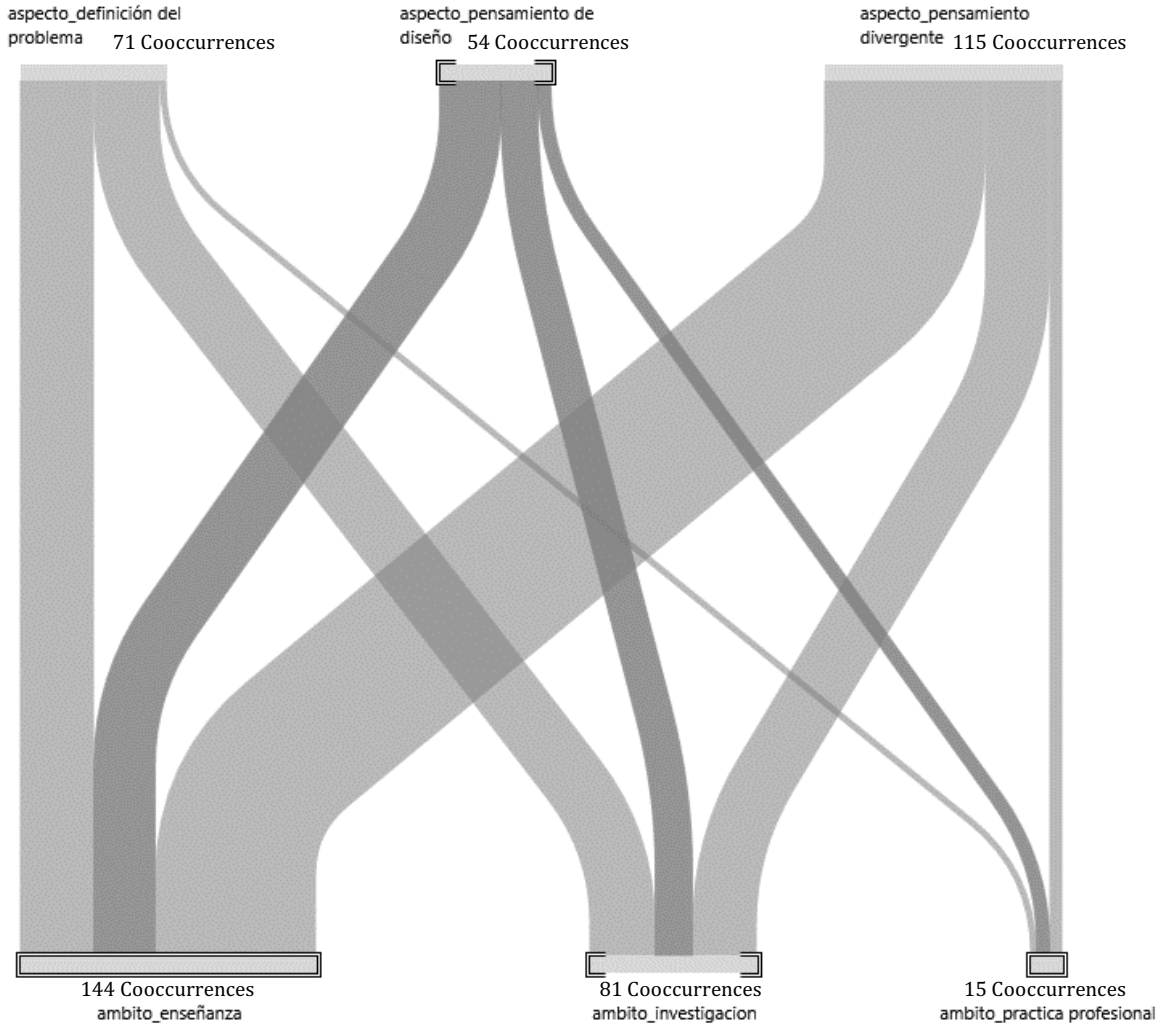
While this study provides a comprehensive overview of the evolution of methodologies in architectural design, it is important to recognize certain limitations. First, the focus on studies published between 2018 and 2024 may exclude relevant contributions from previous decades. In addition, reliance on specific databases could limit the geographic diversity of the studies reviewed. Finally, although advanced qualitative analysis techniques were employed, the interpretative nature of the process could introduce some bias. To address these limitations, future studies are recommended that include historical and comparative reviews, as well as the incorporation of quantitative methods to complement the qualitative analysis presented in this article.

Results and Discussion

As previously mentioned: this article is a partial synthesis of a more in-depth analysis conducted as part of the doctoral research. This research resulted in a systematic literature review article and connection analysis using the method presented. Given the limited scope of this article, certain aspects related to the description of the results will be limited to 3 aspects: teaching, research and professional practice. The empirical analysis is further developed in the framework of a literature review article and the theoretical framework of the doctoral dissertation, where a more detailed evaluation of the results is provided. The following is the Figure 2 the connections between the aspects: design thinking, divergent thinking; and the areas of teaching, research and professional practice are shown.

Figure 2

Sankey diagram: connection between aspects and domains



The results of the analysis indicate how aspects of divergent thinking and design thinking are interrelated with different domains of the formative and professional process in architectural design. The connections visualized by the thickness of the lines indicate the strength and frequency of cooccurrence between the codes analyzed. Three key areas are highlighted:

Teaching: In the field of teaching, divergent thinking plays a key role in the generation of creative ideas among students (Casakin and Wodehouse, 2021; Dash, 2021; Guarín, 2018; among others). According to the diagram, there is a strong connection between this aspect and the expected results related to creativity and exploration of alternatives. This indicates that academic programs that integrate divergent thinking allow students to develop innovative and unconventional solutions during the learning process. The visual link reflects how educational institutions have begun to implement pedagogical approaches centered on design thinking, promoting project-based learning and interdisciplinary collaboration (Brown, 2008; Danchenko, 2021; Guamán et al., 2022; Pandey, 2021; among others). This has fostered the development of critical thinking and creativity (López Terrazas, 2021; Rodríguez et al., 2022; Salama and Burton, 2022; among others).

Research: In the field of research, the diagram shows an intermediate connection between divergent thinking and applied research processes. This relationship suggests

that divergent thinking is used as an essential methodology in the generation of new hypotheses and experimental solutions. Design research, especially when it involves empirical studies and scenario modeling, benefits from the divergent approach by allowing the simultaneous exploration of multiple paths before converging on specific solutions (Casakin and Wodehouse, 2021; Flores, 2020; Hernandez-Moreno, 2020; among others).

Professional practice: Divergent thinking has no meaningful connection to professional practice. This is something that some authors make clear needs to be rethought. Divergent thinking allows architects and designers to explore creative alternatives and innovative solutions, overcoming the rigidity of traditional methodologies. The interdisciplinary collaboration, mentioned in the original article, further enhances this process, as different disciplines bring complementary perspectives that enrich the project development Hettithanthri et al., 2023; Mclaughlan and Chatterjee, 2020; Ozturk, 2020; Park and Lee, 2022; Park, 2020; Zeynep Aydemir and Jacoby, 2022; among others).

The results presented in this article -synthesis- show that a significant methodological transformation in architectural design, characterized by the transition from traditional approaches, would lead to a new vision based on creativity, interdisciplinarity and innovation. This evolution would be driven by several factors, including technological advances, the need to respond to the challenges of the contemporary environment and the search for a greater connection between architectural production and the expectations of end users. The following are the criteria presented by various authors in three areas: teaching, research and professional practice, which are interconnected and determine the effectiveness of this transition.

Transformations in the Educational Field: Towards an Education Focused on Design Thinking and Creativity

In the area of teaching, the results highlight the importance of abandoning traditional models of linear knowledge transmission and adopting pedagogical approaches that promote critical thinking, creativity and interdisciplinary collaboration. The teaching of architectural design has moved from being based on the repetition of established models to integrating design thinking as a central methodology. This transformation has been driven by the need to train architects capable of developing innovative and sustainable solutions (Rodríguez Sandoval et al., 2022).

Qualitative analysis shows that educational institutions that have incorporated design thinking into their curricula have been able to significantly improve students' ability to generate original ideas and solve complex problems (Salama and Burton, 2022). This approach allows them to explore multiple alternatives before converging on a final solution, promoting experiential and collaborative learning. In addition, divergent thinking, as an integral part of this methodology, fosters creativity by encouraging the generation of disruptive and unconventional ideas (Casakin and Wodehouse, 2021).

The findings also indicate that the adoption of emerging technologies, such as 3D modeling, augmented reality and digital simulations, has been key to enriching teaching and learning processes. These tools allow students to visualize and evaluate their proposals in real time, bridging the gap between theory and practice (Pilat and Person, 2022). In this context, universities have begun to adopt project-based learning models, where students collaborate in the resolution of real problems, which contributes to a comprehensive training oriented to the professional world (Rodriguez and Fiscarelli, 2023).

However, despite this progress, the results indicate that important challenges remain, such as the need to train teachers in new methodologies and ensure greater integration between academia and the professional sector. Some studies suggest that a lack of teacher training in design thinking may limit its effectiveness, as not all educators are prepared to guide students in creative exploration and complex problem solving (Salama and Burton, 2022).

Advances in Applied Research: from Theory to Interdisciplinary Practice

The field of research has undergone a significant transformation from traditional theoretical approaches to applied methodologies that combine empirical research with interdisciplinary analysis. The results of the review highlight how architectural design research has adopted holistic approaches that integrate quantitative and qualitative data, allowing for a deeper understanding of design processes and the needs of end users (Linares-Bermúdez, 2021).

In this sense, the analysis of co-occurrences performed using Atlas.ti software evidences the growing importance of interdisciplinary collaboration in architectural research. The studies reviewed indicate that research teams involving architects, engineers, sociologists and sustainability experts are able to develop more effective and adaptive solutions. This interdisciplinary orientation not only allows problems to be approached from multiple perspectives, but also facilitates the transfer of knowledge between academia and professional practice.

Despite these advances, some studies warn of the need to strengthen the links between academic research and professional practice. Although innovative methodologies have been developed, their implementation in the professional field is still limited, which hinders the full adoption of these new perspectives (Linares-Bermúdez, 2021; López Álvarez, 2022; Martínez, 2021; Martínez, 2013; Martínez Zarate, 2013; Rodríguez, 2023; Salama, 2022; Šķerstiņš and Ulme, 2020; among others). This challenge suggests the need to promote joint research projects between universities and architectural firms, as well as the creation of knowledge exchange platforms.

Professional Practice: Limited but Growing Integration of New Methodologies

At the professional practice level, the results indicate that, although traditional approaches persist, there is evidence of an increase in the adoption of methodologies based on design thinking and interdisciplinary collaboration. This change has been driven by the need to develop architectural solutions that respond to contemporary challenges, such as sustainability, energy efficiency, and social inclusion (Rodríguez Sandoval et al., 2022).

Analysis of the literature suggests that architectural firms that have incorporated these new methodologies have managed to improve the quality of their projects by designing more functional and personalized spaces that consider both the needs of the users and the conditions of the environment (Park, 2020). Incorporating design thinking allows architects to approach problems iteratively, exploring and evaluating multiple solutions before selecting the most appropriate one (Brown, 2008, 2019).

However, the results also reveal significant barriers to the widespread adoption of these methodologies in professional practice. These include resistance to change on the part of some practitioners, lack of specific training in design thinking, and poor integration of emerging technologies in some contexts (Casakin and Wodehouse, 2021). These limitations underscore the need to foster a culture of innovation within the sector and to promote continuous training programs for practicing professionals.

Finally, the importance of collaboration with other stakeholders, such as engineers, industrial designers, and environmental specialists, is highlighted to enrich the design process and ensure that architectural projects are sustainable and socially responsible (Pilat and Person, 2022). This collaborative approach not only contributes to innovation, but also allows for the development of integrated solutions that consider all aspects of design, from initial conception to execution.

Synthesis of Results: Cooccurrences and Methodological Trends

The co-occurrence analysis performed using Sankey diagrams shows how methodological aspects such as design thinking, information search and evaluation of alternatives are interconnected and determine the expected results in architectural projects. A strong correlation is observed between divergent thinking and creativity, suggesting that fostering this skill is key to generating innovative solutions (Casakin and Wodehouse, 2021). Likewise, critical thinking and complex problem solving emerge as essential components for improving the efficiency and effectiveness of designs (Salama and Burton, 2022).

The results show that the adoption of a new methodological vision based on design thinking, interdisciplinarity and innovation is essential to close the gap between theory and practice. This transition not only improves the training of future architects, but also makes it possible to develop projects that adequately respond to the demands of the contemporary environment.

Conclusions

The evolution of methodologies in architectural design is a necessary and urgent process in the context of contemporary challenges, such as sustainability, digitalization and adaptation to the dynamic needs of users. The results obtained from this systematic review confirm that classical methodologies, although fundamental at the time, have shown significant limitations, especially in their capacity to generate innovative and adaptive designs. In contrast, design thinking and interdisciplinary collaboration have emerged as promising approaches to transform both the teaching and professional practice of architectural design.

The findings of this systematic review highlight the pressing need for a methodological transformation in architectural design, moving away from traditional rigid and sequential approaches towards a more dynamic and integrative model, focusing on design thinking, divergent thinking and interdisciplinary collaboration. This transition is not simply a change in teaching or design techniques, but an evolution that seeks to ensure that architectural projects respond to the complex and changing demands of the contemporary environment.

In academia, it has been shown that the abandonment of classical methodologies in favor of approaches based on creativity and exploration has improved students' ability to generate innovative solutions and solve complex problems (Casakin and Wodehouse, 2021; Salama and Burton, 2022). Institutions that have adopted project-based learning models and integrated divergent thinking have had promising results, with graduates better prepared to face real-world challenges. However, to achieve a sustained impact, it is necessary to train teachers in the use of these methodologies and to strengthen the links between academia and the professional sector.

In terms of professional practice, although significant steps have been taken towards the adoption of flexible and collaborative methodologies, there are still barriers

that limit their widespread implementation. Resistance to change, lack of access to advanced technologies and limited specific training in design thinking remain major challenges. Overcoming these limitations will require a joint effort by academic institutions, architectural firms and professional bodies.

One of the key findings of this study is the need to close the gap between theory and practice, which has limited the effective implementation of new methodologies in the professional setting. To achieve this, it is essential to strengthen the links between academia and the professional sector through the creation of joint projects, knowledge-sharing platforms and continuing education programs. These actions will allow a more effective transfer of methodological advances, ensuring that architects in training and in practice have the necessary tools to face the challenges of the built environment.

The incorporation of divergent thinking and creativity in teaching programs has proven to be a determining factor in the generation of innovative solutions. Educational institutions should adopt project-based learning models, where students can work on solving real problems in collaboration with other professionals and social actors. This approach not only fosters innovation, but also prepares future architects to respond effectively to the specific requirements of each project.

Bridging the gap between theory and practice is critical to ensure the successful adoption of these new methodologies. This challenge requires the creation of platforms for knowledge exchange and joint research projects between academia and industry, where the impact of new methodologies on the quality of architectural design is constantly evaluated.

Recommendations

Based on the results and conclusions of this review, the following recommendations are proposed to foster a successful transition to the new methodological vision in architectural design:

- Integrate emerging methodologies into the academic curriculum: Educational institutions should actively incorporate methodologies such as design thinking, divergent thinking and interdisciplinary approaches into their curricula. This implies comprehensively reforming the curriculum to develop critical and creative competencies in students, thus strengthening their capacity to solve real, complex and contemporary problems.
- Integrate design thinking and divergent thinking into academic curricula: Educational institutions should include these approaches in their curricula, promoting creativity and the ability to solve complex problems.
- Promote applied research: It is necessary to develop research projects that directly link theory with practice, allowing the new methodologies to be validated and perfected in real environments, as well as to develop joint research projects between universities and architectural firms to evaluate the effectiveness of the new methodologies.
- Continuous training in emerging technologies and soft skills: Establish continuing education programs to enable professionals to update their knowledge and skills, especially in the use of emerging technologies. Teacher training is essential to ensure the effective implementation of design thinking and interdisciplinary collaboration in the educational process.
- Promote interdisciplinary collaboration between academia and professional practice: Establish working teams that include architects, engineers,

sociologists and other experts, in order to develop integrated solutions that consider all aspects of design.

Long-Term Impact on Society:

The implementation of innovative methodologies in architecture will have important benefits for society. First, it will make it possible to design more sustainable spaces adapted to specific needs, improving the quality of community life and addressing current challenges such as climate change and social inclusion. In addition, training architects with advanced skills in creativity, critical thinking and innovation will strengthen the capacity to respond to future challenges of the built environment. Finally, improving the connection between academia and the professional sector will foster a continuous culture of innovation, benefiting not only the architectural field but also the integral development of cities and communities.

Limitations of the Study

This study, although relevant, has certain limitations that should be considered in future research. The review has focused mainly on publications from the last five years, which may have excluded important contributions from earlier periods. In addition, the selection of articles was limited to English and Spanish sources, so some regional or local perspectives may not have been included.

Future Lines of Research

To continue exploring and strengthening the transition towards a new methodological vision in architectural design, the following lines of research are suggested:

- Empirical evaluation of new methodologies: Conduct case studies in which the new methodologies are implemented and evaluated in real projects, in order to measure their impact on design quality and user satisfaction.
- Impact of technology on creativity and innovation: Investigate how the use of emerging technologies, such as 3D modeling and digital simulations, can enhance creativity and innovation in the architectural design process.
- Exploration of regional and cultural approaches: Extend the review to specific regional contexts, in order to identify alternative methodological approaches that can enrich the global practice of architectural design.
- Integration of sustainability and social responsibility: Analyze how new methodologies can more effectively incorporate sustainability and social responsibility criteria, ensuring that architectural projects contribute to the well-being of communities and the environment.
- Empirical studies that systematically evaluate the effectiveness of new architectural methodologies, especially those focused on design thinking and the use of emerging technologies.
- Specific research on how technologies such as artificial intelligence and digital simulations influence creativity during the architectural design process.

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PROPOSAL TO STRENGTHEN THE CAPACITIES OF UNIVERSITY ACADEMIC STAFF IN SEARCHING FOR EXTERNAL FUNDING: PROJECT MANAGEMENT AND KNOWLEDGE TRANSFER

PROPUESTA PARA FORTALECER CAPACIDADES DE LOS ACADÉMICOS DE UNA UNIVERSIDAD EN LA BÚSQUEDA DE FONDOS EXTERNOS: LA GESTIÓN DE PROYECTOS Y LA TRANSFERENCIA DE CONOCIMIENTO

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ABSTRACT

A university in El Salvador has considered conducting research and projects that impact its community with external funding. As a result, a projective study was conducted to understand academics' perceptions of the measures adopted by the university to seek funding, their academic output, and their knowledge of the Sustainable Development Goals, enabling them to impact them through the implementation of projects in the community. The study is primarily based on the Resource-Capabilities Theory (Wernerfelt, 1984). The research methodology uses a non-experimental design with a convergent mixed-method approach. University academics participated by answering a survey and a Likert-scale instrument. The academics were found to have a low level of knowledge about impacting a particular community or population group through projects or research and thus contributing to the achievement of the Sustainable Development Goals (SDGs). They also perceive obtaining research funding as a difficult task. In light of this, the implementation of an R&D and project management system to impact the SDGs is proposed. This system seeks to strengthen human resource capabilities so that academics acquire a high level of knowledge of the SDGs that their work can impact and gain confidence in managing projects, based on increasing their knowledge of the process groups established in PMBOK®.

Palabras clave:
I+D, cooperación, calidad educativa, ODS.

RESUMEN

Una universidad de El Salvador se ha planteado realizar investigación y proyectos que impacten en su entorno con fondos externos. A raíz de ello se realizó una investigación proyectiva para conocer las percepciones de los académicos sobre las medidas adoptadas por la universidad para buscar financiamiento, la producción académica realizada y el conocimiento de los Objetivos de Desarrollo Sostenible para impactarlos a través de la ejecución de proyectos en la comunidad. El estudio se fundamenta

	principalmente en la Teoría de los recursos y capacidades (Wernerfelt, 1984). La metodología de investigación tiene un diseño no experimental con un enfoque mixto convergente. Participaron los académicos de la universidad respondiendo una encuesta y un instrumento con escala de Likert. Se encontró en los académicos bajo nivel de conocimiento para impactar a una comunidad o grupo poblacional en particular por medio de proyectos o investigación y así aportar al alcance de los Objetivos de Desarrollo Sostenible, ODS, también, que perciben que obtener fondos de investigación es una tarea difícil. Ante ello se propone la implementación de un sistema de gestión de la I+D y proyectos para impactar en los ODS, el cual busca que fortalecer las capacidades del recurso humano, para que los académicos adquieran un alto nivel de conocimiento de los ODS que pueden impactar con su quehacer y tengan confianza para gestionar proyectos, a partir de incrementar sus conocimientos sobre el manejo de los grupos de procesos establecidos en PMBOK®.

Introduction

The purpose of this article is to put forward a proposal to strengthen the capacities of academics in the search for external funds, project management and knowledge transfer, based on the results obtained in an investigation carried out at a university in El Salvador, which has proposed to finance part of the research and projects it carries out in its environment with contributions from cooperation, but does not know how this decision has been received by those involved and what their contribution could be to succeed in this mission; likewise, it does not know the potential of the professors to execute projects and impact the community and other sectors of society and the academic production carried out in the last two years.

In this sense, before formulating the proposal, a projective research was carried out to know the perceptions of academics on the measures adopted by the university to seek research funding from external funds, the academic production carried out and the knowledge of the Sustainable Development Goals to impact them through the implementation of projects in the community based on the professional experience of academics. The study is based mainly on the Theory of Resources and Capabilities (Wernerfelt, 1984), which focuses on how organizations can achieve competitive advantages by exploiting their resources, in this case intangible resources, such as the processes of creation, use and transfer of knowledge, and internal capabilities, which are the organizational skills derived from the corporate culture.

External financing for R&D, consulting or other types of intervention projects would allow the university to have more resources available, and at the same time, generate new knowledge and provide solutions to problems posed by social and productive sectors. In addition, this would open up the possibility for more professors to do research and also to intervene in society, which is a requirement for higher education institutions, since they should not only dedicate themselves to teaching.

Previous Research Related to the Subject

In this regard, Bojacá and Zacarías (2016) consider that "the relationship between teaching and research is key to strengthening educational quality, whatever the knowledge management model implemented" (p. 224). In view of this, research funding can not only allow progress in the search for new knowledge, but also have an impact on the entire academic work to provide quality in the training of new professionals.

In the article Situación de la educación superior en El Salvador, de López (2011) reflects on the state of higher education in the national context, also taking into account the perspective of global challenges; he mentions that research production "is at an initial stage, as well as the registration of patents for inventions and innovation, and that there is also no culture in which both the State and private enterprise actively collaborate with projects, spaces and resources" (p. 116).

Regarding the above, R&D expenditure of higher education institutions in El Salvador for the year 2023, according to CONACYT (2024) was $16,791,370, of which 82% comes from the institutions' own funds, 13% from government, 2% from private enterprise, 2% from non-governmental organizations and 1% from abroad; while in that same year 5 patents were applied for and 2 were granted. It is timely to mention that the amount of R&D spending still remains below the $18,885.94 (CONACYT, 2024, p. 37) reported in 2019, a year before the pandemic was declared by COVID-19.

It is worth mentioning that seeking external funds has been the alternative to finance the development of the research. An example of this type of case is that of a private university in Argentina, studied by Adrogué et al. (2019, p. 55) in his article Las universidades frente al aseguramiento de la calidad y las políticas de financiamiento de la investigación: estudios de caso en el sector privado argentino; in this article, he mentions that the university stopped conducting research exclusively with its funds and began to do so with funds obtained from negotiations. In the same article, the author points out that:

> The most proactive policies in terms of diversifying financial and human resources to strengthen the results within the research activity are observed in those private universities that either have an initial governance structure that values this activity or that form an internal group promoting change (p. 65).

Accordingly, allocating resources for fundraising is beneficial for diversifying the source of research funding. It should also be considered that to the extent that a university has more resources for research, professors will have more opportunities to conduct research, academic production and execute projects linked to the needs of social and productive sectors.

In turn, the article Transferencia del conocimiento y tecnología en universidades, by Vásquez (2017), makes a systemic analysis of the literature review, based on the theoretical currents on knowledge and technology transfer, as well as management models. The problem it raises is based on how the economic, social and technological context demands that institutions link with the productive sector to respond to the needs of society. This work was carried out through an analysis based on a review of the literature and the context of knowledge and technology transfer, the latter for the particular case of Mexico. The importance of transcending with research results to impact the socioeconomic environment through the transfer of knowledge is discussed.

Similarly, to learn about the Colombian context, in terms of the knowledge management model of Higher Education Institutions, HEIs, from the systemic integrations between the processes of research, teaching and social projection, Bojacá and Zacarías (2016) evaluated the quality of the integrations of the three pillars of higher education in the levels of comprehensive educational quality, based on the perceptions obtained from a group of managers of different Colombian institutions. They argue that the development of higher education cannot be separated from the development model of the countries, so it is important to achieve a balance between coverage and quality, which must be designed for the benefit of the bulk of the population.

Having said this, it is appropriate to take into account that in a globalized world, countries have unified criteria to work together to reduce social problems, and this is how the Sustainable Development Goals were created, which aim to be achieved by 2030, as an initiative of the United Nations; therefore, the various projects carried out by the government, non-governmental organizations, companies and universities highlight the contribution they make in line with these.

It is worth mentioning that the United Nations Organization in El Salvador signed a Cooperation Framework for Sustainable Development 2022-2026 with the government of El Salvador, which establishes support for the 2030 agenda of the Sustainable Development Goals, determining strategic priorities. The first consists of achieving well-being, the enjoyment of rights and social inclusion, with special emphasis on vulnerable populations; the second seeks economic transformation towards an inclusive, environmentally and socially sustainable, resilient and innovative model; and the third is

sustainable, inclusive and egalitarian peace for the exercise of democracy and the enjoyment of a safer and fairer society (United Nations in El Salvador, 2021).

Within this framework of cooperation between the United Nations and El Salvador, a resource mobility strategy was indicated for the execution of "promotional activities, research and studies, consultancies, program development, monitoring and evaluation, training activities and staff support" (United Nations in El Salvador, 2021, p. 88).

However, academics working in universities, whether teaching, research or social outreach, are specialists in their area of professional practice, but they have not necessarily been trained in project management. Research on this aspect in universities has been of interest to other researchers. Villarreal et al. (2019), in their article Factores que inciden en la gestión de proyectos de investigación científica, evaluated the level of project management of the Engineering Institute, with the purpose of knowing and explaining the most preponderant factors or causes that directly affect the management of the projects of the Camisea Socioeconomic Development Fund of the National University of Huancavelica. This is due to the lack of coherence between research objectives and the quarterly progress presented during the execution of the projects. The paper concludes that there is a positive influence of professional competencies and logistics management on the management of scientific research projects; it also proposes alternative solutions for researchers and the logistics office that will help to efficiently manage the projects for researchers and for the logistics office that will help to efficiently manage the projects.

Regarding scientific production, Martelo et al. (2018) measured and formulated strategies to increase the scientific production of faculty members of the faculty of engineering at the University of Cartagena, Colombia, with the purpose of improving the position of the institution in the SIR ranking. The results obtained in the research were evaluated with the MULTIPOL technique, which, by means of criteria and policies, allowed an assessment of the actions or strategies to be carried out. It was determined that the most relevant strategies for the university are to establish research requirements for faculty hiring and to increase the impact of scientific products. This work is related to ongoing research as it presents strategic proposals that can be taken into account to increase scientific production.

Importance of this Work

The present projective research provided elements of analysis to take advantage of the potential of university academics to seek funding for research or intervention projects in the community linked to social and economic aspects and to increase academic production. This generated new knowledge with which the proposal was elaborated.

In addition, this is articulated with El Salvador's plans for research and technological development, since it seeks not only to increase knowledge through research, but also to transfer it to society, as proposed in the Law for Scientific and Technological Development; which is monitored annually through the National Observatory of Science and Technology, which for this activity takes as a basis the Frascati Manual 2015, used by the Network of Science and Technology Indicators - Iberoamerican and Inter-American, RICYT.

Similarly, the social relevance of this research is the generation of new knowledge for the solution of problems and favors the intellectual production of academics and thus strengthens the institutional capacity of the university where the research was conducted, in terms of scientific production and innovation. At the same time, with this, the higher education institution to which the academic research subjects belong will be able to

transfer knowledge and contribute to the development of the communities through social projection.

On the other hand, the practical implication of this research is to make decisions to obtain external funding, strengthen the installed capacity and competencies of teachers to conduct quality research, as well as intervention projects with entities in their environment. At the same time opening the opportunity for more academics to do research.

Method

Type of Research

The present research is of a projective type. Mousalli-Kayat (2015, p. 25) argues that "projective research is associated with the elaboration of a model, plan, proposal as a solution to a problem detected by the researcher". For Hurtado (1998) "projective research transcends the field of how things are, to enter into how they could be or how they should be, in terms of needs, preferences or decisions of certain human groups" (p. 332). This is why, as a result of the findings, a project will be developed to intervene in the problem.

Research Design

By design, the research will be a non-experimental investigation, since the results will be obtained without manipulation or alteration of conditions. Sousa et al. state that "non-experimental designs do not have randomized determination, manipulation of variables or comparison groups. The researcher observes what happens naturally, without intervening in any way" (2007, p. 3).

Population and Sample Size

For the present research, the population will be full-time faculty and members of the research department of the university under study. This population is composed of:

- 19 full-time teachers
- 5 members of the research department.

Since the population is small, access will be provided to all members of the population:

- 19 full-time teachers
- 5 members of the research department:

For Arias-Gómez et al. (2016, p. 202) "The study population is a defined, limited and accessible set of cases, which will form the referent for the choice of the sample, and which meets a set of predetermined criteria". The same authors add that it is important to specify the study population because "by concluding the research from a sample of this population, it will be possible to generalize or extrapolate the results obtained from the study to the rest of the population or universe".

Data Collection Techniques

The data collection technique used in this research was the survey.

According to López and Fachelli (2021, p. 8) the survey is "a data collection technique through the interrogation of subjects whose purpose is to systematically obtain measures on the concepts derived from a previously constructed research problem".

Data Collection Instruments

In the present study, the data collection instruments were two:

- The questionnaire
- The Likert scale

The questionnaire, for Lopez and Fachelli (2021, p. 17) is:

> The data collection instrument where the questions are stated in a systematic and orderly manner, and where the answers are recorded by means of a simple registration system. The questionnaire is a rigid instrument that seeks to collect information from respondents based on the formulation of the same questions in an attempt to guarantee the same standardized psychological situation in the formulation of the questions and to ensure the comparability of the responses.

In this research, the questionnaire was composed of open and closed questions with multiple choice answers. It was prepared by the author of this work and validated by expert judgment. Through this survey, academics were asked about the level of knowledge of the Sustainable Development Goals that they can impact with their work in society, considering the level of knowledge about community problems, the SDGs themselves, the SDGs that they can impact with their academic work, interest in carrying out activities in the community to impact the SDGs and ways to transfer new knowledge to society; in addition, the level of knowledge that academics have about the management of research projects, taking into account the level of knowledge of the process of initiation, planning, execution, monitoring and control and closure; the academic production carried out in the last two years was also identified in the academics, addressing the number of academics with participation in book publications, articles in scientific journals and interest in making academic production.

The Likert scale allows us to know people's attitude towards a situation. According to Matas (2018, p. 39) this type of instrument consists of:

> a collection of items, half expressing a position in agreement with the attitude to be measured and the other half against. Each item was accompanied by an ordinal rating scale. This scale included a neutral midpoint, as well as left and right points, originally disagreement and agreement, with numerical response options from 1 to 5.

The Likert scale implemented in the research was from 1 to 5; 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree. The attitude towards project financing was identified, considering the level of perception towards the search for project financing, the suitability to seek financing, the motivation to participate in the university's strategy to participate in calls for proposals, and finally the interest in seeking funds. The instrument was developed by the author of the research and validated by expert judgment.

The academics who participated as research subjects agreed to do so voluntarily, after being informed of the purpose of the research, as well as that the handling of their information would be confidential and that at no time would the results be linked to a particular person.

Research Approach

The present research will be conducted under the mixed research approach, since from the quantitative part numerical data will be collected; while from the qualitative

approach data without numerical measurement identified in scales will be obtained. With the mixed approach, a better analysis will be made of the factors involved in the management of research projects of the university under study to increase its external funding and impact on society. The quantitative and qualitative parts will be given equal importance, so this mixed research will have a convergent approach. "In the convergent approach, quantitative and qualitative data are collected separately and integrated at a later stage of the research process" (Medina et al., 2023, p. 28).

Results and Proposal

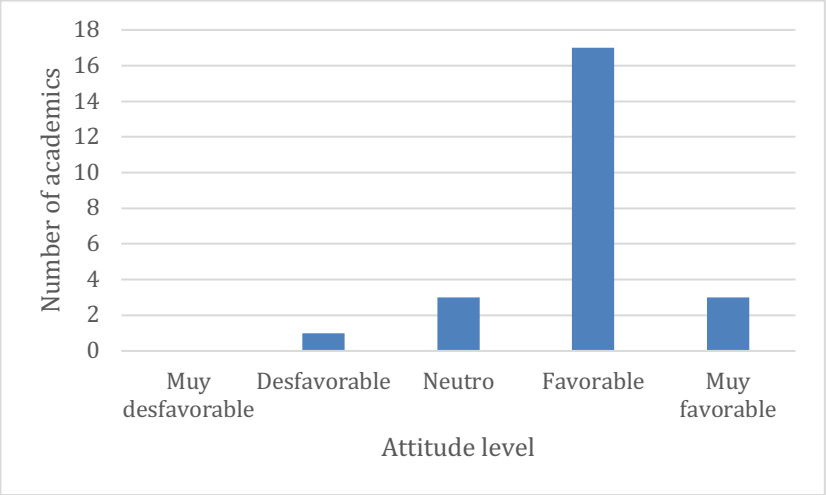
This section first presents the results obtained in the research, and then the proposal is presented.

Research Results

The results obtained with respect to the objective to identify the attitude that academics have towards the search for external funding for research projects it was found that 20 of the 24 academics surveyed have a favorable or very favorable attitude towards seeking external funding for research projects. Three have a neutral position and one reflected having an unfavorable attitude, as shown in Figure 1.

Figure 1

Attitude of teachers towards the search for financing



In addition, it is worth noting that 14 people considered that seeking funding for research projects makes them more committed academics, since they stated that they agreed or strongly agreed with this statement; nine were neutral and one strongly disagreed.

On the other hand, only 5 academics had a favorable attitude towards the fact that obtaining funds for the execution of projects is their responsibility; 16 had a neutral position, and 3 had an unfavorable position.

Regarding the statement "Obtaining external funds for research strengthens the university" in the study, 18 academics agree with it, while 2 maintain a neutral position, and 4 are against it.

As to whether funding for research is necessary, 20 academics said they agreed, three maintained a neutral position and one was against. In this sense, it was identified that respondents recognize the importance of seeking funds to finance projects.

On the other hand, 11 academics, almost half of the total, consider that they have the ability to obtain funding for research projects; another 11 have an intermediate or neutral position, and two consider that they do not have the ability to obtain funding for research projects.

In addition, when asked whether they are competent to obtain research funds, 8 respondents indicated a favorable position, while the rest indicated a neutral or unfavorable position. Eleven academics have the perception that obtaining funds for research projects is a difficult task; on the other hand, 13 showed a neutral position in this regard. In this sense, there is not a favorable position of the majority regarding the suitability and capabilities to seek financing.

Continuing with the attitude that the academics have towards obtaining funds, it can be mentioned that 8 of them expressed a favorable position with respect to knowing the strategy that the university has for participating in calls for external financing of projects, the rest presented a neutral (10) or unfavorable (6) position. Only 4 academics agreed that the aforementioned strategy motivates them, 14 are neutral and 6 are unfavorable

On the other hand, 13 of the participants had a neutral attitude towards the statement of motivation that there is a possibility of creating a proposal to respond to a call for external financing; 10 indicated a favorable position and one was against.

A similar attitude was recorded for the statement "I have always been interested in seeking funding for research projects", with 14 neutral, 5 favorable and 5 unfavorable. Regarding the item "I am motivated to seek funding for research projects because as an academic I would make a better contribution to society" 9 academics agreed, 12 had a neutral position, while three were against.

Likewise, in response to the statement "I am motivated to seek funding for research projects because as an academic I would achieve professional recognition", it can be seen that 6 academics have a favorable position, 13 indicated the neutral option and 5 unfavorable.

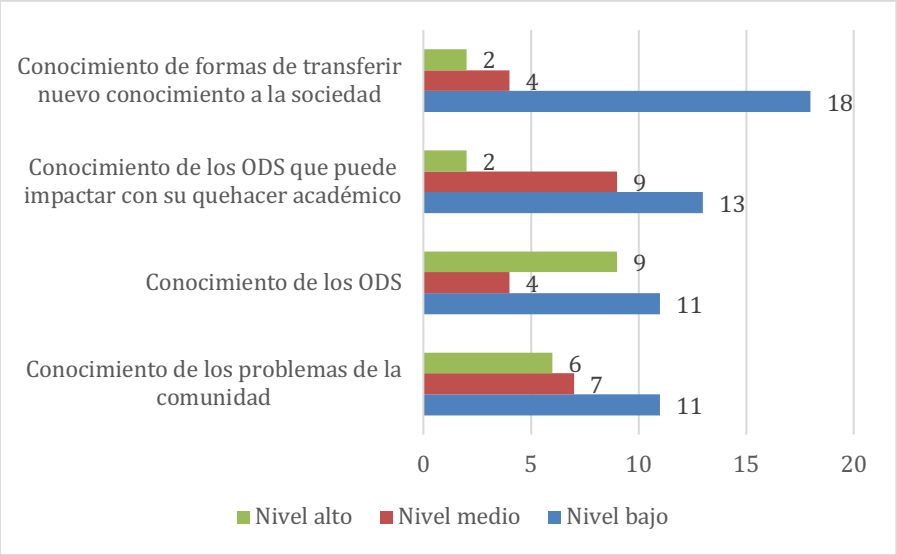
Another of the objectives of the projective research was to find out among academics the level of knowledge of the Sustainable Development Goals, which they can impact with their work in society.

The level of knowledge of the ways to transfer new knowledge to society was one of the aspects least handled by academics. Regarding the level of knowledge of the SDGs that academics can impact with their work, most were at a medium and low level; only two reached a high level.

Regarding knowledge of the Sustainable Development Goals, nine academics had a high level of knowledge; however, more obtained a low level.

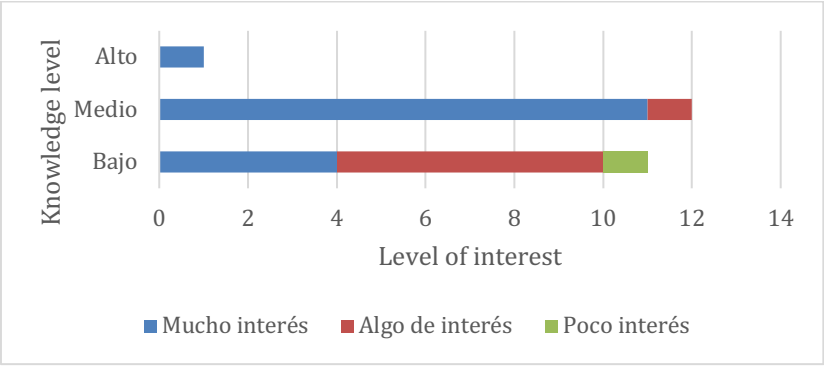
In the category of knowledge of community problems that academics can address from their specialty, the majority obtained a low level of knowledge, while the medium and high level was achieved by 7 and 6 academics, respectively, as can be seen in Figure 2.

Figure 2
Number of academics by level of knowledge of SDGs and how to impact society



The level of interest in carrying out activities in the community to impact the SDGs, when crossed with the level of knowledge of the SDGs, can be observed regardless of whether or not they know how to do it, they are interested that it can be achieved (see Figure 3).

Figure 3
Knowledge and interest in carrying out activities in the community to impact the SDGs



Regarding the research objective to verify among the academics the level of knowledge they have about the management of research projects it was verified that almost all the academics who participated in the research have a low level of knowledge about the management of research projects. Of the research project management processes, the academics demonstrated greater knowledge of the initiation process.

On the other hand, the results obtained with respect to the objective of to identify the academic production of the academics in the last two years, 3 of the academics have been the sole author of books; the activity from which the book has been generated corresponds to research. Also, the number of academics who have co-authored a book is twice as high as when they are sole authors. When there is co-authorship, the production of books also incorporates the teaching task, and ceases to be exclusively research.

In this same objective, the results show that 5 of the academics have been the sole author of papers in the last two years, which originates exclusively from research work. Three of the academicians have co-authored papers.

21 of the academics are interested in academic production, most of them (12) wish to do so as a result of their work in teaching and 9 in research; three indicated that they have no interest in producing.

Proposal for a Program to Strengthen the Capacities of Academics

The low level of knowledge to impact a particular community or population group and thus contribute to the achievement of the Sustainable Development Goals, as well as the perception that academics have that obtaining research funds is a difficult task could interfere in academics designing proposals to present to potential project funders or to attend calls for proposals launched by them.

This puts at risk the achievement of the university's strategic plan goal related to obtaining funding to carry out research or any other type of project. In this sense, we propose a management system for R&D and projects to impact the SDGs with funding from outside the university, which seeks to increase the possibility of success in obtaining funds from donors.

It has been analyzed that there are no contradictions in the requirements of the different actors involved to receive this proposal; the first phase of this system would incorporate the strengthening of knowledge about the SDGs and the problems that can be impacted by academic work, as well as the mastery of project management processes.

The system, in addition to focusing on attracting funding, would allow academics to develop new knowledge to enrich their professorships and link the institution with society, also generating academic production.

For its operation, the system will have a second phase, which will monitor calls for funding research projects (R&D) and those focused on the creation of new products, processes or services through the application of existing knowledge that can be for a specific implementation according to the university's training areas and will be managed according to the processes established by the PMBOK® guide: initiation, planning, execution, monitoring and control and closure (PMI, 2017). Through academic production and knowledge transfer, we will end up impacting the community.

The main human resource to be trained will be the university's researchers and teachers.

Figure 4
Diagram of the operation of the proposal in its phase 1

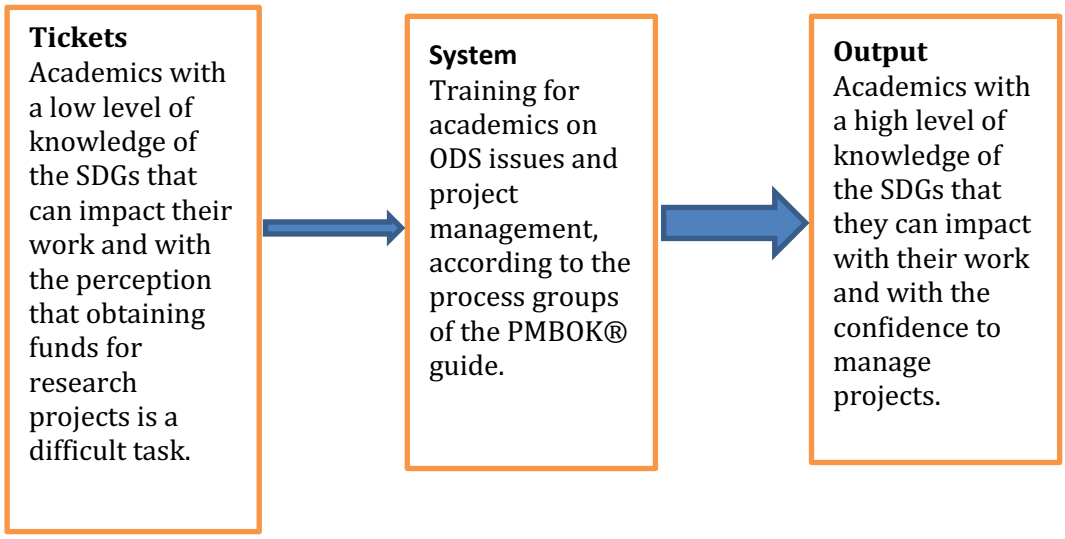
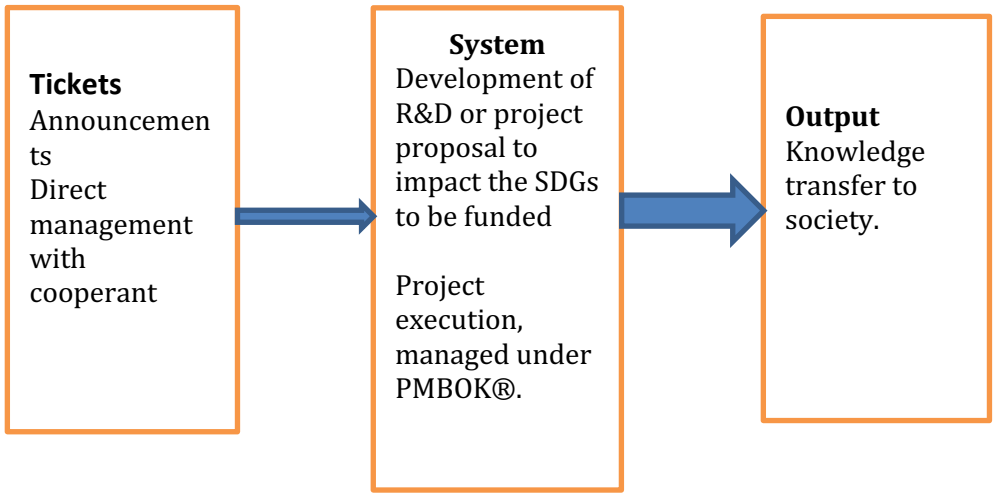


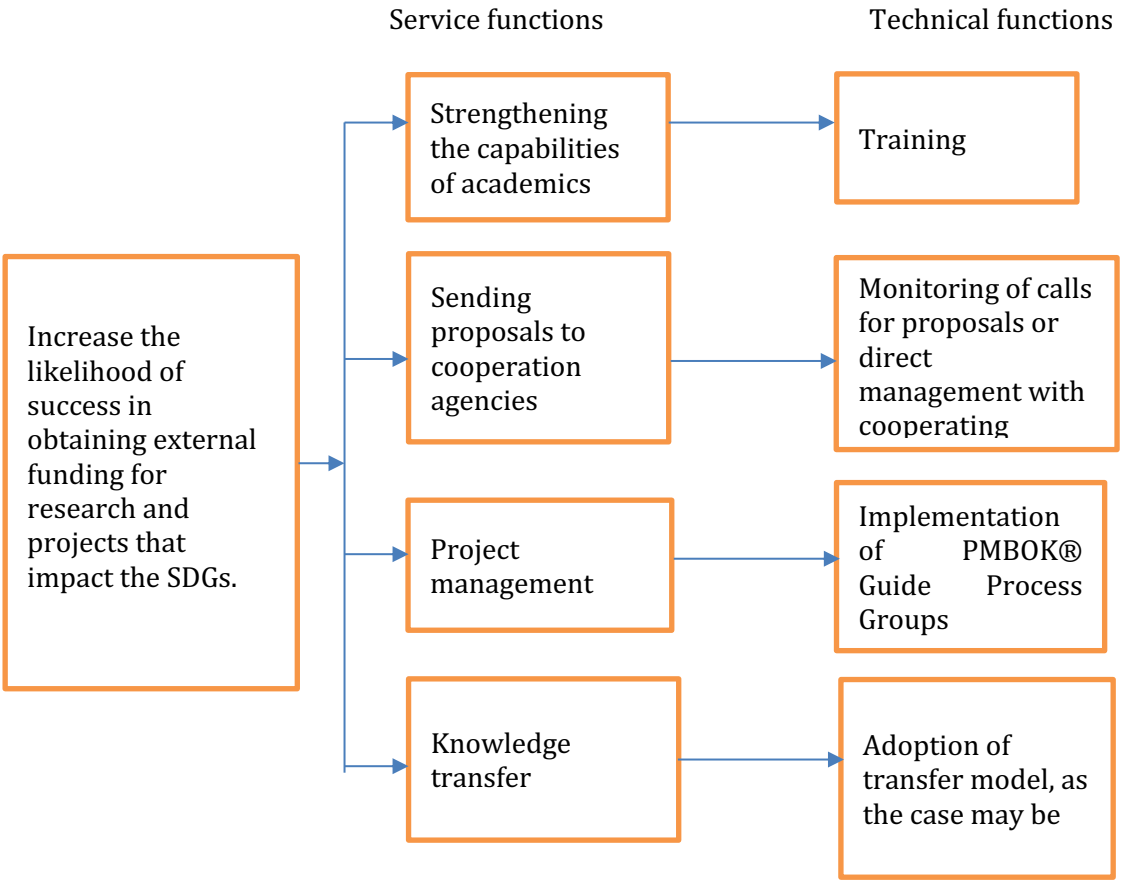
Figure 5
Diagram of the operation of the proposal in its phase 2



It should be clarified that in order to transfer knowledge to society, a model will have to be adopted according to the needs and interests of the university that implements it, for which a tree of services is presented in Figure 6.

Figure 6

Service tree



To increase the possibility of success in obtaining external funding for research, a system will be developed to monitor calls for funding research projects (R&D) that can be for a specific implementation, or to support the work of the lines of research established by the university, whose projects will be governed under the classifications of the Frascati manual, and will be managed according to the processes established by the PMBOK® guide, in order to end up impacting the community through academic production or the transfer of knowledge.

This involves the participation of UNASA academics grouped by the areas of training offered by the university. Prior to this, academics will be trained in project management and knowledge transfer to society, and their level of knowledge will be re-evaluated in order to identify those who are capable of generating proposals or those who are lacking in this area, and support them in this respect.

The system will be used to manage all research projects focused on generating new knowledge or solving a problem.

Academics will benefit, since their work will have an impact on society and will be transferred to society; people in the community, companies and their clients will also benefit from the work resulting from the research; as well as the university, since it will receive other sources of income to conduct research.

Discussion and Conclusions

From the findings it is established that the academics of the researched university have a low level of knowledge about the Sustainable Development Goals and the management of research projects, so they have a low academic production, in contrast to the interest in obtaining funding for research projects and transferring new knowledge to society.

As a general rule, this reflects that their practice is more oriented to the training of students than to linking with the community, which does not coincide with the mission of higher education institutions, since in addition to providing knowledge to their students, academics must train critical people through research and sensitize them to social problems. This should be the case, even when the cut of the higher education institution is professionalistic.

These results reflect that there is an opportunity to project initiatives that stimulate academics to link with society, meaning the surrounding community, the public sector and private companies, to address their problems and thus contribute to national development; incidentally, this opens the door to academic production.

To achieve this, teachers and researchers must strengthen their capacities in the formulation of project proposals capable of having an impact on the community and in the knowledge of the processes to manage them.

In the research study Factores que inciden en la gestión de proyectos de investigación científica, its authors, Villarreal et al. (2019) found that there is a positive influence of professional competencies and logistics management on the management of scientific research projects. In that sense, the results found in the present research indicate that having a low level of knowledge in project management would affect the execution of research projects.

Even if the results had been different, this would not guarantee that doing research would end up having an impact on society by the mere fact of generating new knowledge. Vasquez (2017), in his study Knowledge and Technology Transfer in Universities, concludes that, although most universities in Mexico have quality researchers and students who manage to create, store and retrieve knowledge in a form of technology, in most cases it does not get transferred and applied in industry because there is no adequate understanding between researchers and entrepreneurs.

Based on this, it is evident that it would be useless to have the capacity to conduct research or carry out projects that have an impact on the community, to manage its processes correctly and to produce academic output if what is researched is not transferred to society through an adequate understanding between academics and businessmen.

This research identified that there is a low level of knowledge among academics on how to transfer knowledge; for this reason, it is necessary to strengthen them, and also to design a strategy that articulates academia with society.

This approach coincides with what Vasquez (2017) proposes, who points out that when there is a lack of trained personnel to help achieve understanding with the industry, a model is needed to articulate towards the same direction the parties that integrate the transfer of knowledge and technology up to its application.

The results obtained in the research confirm that the academics surveyed have a favorable or very favorable attitude towards seeking funding for research projects, and that they are interested in impacting the community with their academic work. Therefore, in order for these intentions to become a reality, they need a system that improves the capabilities of human resources to formulate proposals before international cooperation

agencies and thus impact society by transferring knowledge, so in addition to training, they must also define management processes and transfer models.

Paradoxically, the research shows that a good part of the academics surveyed consider that seeking funds to finance research is not their responsibility, in that sense, this aspect should be taken into account, so that the operation of the system does not have a connotation of obligatory nature, but rather as an opportunity for development in the academic career of teachers and researchers.

After this research, future projections should be to measure, every two years, the level of knowledge of teachers regarding societal issues, knowledge transfer and project management, as well as academic production, in order to compare the data; this would serve to measure the impact of the system proposed after this research.

Likewise, it will be necessary to analyze the attitude towards the search for external financing funds, in order to know if this action is becoming part of the culture of the university's academics

Based on the analysis carried out, the implementation of an R&D management system is proposed, which will strengthen the competencies of academics with respect to research findings, determine the project management processes, based on the PMBOK® guide, and establish the knowledge transfer models, which will generate the necessary conditions to increase the possibility of obtaining international cooperation funding for research.

Given that the university does not pursue profit, and that it must conduct research on an annual basis, the implementation of the R&D management system and projects to impact the SDGs will not be seen as an expense, but rather as a tool that can make research self-sustaining, which would allow the university to invest the funds it currently allocates to research in improving the resources used to train students.

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