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Standardization of Internal Processes in the Graduate Institute of the Faculty of Engineering at Universidad Libre, Bogotá Branch

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Abstract: *At the Graduate Institute of the Faculty of Engineering at Universidad Libre, Bogotá Branch, a comprehensive model for the standardization of internal processes was developed, aimed at strengthening the overall operational efficiency of the institution. For this purpose, process traceability, document control, and the time required for each process were considered; additionally, the social impact of carrying out this project was considered. A sequential model was applied, beginning with a diagnosis, followed by the development and formalization of standardized documents for selected strategic processes: internal communications management, risk management, and Coterminal process management. Subsequently, technical matrices, analytical tools, the creation of key performance indicators (KPIs), an operational time study, and an evaluation of organizational and social impact were carried out. These elements facilitate the transformation of routine administrative activities into structured and measurable processes to be transformed into structured and measurable processes subject to continuous improvement. The results of the project point to a significant improvement in organizational clarity, as well as greater transparency in strategic control and in end-user experience. In this way, a replicable process management model in higher education within the Institution is consolidated.*

Keywords: *Standardization of academic processes, process management, graduate studies, academic processes, continuous improvement*

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I. Introduction

The internal management of processes within higher education institutions such as Universidad Libre currently faces demands for efficiency and administrative transparency. Ideally, university management should evolve toward operational optimization models [1]. In an academic environment that is increasingly competitive and regulated by various international standards and laws [2], it is not sufficient to guarantee the academic quality of the programs offered; it is even more essential that the administrative processes supporting them be clearly structured, formally documented, and technically measurable. The absence of standardization can generally cause operational delays, duplication of certain functions, gaps in responsibility within processes, and weaknesses in document traceability, affecting both institutional performance and the experience of students and certain stakeholder groups.

Taking this context into account, the Graduate Institute of Universidad Libre, Bogotá Branch identified the need to strengthen some of its administrative support processes through a comprehensive standardization exercise. Although the activities were carried out functionally and fulfilled their operational purpose, the absence of certain formal measurement tools, updated risk matrices, structured indicators, and some undocumented or outdated procedures was evident, which required updating to guarantee institutional continuity and control. This situation represents a strategic opportunity to organize and formalize internal management with a more technical and preventive approach.

The standardization proposal was not limited to describing existing activities. From the outset, it was conceived as a structured process that began with an institutional diagnosis supported by ISO 9001 [3], aimed at identifying documentary gaps within the University's process map, operational risks, and opportunities for improvement. Subsequently, three strategic processes were formulated and documented: internal communications management, risk management, and Coterminal process management. Each of these processes was accompanied by the development of technical matrices, risk maps, definitions of roles and responsibilities, the design of key performance indicators (KPIs), and a detailed study of operational times.

Additionally, analytical tools were developed to systematically measure the efficiency of these processes to establish monitoring criteria and facilitate data-based decision-making. The time study made it possible to identify operational workloads and estimate the actual duration of activities, providing technical

inputs for future optimizations. Likewise, the risk matrix served to classify, assess, and prioritize potential events that could affect the operation of the Graduate Institute, establishing certain preventive and corrective controls.

It is important to clarify that the results of this project are strictly technical, derived from the design of the standardization model, highlighting improvements in process clarity and responsibilities, reduction of administrative rework, strengthening of internal control, increased documented traceability, and the generation of strategic information for decision-making. This article describes in a structured manner each phase of the project, demonstrating how administrative standardization, from a design stage, can be built and become a strategic instrument to strengthen the institutional system, improve operational sustainability, and lay the foundations for future implementation and continuous improvement processes within the University.

II. Methodology

Comprehensive Institutional Diagnosis: The institutional diagnosis was developed using a mixed methodological approach, which combined qualitative and quantitative techniques that, according to Hernández-Sampler [4], allow a real and structural vision of the current state. First, a consistent systematic documentary review was applied to collect, classify, and analyze the institutional documentation available on the official Kawak platform. For this purpose, a documentary inventory matrix was constructed in which all documents were categorized by typology (procedures, formats, policies, characterizations, instructions, among others). This exercise was carried out through a direct and individual count of each document, performing a thematic classification and a comparative analysis against process management criteria established in ISO 9001.

Component	Description	Activities	Approach	Expected Outcome
Methodological Approach	A diagnosis is carried out under an established model to obtain a real and structural view of the current state of internal processes.	Integration of quantitative and qualitative techniques.	Mixed Methodological Approach	Comprehensive analysis of institutional status.
Systematic Documentary Review	Structured analysis of institutional documentary information.	Collection Classification Comparative analysis Documentary inventory	Quantitative	Organization and evaluation of institutional documentary support.
Qualitative Reviews	Interpretative evaluation of processes through descriptive analysis.	Interviews Data analysis Thematic categorization	Qualitative	Identification of findings, strengths, and opportunities for improvement.
ISO 9001 Analysis	Comparison of the current state of processes against quality standards.	Comparison according to ISO 9001 Standard	Regulatory Evaluation	Determination of the level of compliance and gaps in relation to the standard.
Final Diagnostic Result	Consolidation of the institutional analysis.	Integration of quantitative and qualitative results.	Comprehensive Diagnosis	Diagnosis of the Graduate Institute of Universidad Libre.

Table 1. Diagnostic methodology

Secondly, structured interviews were conducted with administrative managers such as directors and assistants; this to identify certain practices that were not documented within the Graduate Institute, whether they were dependent on tacit knowledge or recurrent operational difficulties. The responses from these interviews were analyzed and documented through categorization techniques. Additionally, to complete this diagnosis, an analysis according to ISO 9001 was carried out for the entire Graduate Institute to detect at which point it was less effective and thus work on this publicly available information of the Graduate Institute of Universidad Libre.

Development and Standardization of Strategic Processes: The design and selection of strategic processes were carried out through the study of the Business Process Management methodology [5]. Initially, identification and delimitation of the scope of each process were performed, defining existing inputs, activities, and responsible parties. Subsequently, flowcharts were constructed using standardized symbols and university formats, graphically designing the logical sequence of the different activities and decision points within each process considered fundamental for the operation of the Graduate Institute: internal communications management, risk management, and Coterminal management.

For the development of the internal communications management process, a completely new proposal was structured, beginning with the identification of the need for accurate and continuous communication and the validation of each message, in addition to having the corresponding record and follow-up until its closure.

On the other hand, the process related to Coterminal management was formalized with the main objective of providing a regular channel for this process, thus offering transparency and clarity in academic

requests. Defined steps were established for reception, verification of requirements, academic validation, and institutional approval.

For the risk management procedure, institutional formats covering all aspects related to risk management at the university were used, with the particularity that there is no standardized procedure for risk prevention

Construction of Tables and Technical Matrices for the development of the framework, various analytical. tools were incorporated to strengthen decision-making and allow understanding of the operation of the Graduate Institute from a more strategic and systematic perspective. Within this framework, the SWOT matrix [6] and the Vester matrix [7] were mainly developed to prioritize critical variables and identify their strengths, opportunities, weaknesses, and threats influencing these support processes. Complementarily, the Vester matrix was used at the beginning of the project to prioritize critical variables of the organizational system and recognize which factors required priority intervention.

Figure 1. SWOT methodology

Definition and Implementation of Management Indicators: Once the processes were standardized, a specialized system of management indicators was designed to guide performance measurement in terms of efficiency, compliance, and control for each process. These indicators were structured with mathematical formulas, defined targets, responsible parties for monitoring, and frequency of measurement. This allows these processes to become more measurable and comparable systems.

Operational Time Study: The time study was proposed as a key phase in the development of the initiative, as it allowed quantifying the administrative effort required for each process by performing direct measurements and structured records by stage, considering start, sub-activities, and verifications, both at Universidad Libre and at Universidad Minuto de Dios and Manuela Beltrán, with the objective of obtaining a clearer overview of the times of other educational institutions and consolidating templates that facilitated the analysis and graphical visualization of the generated times.

Evaluation of Institutional and Social Impact: Different methods were proposed, such as the weighted multicriterial method, which was defined in three dimensions of analysis: academic, administrative, and institutional. Each of these dimensions was broken down into specific variables, making it possible to assign percentage weights according to their level of importance and strategic relevance.

A rating scale from 1 to 5 was established to calculate a global index through a weighted sum. The selection of institutional impact dimensions was based on the university's process map and the strategic objectives of the Graduate Institute, ensuring coherence with organizational direction. The variables of each dimension were defined based on the findings of the institutional diagnosis and the SWOT analysis, ensuring that the evaluation focuses on previously identified critical factors.

III. Results

The results obtained in the diagnosis correspond to the technical design, structural analysis, and impact projection of the proposed model. The documentary inventory identified a total of 115 institutional documents on the platform (Kawak), with a greater concentration in formats and procedures. This result shows that Universidad Libre has sufficient operational tools; however, the detailed analysis incorporated control points and the PDCA cycle [8], which made it possible to identify the lack of specialized documents and administrative bottlenecks for the Graduate

Faculty, according to Tolerant [9], the absence of formal indicators and weaknesses in documentary traceability.

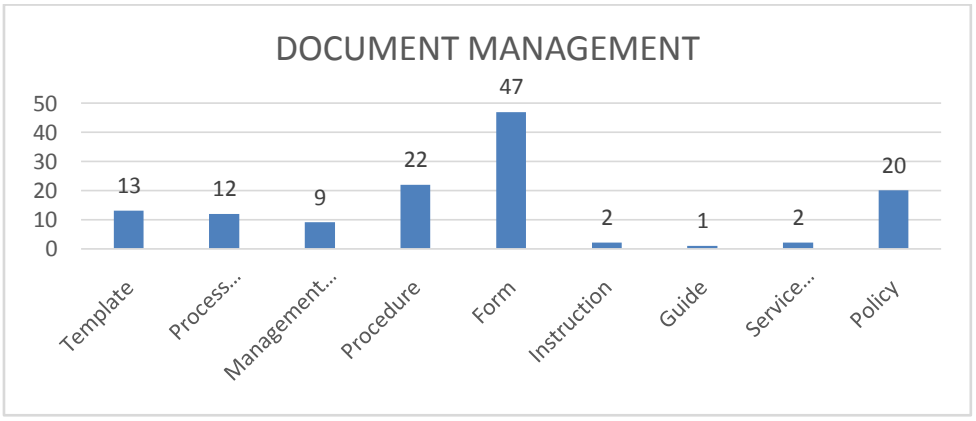

Figure 2. Documentary inventory graph

The diagnosis made it possible to evidence different structural and documentary weaknesses in process management; among them, the absence of formal standardization of certain procedures, dependence on staff tacit knowledge, and the lack of certain performance indicators. In the analytical phase, the SWOT matrix and the Vester matrix were used to prioritize critical variables requiring priority intervention. Likewise, limited measurement of operational times in certain processes was identified, deficiencies that in documentary traceability affect university indicators.

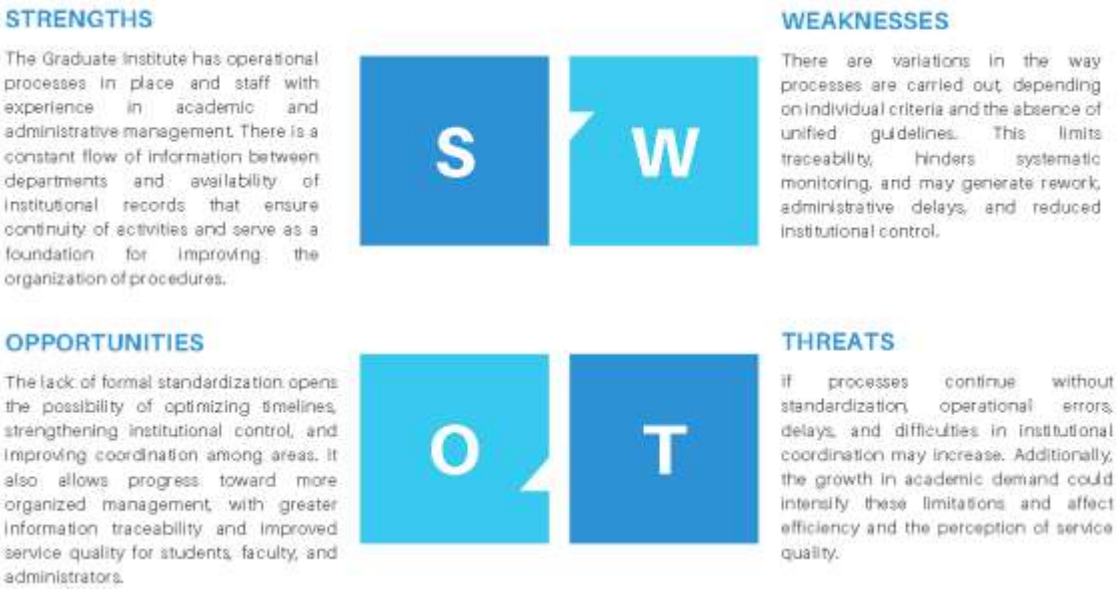

Figure 3. SWOT Matrix

These findings support the need to move toward a structural design phase focused on the organization, measurement, and comprehensive strengthening of processes. The lack of standardization of the Coterminal process was detected as the main and most critical factor among the processes.

Process Design Results: As a result of the process design, the structured formalization of three critical or strategic processes was achieved: internal communications management, risk management, and Coterminal management. Each process was documented through flowcharts. Responsibilities were defined, and control points were added to institutional formats. This institutional design made it possible to transform previously dispersed and tacit knowledge-based activities into organized and verifiable sequences, establishing technical bases for their future implementation within the University. Likewise, the incorporation of matrices such as root cause analysis and PDCA was considered to strategically support the proposal. The flowcharts were constructed under standardized BPMN 2.0 notation [10].

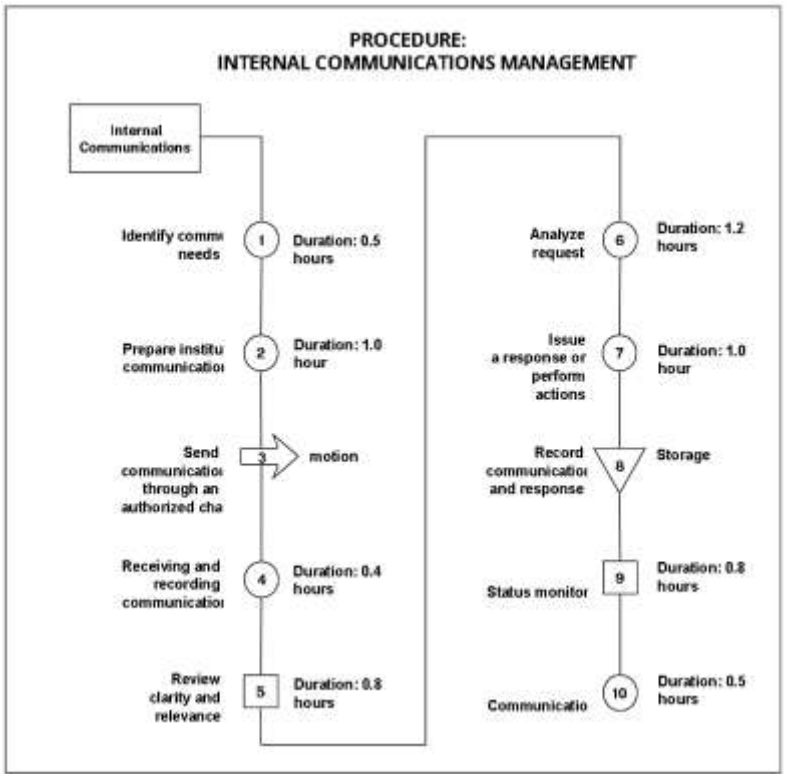

Figure 4. Internal communications procedure

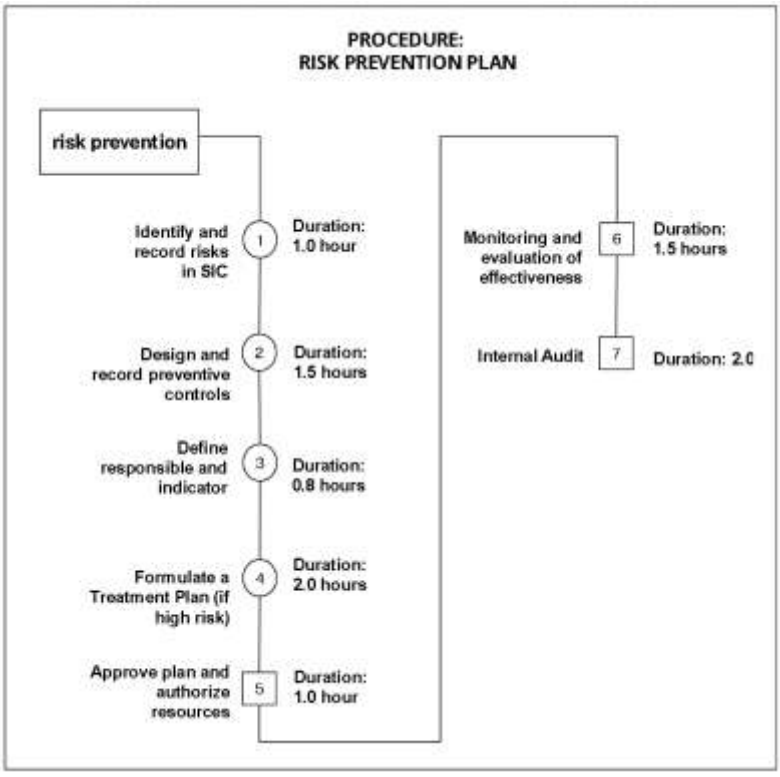

Figure 5. Prevention procedure

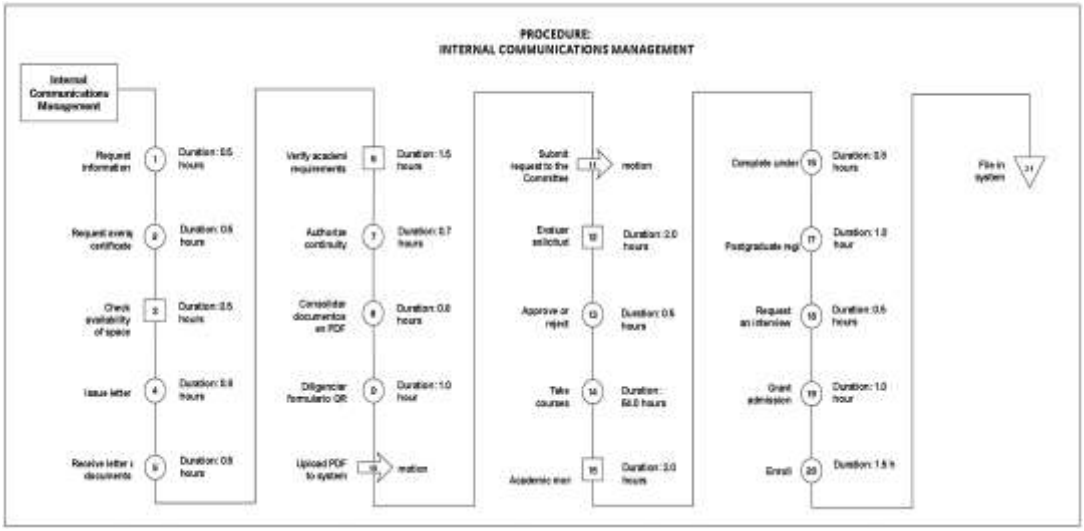

Figure 6. Coterminal management procedure

Time Study Results: The time study's main function was to quantify the operational and theoretical workloads of each process. The analysis showed that the risk prevention plan has the longest duration (11.2 hours) compared to the other two processes: the Coterminal management process lasts 7.4 hours, and internal communications lasts 6.98 hours.

Individual Analysis by Process: In Coterminal management, the longest times are concentrated in evaluation by the academic committee and student follow-up, showing dependence on formal variations and certain administrative decisions. In internal communications, time is mainly concentrated on information analysis and the issuance of responses, reflecting a predominance of cognitive activities. In the risk management plan, the longest activities correspond to the formulation of the treatment plan and internal auditing, confirming a structured process with multiple verification stages.

Table 4. Time study

TIME STUDY – GRADUATE INSTITUTE		AVERAGE EXTERNAL FACULTIES	WEIGHTED AVERAGE
PROCESS	ACTIVITY DESCRIPTION		40% P.G ING 60% P.G. EXTERNAL
Internal Communications Management	Identify communication need	0,6	0,54
	Prepare institutional communication	1,2	1,1
	Receive and register communication	0,5	0,44
	Review clarity and relevance	1,0	0,92
	Analyze request or information	1,5	1,36
	Issue response or execute actions	1,3	1,16
	Follow up on communication status	1,0	0,92
	Close communication	0,6	0,54
GLOBAL TOTALS	8 ACTIVITIES	7,5	7

Interpretation of Graphs: The graphs from the time study show the concentration of time in a reduced number of activities, facilitating identification of specific points for process optimization. Additionally, when comparing results, the University shows slightly lower times than external institutions, suggesting a higher level of standardization and operational efficiency, although processes are not yet fully documented.

Impact Projection: For this objective, the multicriteria method [11] shown in Table 5 was used, which yielded a projected global result of 4.07 out of 5, indicating a high potential social impact of the standardization model regarding academic, administrative, and institutional dimensions. This analysis suggests that, if implemented, the project would strengthen the core and improve strategic alignment, reducing operational vulnerabilities; this project presents potential to increase transparency and clarity of all academic procedures of the institute.

Table 5. Criteria evaluation

Evaluation Criteria	Evaluation Criteria	Evaluation Criteria	Evaluation Criteria	Evaluation Criteria	Evaluation Criteria
Academic	Curricular articulation	12%	5	0.6	The articulation between graduate programs and institutional guidelines strengthened the academic coherence of the educational process.
	Timeliness in academic management	18%	4	0.72	The optimization of academic procedures reduced processing times for admission, enrollment, and evaluation.
	Impact on student experience	22%	4	0.88	The improvement of academic processes increased satisfaction and retention among graduate students.
Administrative	Operational efficiency	9%	5	0.45	The reorganization of administrative processes enabled a more efficient use of institutional resources.
	Reduction of rework	14%	3	0.42	The standardization of procedures reduced errors and duplication in administrative management.
Institutional	Process integration	13%	4	0.52	The articulation between academic, administrative, and quality management strengthened the coherence of the graduate system.
Total		**100%**	**4.07**		

IV. Discussion

The proposal developed for the Graduate Institute of the Faculty of Engineering at Universidad Libre, Bogotá Branch, is framed within different contemporary trends in university management oriented toward the formalization, measurement, and continuous improvement of internal administrative processes. The specialized literature indicates that higher education has transitioned from traditional administrative models to approaches based on process management and strategic controls.

Process management is defined as an approach that understands the organization as an interrelated system [12]. Process management implies understanding the organization as interrelated systems in which each activity contributes a distinct value to the result. From this point of view, the design of the internal communications, risk, and Coterminal management processes carried out in this project responds to the need to define inputs, activities, responsible parties, and outputs in a clearly structured manner that overcomes fragmented functional schemes.

In the Latin American context, Maldonado [13] indicates that document standardization constitutes one of the first steps to strengthen transparency and reduce dependence on tacit knowledge in public and educational institutions. This approach relates to the findings of the institutional diagnosis, where it was evidenced that, despite the existence of some documentation and various documents related to the Graduate Institute, there was no integration under a coherent system of measurement and monitoring.

It is proposed that continuous business process improvement requires not only documentation but also performance indicators [14], emphasizing that improvements in processes require different types of indicators that allow evaluation of their performance in terms of effectiveness and efficiency. In line with this perspective, the definition of KPIs in this project aligns with the need to translate the administrative operations of the Graduate Institute into quantifiable information, an aspect that, according to Beltrán Jaramillo [15], strengthens data-based decision-making and accountability in educational organizations.

In accordance with ISO 31000, risk management must be integrated into strategic planning [16] and not be limited to reactive exercise. Authors such as Rodríguez and García argue that there are universities that still do not apply it and must adopt updated risk management matrices [17] and risk prioritization systems that allow them to anticipate different academic and administrative contingencies. Therefore, the inclusion of an institutional risk matrix in this project is adjusted to these theoretical recommendations of the authors and the standard.

Regarding performance measurement factors, the Balanced Scorecard model has been widely used by Kaplan & Norton to link operational indicators with strategic objectives [18]; this method has been widely referenced in Spanish-language studies as a tool to connect different types of operational indicators with strategic project objectives. Complementarily, Nogueira Rivera states that indicator systems in higher education should articulate more academic, administrative, and social dimensions [19] to achieve institutional coherence. The multicriteria method applied in this study aligns with this integrative perspective by evaluating several impacts during the project.

Currently, authors such as Chiavenato [20] propose standardization as a model that should not be understood as organizational rigidity, but rather as the basis for continuous improvement and learning. At Universidad Libre, this author's approach coincides with the incorporation of the PDCA cycle, which, according to Deming [21], constitutes a structured mechanism to ensure the adaptation of processes to changes in the environment.

In rigorous diagnoses and methodological analyses, understanding the combination of documentary review, matrices, analysis, and time studies provides methodological solidity to the standardization proposal, which allows it to align with recognized academic practices. In summary, the various authors and specialized literature support the relevance of the model proposed in this project, showing that the standardization of processes in higher education institutes must integrate formal documentation, measurable indicators, risk planning processes, strategic alignment, and continuous improvement [22].

The project is based on these theoretical frameworks and proposes a structured model consistent with their principles within all the theoretical frameworks of these authors, providing a structured proposal that responds to the current challenges of Universidad Libre and in the social context: the standardization of the different internal processes of the Graduate Institute of Engineering at Universidad Libre, Bogotá Branch.

V. Conclusions

The standardization of the internal processes of the Graduate Institute of Engineering at Universidad Libre, Bogotá Branch made it possible to clearly structure a more comprehensive and coherent organizational model than the one previously existing at the university. This model mainly articulates the institutional diagnosis and complements the previous operational vision that was fragmented, establishing a systematic logic in which the selected processes are better interrelated under criteria of traceability, control, and institutional coherence.

It was identified that the detailed characterization of the internal communications, risk management, and Coterminal management processes made it possible to define clear sequences of activities that did not previously exist, in addition to specific responsible parties and verification points. This strengthens administrative order and provides stronger foundations following the methodologies of the ILO [23] for institutional management. Furthermore, the development of technical tools such as the SWOT matrix, the Vester matrix, root cause analysis, and the process map contribute to a deeper structural understanding of the Graduate Institute, allowing a more efficient allocation of resources based on real data as proposed by Freeman [24], facilitating the identification of critical variables for its future operation.

The system of measurement indicators designed constitutes a crucial component within the proposed model, since, by incorporating objective and quantitative mechanisms to measure compliance, effectiveness, and control of the proposed processes, transparency is favored, and a continuous evaluation scheme aligned with the institutional objectives of Universidad Libre and the adopted theoretical references is established.

The operational time study provides quantitative information about the administrative workload of each actor involved in the processes analyzed within the faculty, allowing identification of critical activities and longer-duration stages. This information constitutes a relevant technical input for future decision-making at the Graduate Institute.

The analysis of institutional and social impact makes it possible to evidence that process standardization transcends the administrative scope, becoming a strategic instrument that strengthens technical clarity in processes, transparency in academic procedures, and the culture of institutional high quality. In practical terms, the project not only represents a methodologically supported proposal, but also demonstrates that standardization is not merely a documentary exercise. It establishes solid foundations for future adoption, consolidating its focus on continuous improvement and sustainability in the Graduate Institute of Universidad Libre, integrating the expectations of all its stakeholders.

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