

Development of a continuous control structure using the BSC to enable the alignment and achievement of the strategic objectives of the Faculty of Engineering at Universidad Libre, Bogotá campus.

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Abstract: Universidad Libre, founded in 1923, is a national, non-profit higher education corporation of a private nature located in Colombia, with various campuses across the country. The School of Engineering in Bogotá aims to develop a monitoring and control system based on quality indices, financial metrics, internal controls, external relations, and customer interactions. Each of these areas has several strategic objectives that need to be monitored as mentioned earlier. The purpose is to provide the institution with a model that ensures the achievement of the set goals. The design of the Balanced Scorecard was based on an analysis of the School, identifying key success factors, leading to the creation of a strategic map encompassing the four BSC perspectives (financial, customer, internal processes, and learning and growth). Subsequently, metrics are generated to respond to the strategic process outlined. Finally, the model's validation is presented through a tool developed in Excel to analyze the results against the goals, enabling projections that aid in decision-making by senior management.

KEYWORDS – Indicators – Strategic Objectives – Models – Balanced Scorecard – Strategic Map – Financial – Customers – Internal Processes – Learning and Growth

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I. INTRODUCTION

Universidad Libre is highly committed to society by training professionals with the excellent skills and capabilities required by organizations to generate a positive impact on the socio-economic development of the city and even the country. The Faculty of Engineering must identify the processes and aspects that require continuous control to ensure efficiency and compliance with the strategic objectives set by the institution.

Given the current situation of higher education institutions, it is essential for universities to have various control structures and tools that ensure the quality of processes and activities. For this reason, the Balanced Scorecard (BSC) methodology has become a key tool in the strategic management of organizations, clarifying vision and strategies into concrete and measurable objectives. In an increasingly competitive and dynamic business context, having a comprehensive measurement system like the BSC is essential for evaluating organizational performance and making informed decisions. [9]

Therefore, the Balanced Scorecard has emerged as a tool for strategic management, enabling organizations to control objectives and performance measures. However, to ensure the efficiency of the BSC, it is crucial to correctly identify and diagnose the capabilities of financial, quality, and control indices, which make up the management system and recognize the critical points that require intervention to improve processes and achieve strategic objectives. [10]

In this project, we address the need to develop a systematic approach to diagnose the capacities of the indices of interest concerning the BSC context. This will be done through a thorough analysis of these indicators and their relationship with the organization's strategic objectives, leading to the success of the comprehensive development plan. Therefore, this research aims to identify the processes and activities within the Faculty of Engineering at Universidad Libre that require continuous monitoring, according to the parameters to be met.

An analysis of the processes and activities within the Faculty of Engineering will be conducted, identifying those that present the highest risk or impact, considering their weighting and importance in meeting institutional objectives. Additionally, the relevant success points that continuously support the faculty's compliance and continuous improvement will be recognized. Following this, an analysis from different

perspectives, supported by engineering methodologies, will be performed to quantitatively evaluate the real effect of each strategy.

To estimate the performance of the strategies, a strategic map will be created based on the four perspectives of the Balanced Scorecard (Financial, Customer, Internal Processes, and Learning and Growth), identifying each interrelated factor to provide direction to the strategic objectives.

The Balanced Scorecard, adapted to the specific needs and characteristics of the Faculty of Engineering at Universidad Libre, will be based on the methodology proposed by Kaplan and Norton. Each perspective will be thoroughly analyzed, identifying the strategic objectives, key performance indicators (KPIs), and the initiatives necessary to achieve the estimated goals. Clear and measurable targets will be set for each indicator to ensure effective performance monitoring of the institution. Through this process, the aim is to optimize resource management efficiency, enhance academic and research quality, and consequently increase the Faculty's impact on society and the professional field. [7]

In the continuation of the methodology and results, the design, implementation, and monitoring process of the BSC in the Faculty will be detailed, as well as the benefits and challenges faced in applying the model. Consequently, the validation of the Balanced Scorecard's performance will be addressed, focusing on how the implemented quality management indicators reflect and support the faculty's strategic objectives. [18]

Validating the BSC's performance is crucial to ensure that the Faculty's efforts and resources are effectively directed toward achieving its strategic goals. This process will not only contribute to improving educational and administrative quality but also strengthen the Faculty of Engineering's position nationally and internationally, reaffirming its commitment to excellence and innovation.

II. METODOLOGY

To conduct the research on the development of the BSC structure for the Faculty of Engineering, both the potential processes requiring continuous control and the success factors that will drive the strategies to achieve the established metrics were identified. This was supported by methodologies based on PESTEL analysis (Political, Economic, Social, Technological, Ecological, and Legal Analysis), EFE (External Factor Evaluation), EFI (Internal Factor Evaluation), and SWOT analysis. These methodologies helped identify and detail the aspects negatively affecting institutional processes to develop and present improvement strategies aligned with the balanced scorecard and the established indicators.

Subsequently, based on the developed analysis, a strategic map for the Faculty of Engineering is established. From this map, the KPIs (Key Performance Indicators) are defined to monitor continuous progress towards strategic objectives. Similarly, for the construction of the BSC, the four fundamental perspectives are considered (Learning and Growth, Internal Processes, Customer, and Financial). Based on this, the aspects detailed in the Learning and Growth perspective form the foundation of the structure to be developed. Initially, strategies are clarified, and objectives for each perspective are defined.

Once the Balanced Scorecard is structured, its validation is carried out through forecasts, which serve as a support tool to provide a grounded version of the Faculty's context analysis. It should be noted that for this validation, the key points of the strategic map and the indicators of the balanced scorecard are considered, as they will determine the viability and effectiveness of the planned model. Subsequently, a system is designed to compare the target KPIs with the data entered according to the Faculty's progress over a year. This tool will also graphically detail the behavior of each factor, thus facilitating decision-making regarding the performance and impact of each improvement strategy implemented in the Faculty's processes.

Finally, the results provided by the forecasting model are analyzed to conclude the validity of the BSC based on the accuracy of these results. Consequently, recommendations will be made to improve intervention strategies related to the processes. Based on this and with the support of forecasting tools regarding Faculty management, it will be possible to delineate and recognize the study's scope and potential biases in the selection of indicators or the impact of each control measure.

III. RESULTS

At Universidad Libre, various processes are categorized, each accompanied by strategic objectives focused primarily on achieving levels of quality and service for their clients. To address this and primarily bias the influential factors within the Faculty of Engineering, a diagnosis supported by contextual analysis and decision-making and evaluation techniques is conducted. Effectively emphasizing the implementation of analysis tools such as the SWOT matrix, a study was conducted on the strengths, weaknesses, opportunities, and threats of the Faculty of Engineering to identify detailed internal and external aspects influencing it, as listed in Table 1 below:

Table 1. DOFA Matrix

MATRIZ DOFA	
WEAKNESSES	OPPORTUNITIES
Adaptation of laboratories and facilities	Changes in tuition fees
Partnerships with companies for internship programs	Changing student expectations for facilities and services
Student retention and admission rate	Integration of technologies in the teaching process
Financing methods	Sustainability programs in resource management
Effectiveness of internal processes (Teacher evaluation)	Laboratory Safety Regulations and Engineering Practices
STRENGTHS	THREATS
Staff Quality (Teachers)	Changes in government education policies
Alliances of higher education institutions at the international level	Regulations on accreditation of academic programs
Variety and relevance of engineering programs offered	Trends in the social perception of engineering
Adaptability to market trends and demands (Curriculum update)	Changes in education laws that affect academic requirements
Student Support Services (Library, Technology and Wellness Resources)	Labor regulations that impact the hiring of personnel (Teachers)

Reference: Authors, 2024

Once each of the aspects that influence both positively and negatively are identified, possible scenarios and intervention strategies are established to interrelate the factors of the DOFA matrix. For this reason, Table 2 shows designed measures aimed at maximizing strengths and, conversely, minimizing and/or eliminating weaknesses, while also taking advantage of opportunities presented by the environment and managing any threats that may arise from it.

Table 2. Crossed DOFA matrix

STRENGTHS	STRATEGIES SO	STRATEGIES ST
S1. Staff Quality (Teachers)	O3,O4,S1 - Encourage and develop research projects in favor of sustainability based on resource management.	T5,S1 - Maintain a high standard of quality by teachers, mitigating staff turnover.
S2. Alliances of higher education institutions at the international level	O1,O4,S2,S3 - Expand the portfolio of alliances with national and international higher education institutions to achieve a modification in the enrollment rate in accordance with the quality of teaching without having a negative effect on the perception of future students of the	T1,T2,T3.T5.S3,S4 - To have effective student support services, which translate into good welfare and customer satisfaction, achieving greater retention of students during the course of the program.
S3. Variety and relevance of engineering programs offered		
S4. Adaptability to market trends and demands (Curriculum update)	O1,O4,S2,S3 - Modify the curriculum of the programs, to offer subjects that generate greater expectation in people to pursue an undergraduate engineering degree at Universidad Libre.	T3,T4,S1En apoyo con el conocimiento y experiencia de los docentes, guiar los proyectos de investigación hacia la reducción del impacto ambiental dando total cumplimiento a los Objetivos de Desarrollo Sostenible.
S5. Student Support Services (Library, Technology and Wellness Resources)		
WEAKNESSES	STRATEGIES WO	STRATEGIES WT
W1. Adaptation of laboratories and facilities	O2,O5,W1,W3 - Continuous updating of equipment and machinery in line with technological advances and market needs.	W1,T3,T4 - Implement financing and payment flexibility systems in accordance with the target population of the School of Engineering and the available capital, together
W2. Partnerships with companies for internship programs	O3,O4,W2 - Implement virtual courses at the international level within the curriculum to strengthen learning and encourage the exchange of knowledge and the proximity of other methodologies and development strategies.	W3,A5,T5 - Improve the system of teacher evaluation by students due to the current lack of effectiveness, since students do not have the necessary commitment to rate teachers.
Student retention and admission rate		
Financing methods	O2,O4,O5,O1,W2 - To propose the adequacy of spaces inside and outside the Universidad Libre to encourage the research process in a proactive way, focused on the current environment with recent technologies.	W3,W4,T2 - Implementar estrategias de acercamiento, de manera frecuente al ámbito laboral, con el objetivo de brindarle a los estudiantes herramientas y métodos en pro de abordar de mejor manera el campo laboral.
Effectiveness of internal processes (Teacher evaluation)		

Reference: Authors, 2024

In Table 3, each of the Political, Economic, Social, Technological, Environmental, and Legal factors that positively or negatively impact Universidad Libre as a whole are identified.

Table 3. PESTEL analysis

ANALISIS PESTEL		
POLITICAL FACTORS	ECONOMIC FACTORS	SOCIAL FACTORS
*Changes in governmental educational policies. *Regulations on accreditation of academic programs.	*Changes in tuition rates. *Scholarship policies. *Economic fluctuations that may affect the availability of financial resources.	*Changing student expectations for facilities and services. *Trends in the social perception of engineering.
TECHNOLOGICAL FACTORS	ECOLOGICAL FACTORS	LEGAL FACTORS
*Technological advances that require updating of academic programs. *Integration of technologies in the teaching process.	*Environmental considerations in engineering projects. *Environmental impact of research and development activities. *Sustainability programs in resource management.	*Changes in education laws affecting academic requirements. *Regulations that impact the hiring of personnel (teachers). *Safety regulations in laboratories and engineering practices.

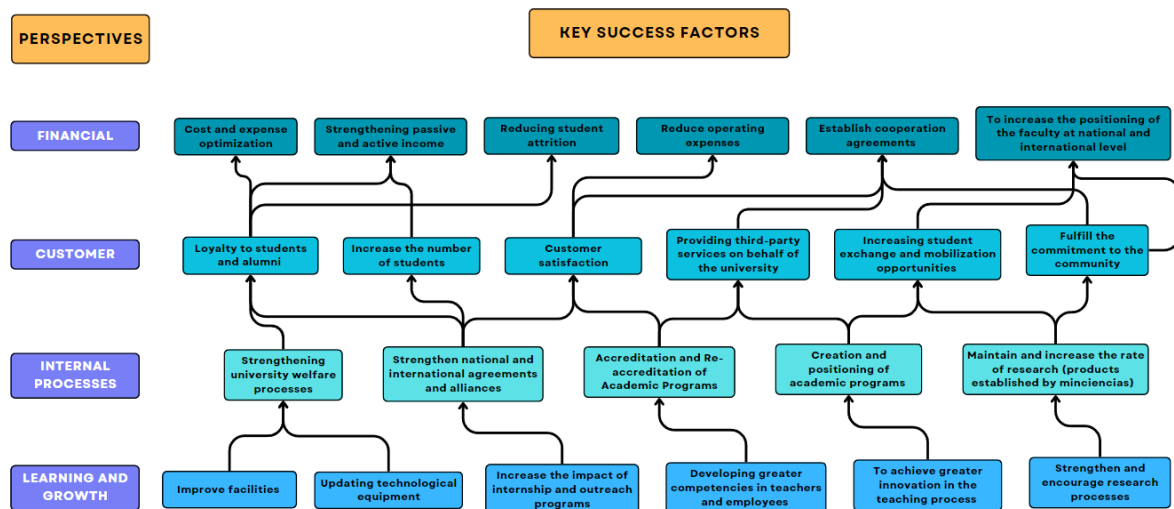
Reference: Authors, 2024

The PESTEL analysis focuses on various factors negatively impacting Universidad Libre, rooted in current global trends and the inclination of young people towards careers focused on social media, which may lead to reduced interest in engineering or other traditional professions requiring higher education. On a positive note, factors such as high-quality accreditation regulations for programs offered contribute positively, as the institution holds certifications for a significant portion of its curriculum.

Following the structured diagnosis and contextual analysis, the strategic map of the Faculty of Engineering is developed to optimize the management of institutional activities and resources. The map highlights each of the 4 perspectives of the Balanced Scorecard, along with their interrelationships at the next level, as depicted in Figure 1:

- **Learning and Growth:** Strategic resources necessary for the Faculty
- **Internal Processes:** Key processes crucial for achieving the institution's strategic objectives
- **Customers:** Factors influencing the perception of customers (students, graduates, and companies) towards the organization
- **Financial:** Elements contributing to greater financial benefit for the Faculty.

Figure 1. Faculty of engineering strategic map



Reference: Authors, 2024

In the structure of the strategic map, the first perspective detailed is Learning and Knowledge, where key aspects are outlined to maintain excellence, quality of staff, and infrastructure at the Faculty. This can be achieved through the development of capabilities among faculty and staff. On the other hand, internal processes are analyzed, which are crucial for achieving the Faculty of Engineering's strategic objectives. These must be carried out with quality, adding value to the institution, and considering the competencies developed in the

learning and knowledge perspective.

Another essential aspect for achieving processes and ensuring the Faculty's success is the relationship with customers, whose impact is fundamental for the institution, being the basic element in a Balanced Scorecard analysis. This aims to understand their expectations to align objectives with current needs. The final perspective supports the Faculty's economic viability, focusing on managing financial resources to support goals set by the University's leadership.

Once key factors influencing success in each Balanced Scorecard perspective (Learning and Knowledge, Internal Processes, Customer, and Financial) are identified, strategic objectives are established for tracking over a specified period. This sets metrics to achieve the goals set by the Faculty. Four objectives are established focusing on measuring the Faculty's financial performance, emphasizing profitability measurement and service levels provided, directly impacting passive and active income. Additionally, a measurement and tracking period of semi-annual and annual intervals is proposed, depending on the indicator type. To maintain satisfaction among students, alumni, companies, and the community, Table 2 shows the established objectives for the customer perspective.

INDICATORS BY PERSPECTIVE

The first perspective is financial, as shown in Table 4, detailing indicators to maintain and increase the Faculty's profitability. This can be achieved through positioning Universidad Libre while reducing operational expenses, among other strategies

Table 4. Financial Perspective Indicators

FINANCIAL PERSPECTIVE FACULTY OF ENGINEERING					
OBJECTIVE	INDICATOR	MEASUREMENT	PERIOD	META	KPI STATUS
Increase the profitability margin for the engineering faculty.	Profitability margin	$\frac{\text{total faculty income} - \text{total faculty costs}}{\text{total faculty income}}$	SEMESTERLY	Greater than 25%	25%
Decrease the number of students who drop out of the faculty.	Student dropout rate	$1 - \frac{\text{total number of students previous semester} - \text{Total number of withdrawn students}}{\text{Total number of students previous semester}}$	SEMESTERLY	Less than 5%	4%
Increase the number of cooperative agreements for the faculty.	Growth in alliances	Total new agreements compared to the previous six-month period	ANNUAL	Three new agreements per year	3
Measure faculty growth internally through student growth.	Student growth	$1 - \left(\frac{\text{Total law students} - \text{Total new law students}}{\text{Total law students}} \right)$ VS $1 - \left(\frac{\text{Total engineering students} - \text{Total new engineering students}}{\text{Total engineering students}} \right)$	SEMESTERLY	Greater than 10%	8%

Reference: Authors, 2024.

- **Profitability margin:** This indicator focuses on measuring the profitability of the faculty based on the costs and revenues it generates, measured as a percentage using the profit margin formula. Strategies will focus on cost efficiency, revenue maximization, and effective resource management, thereby strengthening the financial position and enhancing the ability to invest in innovation and academic development.

- **Student Dropout Rate:** To meet the goal of progressively reducing the number of students dropping out of undergraduate programs, this indicator analyzes and evaluates the fluctuation in the faculty's student dropout rate, measured semi-annually. It emphasizes personalized academic and emotional support through enhanced mentoring programs, guidance, and continuous improvement of educational quality.

- **Growth in Partnerships:** Expand and diversify cooperation agreements for the Faculty by identifying new strategic partnership opportunities with educational institutions and companies in the industrial and technological sectors. This indicator aims to track effective annual progress, proposing a minimum target of three new agreements annually, which also serves to gauge student satisfaction levels.

- **Student Enrollment Growth:** Measuring the Faculty's internal growth through student enrollment increase is essential for competitive positioning. Strategies will be designed to measure recognition, internal and external impacts generated by the Faculty, contributing to high-impact collaborations and institutional benefits.

Customers are a fundamental part of the institution, serving as the cornerstone in a Balanced Scorecard analysis. Table 5 outlines indicators related to student satisfaction and their participation in various activities offered by the Faculty.

Table 6. Customer Perspective Indicators.

CUSTOMER PERSPECTIVE FACULTY OF ENGINEERING					
OBJECTIVE	INDICATOR	MEASUREMENT	PERIOD	META	KPI STATUS
Increase the number of active students enrolled in various university processes	Student participation	$\frac{\text{Engineering faculty students enrolled in university projects and activities}}{\text{Total students of the engineering faculty}}$	SEMESTERLY	Greater than 15%	16%
Increase the level of new students per program with respect to the previous semester	Semiannual growth rate	$\frac{(\text{New students current semester} - \text{New students previous semester})}{\text{New students previous semester}}$	SEMESTERLY	Greater than 20%	22%
Analyze the level of service provided by the faculty to customers	Student satisfaction index	Average satisfaction level across all surveys	SEMESTERLY	Satisfaction level over 80%	70%
Providing third-party services on behalf of the university	Coverage of services	Number of services provided by program	SEMESTERLY	Two services offered	2
Increase the number of effective students for the exchange process	Exchange participation rate	$\frac{\text{Students accepted for exchanges}}{\text{Total quotas for exchanges}}$	SEMESTERLY	Greater than 5%	3%

Reference: Authors, 2024.

- **Student Engagement:** Promoting comprehensive student participation and commitment through enriched educational and personal experiences. This indicator focuses on the direct importance of retaining active students in the Faculty, fostering a sense of belonging, promoting attractive programs, and enhancing collaborations and benefits through the university to third parties.
- **Semester Growth Rate:** By implementing effective strategies for student recruitment, retention, and improving the attraction process for academic talent to the program, this indicator tracks the percentage fluctuation of students entering the Faculty of Engineering programs.
- **Student Satisfaction Index:** Evaluating the quality of service offered by the Faculty to clients, including students, graduates, professors, administrative staff, and the community. The target is to achieve a satisfaction index of above 60% among clients of the Faculty of Engineering.
- **Service Coverage:** Establishing and managing third-party services on behalf of the University, aimed at meeting specific needs and complementing educational and administrative offerings. This enhances operational capacity and improves relationships with internal and external clients, while strengthening the university's reputation and positioning. The indicator emphasizes the involvement of faculty, students, and third parties in providing advisory services, participating in conventions or presentations at other educational or related institutions.
- **Exchange Participation Rate:** Strengthening internationalization and cultural diversity within the student community by expanding exchange opportunities and supporting participating students. This indicator measures the number of students accepted into exchange programs, aiming to increase exchanges and implement new metrics for optimal access to university benefits.

Table 6. Indicators Perspective Internal Processes

PERSPECTIVE INTERNAL PROCESSES FACULTY OF ENGINEERING					
OBJECTIVE	INDICATOR	MEASUREMENT	PERIOD	META	KPI STATUS
Evaluate the quality of university welfare processes	Satisfaction with internal processes	Number of satisfactory university welfare processes (satisfaction over 75%)	SEMESTERLY	Four successful wellness processes	4
Measure the increase in student participation in national and international agreements and partnerships	Student participation in agreements	$\frac{\text{Total accepted students}}{\text{Total students}}$	ANNUAL	Greater than 10%	5%
Achieve accreditation and reaccreditation of academic programs	Accreditation	Number of engineering programs with high quality accreditation	5 YEARS	All programs re-accredited	4
Increase the number of new programs in the faculty	Creation of programs	Number of new engineering programs in the period	2 YEARS	A new program	1
Maintain research rate (products established by min sciences)	Research index	$\text{Index} = \frac{\text{Indicator value}}{\text{Maximum value of the indicator}}$ $\text{Group index}_4 = \text{Nc. Top} + 2.5 * \text{Nc. A} + 1 * \text{Nc. B} + 0.2 * \text{AP} + 1 * \text{Fr. A} + 0.5 * \text{Fr. B} + 0.4 * \text{Cohe} + 0.4 * \text{Coop}$	SEMESTERLY	Publish a Q1 article	1

Reference: Authors,2024.

- **Internal Process Satisfaction:** Conduct a comprehensive evaluation of the quality of university welfare processes to continually improve support and overall experience for students, faculty, and administrative staff. This involves implementing data collection methods, satisfaction analysis, and feedback mechanisms to ensure successful service levels in welfare projects, which are crucial for enhancing student skills and easing current

context tensions.

- **Student Participation in Agreements:** Implement a comprehensive evaluation and monitoring system to quantify and analyze the increase in student participation in national and international agreements and partnerships. Agreements play a vital role in the growth and positioning of the Faculty, thus measuring the efficiency and performance impact of current agreements in social, educational, and professional realms is optimal.

- **Accreditation:** Establish an integral and effective process to ensure the attainment and renewal of accreditation for all academic programs at the Faculty, ensuring high standards of educational quality recognized nationally and internationally. Accreditation is a priority indicator for the University, representing reliability for students choosing programs.

- **Program Creation:** Expand academic offerings by creating new educational programs that meet emerging demands in the labor market and community needs. This indicator ensures the portfolio of offerings expands with a focus on the job market.

- **Research Index:** Increase development through continuous support for high-quality research, promoting interdisciplinary collaboration, and constantly improving conditions and resources for researchers. Research is a significant factor in educational processes, hence measuring this indicator through production indices detailed and implemented by Colciencias, emphasizing cohesion and cooperation factors, and focusing on production criteria control methodology for group indices. As a monitoring factor for this indicator, the group index control methodology is applied, detailed by Colciencias as follows (Related indicator formula in BSC):

- NC. Type. Index of New Knowledge Production A1
- NC. A. Index of New Knowledge Production A
- NC. B. Index of New Knowledge Production B
- AP. Index of dissemination and social appropriation
- Fr. A. Resource Training Index A
- Fr. B. Resource Training Index B
- Coh. Cohesion Index
- Coop. Cooperation Index.

In the learning and knowledge perspective, key aspects are detailed to maintain excellence and quality in Faculty personnel and infrastructure development. This is achieved through the capacity development of professors and staff, as shown in Table 7.

Tabla 7. Indicadores Perspectiva Aprendizaje y Conocimiento

LEARNING AND KNOWLEDGE PERSPECTIVE FACULTY OF ENGINEERING					
OBJECTIVE	INDICATOR	MEASUREMENT	PERIOD	META	KPI STATUS
Evaluate the level of service in terms of the university's infrastructure	Infrastructure Satisfaction	Average satisfaction level across all surveys	SEMESTERLY	Satisfaction level over 80%	75%
Evaluate the level of service in terms of university resources	Resource satisfaction	Average satisfaction level across all surveys	SEMESTERLY	Satisfaction level over 80%	88%
Guarantee the coverage and operation of technological equipment	Technological coverage	$\frac{\text{Total available equipment current semester} - \text{Total equipment available previous semester}}{\text{Total current students}}$	SEMESTERLY	technological coverage greater than 50%.	45%
Ensuring quality and competencies in teachers	Academic quality	$\frac{\text{Number of faculty members with doctorates in the faculty of engineering}}{\text{Total professors in the engineering faculty}}$	SEMESTERLY	Greater than 20%	18%

Reference: Authors, 2024.

- **Infrastructure Satisfaction:** Conduct an evaluation of the service level provided by the University's infrastructure, including gathering user feedback and analyzing the functionality and efficiency of existing services. It's important to note that the University's service level focuses on the Faculty's infrastructure and should be measured through the perspective and satisfaction of students, allowing for the identification of critical points. This is crucial to ensure educational quality and sustainability, as focusing on having suitable spaces for education provides better long-term maneuverability for new projects planned by the faculty.

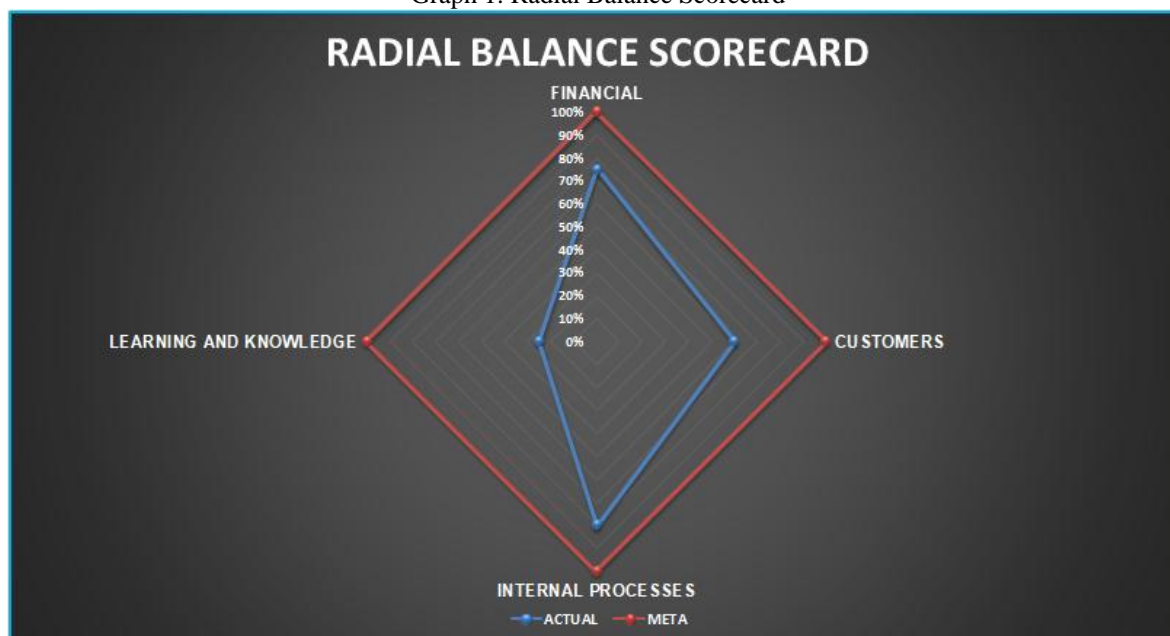
- **Resource Satisfaction:** Linked to the previous point, establish strategies for continuous improvement through surveys conducted with students, graduates, professors, and other users. This aspect of the indicator should also be measured from the customer perspective based on their satisfaction with the use of University resources.

- **Technological Coverage:** Implement a comprehensive plan to ensure coverage and optimal operation of all technological equipment at the University, including hardware and software. This involves regular performance evaluation as well as preventive and corrective maintenance. This indicator focuses on understanding and meeting customer needs based on technological factors, measuring the Faculty's coverage capacity regarding

student or third-party demand faced by the University.

- **Academic Quality:** Ensure and continuously improve the quality and competencies of faculty members at the University, including implementing training and professional development programs. In this way, the competencies of teaching staff are measured to provide quality education and the ability to embark on new projects focused on human resource knowledge, ensuring that teachers possess high competencies.

Graph 1. Radial Balance Scorecard



Reference: Authors, 2024.

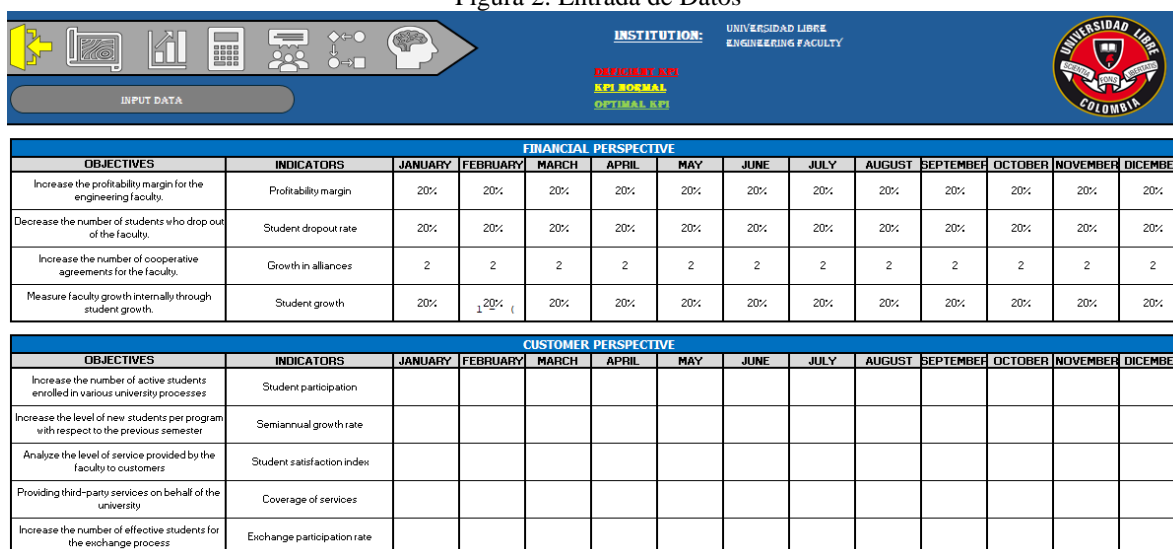
In the development of the research, the radial chart methodology is implemented, as shown in Graph 1. This method allows for the comparison of performance and behavior between indicators by perspective according to optimal and current KPI measurements. As mentioned, this graph denotes the indicator's performance and its deviation from the expected performance under the strategic objectives. From the data points and measurement axes between the two graphs, it can be concluded that while they approach the expected value, any observed variation necessitates reevaluating the indicator or action strategies to improve the KPI's performance.

After designing the Balanced Scorecard for the Faculty of Engineering, a validation process is carried out using forecasting tools to project the Faculty's performance over a year. An Excel file (Appendix A) was created to present this validation.

Validation of the Balanced Scorecard

Initially, a series of tables are presented, outlining each established indicator classified into the four perspectives of the Balanced Scorecard (Financial, Customer, Internal Processes, and Learning and Growth). These tables include fields for data entry over a one-year period, where the user inputs the value of each KPI on a monthly basis. This data entry process aligns with the strategic objectives established in the BSC, derived from the strategic map developed, as presented in Figure 2.

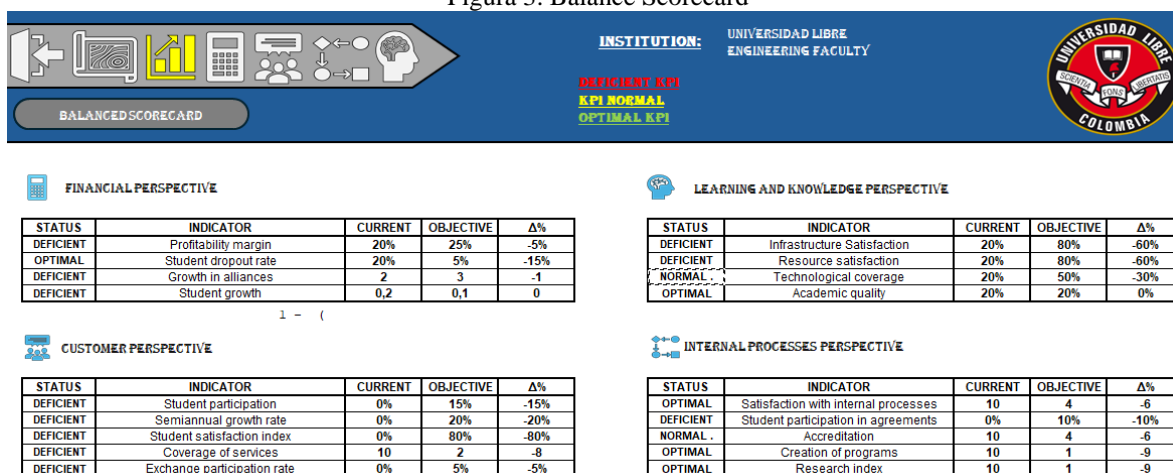
Figura 2. Entrada de Datos



Reference: Authors, 2024

As the data is entered, in the BSC presented in Figure 3, the status of each indicator is constantly updated (poor, normal or optimal) according to the goals established for each one, these in turn are presented next to the value. current and accompanied by a remaining percentage to achieve them. In this Balanced Scorecard, the progress made so far, the objective or goal is presented quantitatively. A total of 18 separate indicators are detailed in the four foundations of the Balance Scorecard, which when reaching the optimal level will guarantee in a large percentage both the success, positioning and increase in the profits of the Faculty as well as the satisfaction of students, teachers, graduates, administrators and other individuals to be part of the institution and on the other hand, the University will have greater value thanks to its commitment to the community and as it is perceived as an organization that seeks the good of those around it.

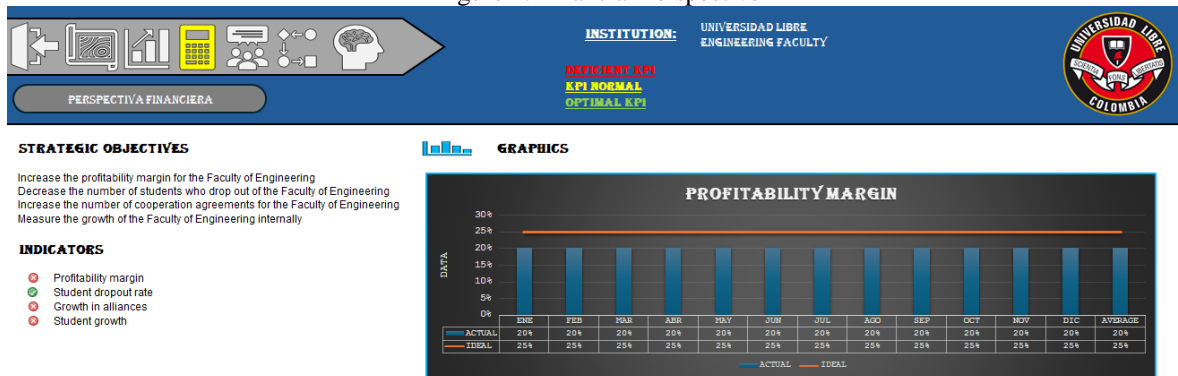
Figura 3. Balance Scorecard



Reference: Authors, 2024

In this study focused on the Faculty of Engineering, a detailed structure of the strategic objectives and indicators designed previously oriented to the growth of the institution is presented. That said, Figure 4 uses blue bars to represent the performance of the KPI, allowing greater interpretation of its status visually and accurately. Additionally, there is also an orange line that marks the goal to be surpassed and that serves as a reference point to measure current performance and facilitate monitoring. In addition, at the end a value is included that refers to the average of the projected year, which ends being a temporal perspective to the analysis of the data entered previously.

Figure 4. Financial Perspective



Reference: Authors, 2024.

In the previous figure, the chart for the "Profit Margin" indicator, which corresponds to the financial perspective, is presented as an example. However, each KPI has its graphical representation, classified into the four horizons of the Balanced Scorecard. This methodology not only promotes effective strategic management but also ensures continuous alignment and monitoring of the established objectives. It provides a solid foundation for continuous improvement and achieving medium and long-term success for the Faculty of Engineering and subsequently for Universidad Libre.

IV. DISCUSSIONS

The implementation of the Balanced Scorecard (BSC) in the Faculty of Engineering encompasses various aspects and questions that must be clarified when structuring the indicators for measuring and evaluating strategic objectives. This is because they can be fluctuating due to the situational context analysis presented by the Faculty. It is important to highlight that for this study, one of the flagship perspectives is that of customers, as it concentrates the potential success factors. In contrast, the other perspectives depend on the performance of another, as in the case of the financial perspective, or they present subprocesses that are not as individually relevant. However, if the complete structure is analyzed, these can be equated in the same magnitude of importance to the University's core processes.

It is crucial to note that the implementation of the Balanced Scorecard relies on a series of forecasts, which will be available to competent and qualified personnel for process evaluation. These aspects must be very well identified by the analysts, as any erroneous interpretation risks the performance of a strategy, leading to both time and economic resource losses, directly affecting the Faculty's budget.

To control the aforementioned, it is sufficient to define the metrics in the Balanced Scorecard more efficiently each year to align them better with the strategic objectives of the Faculty of Engineering. This will allow them to be used as inputs for the forecasting tool, projecting the institution's behavior. Additionally, it is essential to provide adequate training to the personnel responsible for using the forecasting tool, ensuring they understand how to interpret the results and make informed decisions based on them.

In conclusion, the structure of the Balanced Scorecard is quite robust and concrete, to the point that it enables the perception of various scenarios based on the Faculty's operation. Furthermore, it is not a rigid and inflexible model; on the contrary, it is a versatile system that facilitates the study and analysis of the feasibility of strategies according to the contexts in which they are proposed, allowing contingency plans to be developed for critical factors detected through forecasts or the base execution of the model.

IV. CONCLUSIONS

Throughout the development of this project, it has been segmented into different phases within which improvement strategies are proposed for the processes and aspects embedded in the Faculty of Engineering. Initially, key internal and external aspects are determined based on methodologies founded on the DOFA matrix, which clarifies that the University has strengths in strategic alliances. These alliances provide opportunities for students and the institution itself, given that the foundations for exchange processes and courses abroad are already in place, leading to an increase in national and international positioning.

On the other hand, a significant threat and weakness in achieving academic objectives concerning the attraction and retention of students in each of the programs offered by the Faculty is evident. It is clear that one of the most significant perspectives to intervene is that of customers, being a critical success factor for the entity. As mentioned, student dropout is the most relevant and concerning issue for the Faculty since the number of new or continuing students decreases each semester. Therefore, indicators are established, accompanied by

strategies aimed at reducing the student decline trend.

Simultaneously, to implement the BSC structure, specific indicators for each strategic objective focused on the balance perspectives were established. Optimal and deficient KPI values are proposed, fluctuating according to prior analysis and the strategies implemented to achieve the strategic objectives. These objectives are centered on the Faculty fulfilling its obligations and increasing its growth in the market.

In summary, the validation and implementation of the Balanced Scorecard allow the Faculty to better optimize and manage resources, aligning their allocation with the areas of greatest impact in achieving strategic objectives. Moreover, the forecasting tool effectively evaluates and controls intervention strategies and their impact on processes in terms of the set goals.

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