

Development of Market Research to Determine the Viability of the Bioengineering Program at the Faculty of Engineering, Libre University, Bogotá Section

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ABSTRACT: Libre University, Bogotá campus, a highly renowned higher education institution in the country, seeking continuous improvement, is aiming to implement new programs that are in line with the latest technologies and attract students in line with its policy. For this, a market study was conducted to determine the viability of a new Bioengineering program for the Faculty of Engineering at the Bogotá campus. The research was carried out using a survey model, characterized by targeting the Engativá locality in Bogotá, focusing on students from 10th and 11th grades. After gathering the data, different analysis models were applied to reach a definitive answer, which was positive for creating the new offering, finding it attractive to new students due to its campus, curriculum, and prestige, among other factors. This positions the university better in the market and contributes to the country's development.

Keywords: Bioengineering, Market study, Accreditation, Curriculum, Campus.

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I. INTRODUCTION

Libre University began its academic work under its current name in 1923, with General Benjamín Herrera as its president, although it was legally established on October 30, 1913. [1] On average, it educates 29,800 students across its 67 undergraduate programs and 7,200 students in its 164 postgraduate programs, distributed across 12 campuses. In Bogotá, it has two campuses: one in La Candelaria and another in El Bosque Popular, Engativá. It is renowned for its Law program and also offers faculties such as Engineering, Political and Social Sciences, Education, Economics, Administrative and Accounting Sciences, and Philosophy.

The weaknesses and opportunities in the current academic program offerings led the institution to evaluate the implementation of a new program to stay at the forefront of technology and maintain a strong market position, contributing to societal advancement. Based on this need, a market study [2] was conducted to determine the viability of a new Bioengineering program in the Faculty of Engineering. The study used a survey model, limited to the Engativá locality in Bogotá, targeting students from 10th and 11th grades in socioeconomic strata 2 and 3.

The exhaustive analysis of the current Bioengineering market [3], where the trends, opportunities and challenges that define this career. From its impact on human health to its revolutionary potential in key industries such as biotechnology and medicine, this study offers an in-depth look at how professionals and companies are positioning themselves to take advantage of this growing demand for biology-based technological innovation [4].

BACKGROUND

A review of similar projects evaluated those executed in Bogotá, which served as a reference for this article. For example, a market research study conducted to establish opportunities for new postgraduate specializations at the Institute of Postgraduate Studies in Engineering at Libre University, Bogotá [5], identified trends and needs in the Colombian labor market. This provided a foundation for implementing a new program in the future.

Another relevant study was conducted on the educational needs and preferences of youth in the Engativá locality [6]. This study, focused on a similar population, highlighted good results, particularly in the Foundation University Cafam, which serves lower-middle-class students in strata 2 and 3. The study emphasized the needs of prospective students and the reasons behind declining enrollment in higher education [7].

Considering a third research, it addresses the study analysis of the higher education offer of university undergraduate marketing in Colombia [8], it states that although it is considered that the face-to-face modality is

still strong in education and where it is expected to gain participation in the future, it is clear that education tends to be shorter. On the other hand, he mentions that the best city for higher education is Bogotá, where most of the offer is concentrated. Finally, he establishes that the average value of academic programmers and where students are willing to finance is above the average of \$5'000. 000COP.

Finally, it is necessary to address the conclusions that are perceived from the Market Research study for the Industrial Administration Programme at the Universidad Tecnológica de Pereira [9], which confirms what is found in other institutions where the majority of students are women; on the other hand, the need for attention from the administrative body for night students is evident. Another symptom that is found at the time of registration for subjects where the platform collapses and generates discomfort among students, another similarity found is the little use of the physical information resources provided by the library and where students state that the growing advance of technology makes it necessary to collect information from books and others.

II. METODOLOGY

The market study responds to the institution's need to implement a new programme in the faculty of engineering, establishing a market niche and positioning in this new academic offer that every day represents more interest in the community.

At the beginning, a diagnosis was made about the target population that wanted to obtain information, to which it was argued that given the location of the Universidad Libre in the locality of Engativá and where its socioeconomic stratum is 3, it was decided to carry out the study in that location, where 2 and 4 can be found.

Later on, a documentary compilation was carried out with 35 research studies which provide a precedent for the methodology to be applied, working with a survey type data collection instrument in mixed mode [10], where it is applied virtually through the Google Forms platform, this being a very good tool and easy to use for the information and management of the data obtained, as well as a very good response of data in graphs and statistics [11].

Next, although we have the population of the locality of Engativá, we have to segment students in the 10th and 11th grades of secondary education institutions, thus surveying the following institutions: Colegio Cafam, Colegio moderno and Colegio de la Universidad Libre.

Then, with the prior authorization of the institutions, the information was collected in the three institutions, with a sample of 185 students of which 54 correspond to 10th grade and 131 to 11th grade, open questions were presented to know the particularities of each respondent.

For the treatment of the data obtained, three types of tools are used to give clarity to the results, such as.

SWOT Matrix: is an analysis technique used to identify the internal and external factors that can affect a situation or decision.

The acronym SWOT comes from the first letters of each of the four elements that are analyzed [12]:

- Weaknesses: refer to internal aspects of the situation that can negatively affect the outcome.
- Opportunities: these are external factors that can be beneficial to the outcome.
- Strengths: are internal aspects that can contribute positively to the outcome.
- Threats: are external factors that can negatively affect the outcome.

VESTER Matrix: is a development instrument that is part of the Logical Framework matrix, which helps and facilitates the identification of the problems with the greatest impact in the field to be applied [13].

To apply the matrix, the problems identified in previous analyses must be prioritized and assigned a rating, which will assess the extent to which Problem 1 (P1) has an influence on Problem 2 (P2) and so on. The scale used for the process is:

- 1 Not causal
- 2 Weak causal
- 3 Medium causal
- 4 Strong cause
- 5 Very strong cause

BCG Matrix: It is used to classify a product, a portfolio of goods or lines of business, and based on the conclusions drawn from this classification, companies can make decisions such as [14]:

- In which product they have to continue to invest and focus on
- Which product to start investing in or stop investing in
- Whether to diversify their portfolio

III. RESULTS

Considering that the Bioengineering program is offered at other institutions such as Universidad del Bosque, Universidad Javeriana, Universidad de Antioquia, and Universidad EAFIT, among others, it is evident that it is a program that receives a very positive response from the community.

According to the profiles of the various educational institutions that offer Bioengineering, it is necessary to compare their curricula, the strengths of each, and especially the average tuition cost to achieve competitiveness in this market [15].

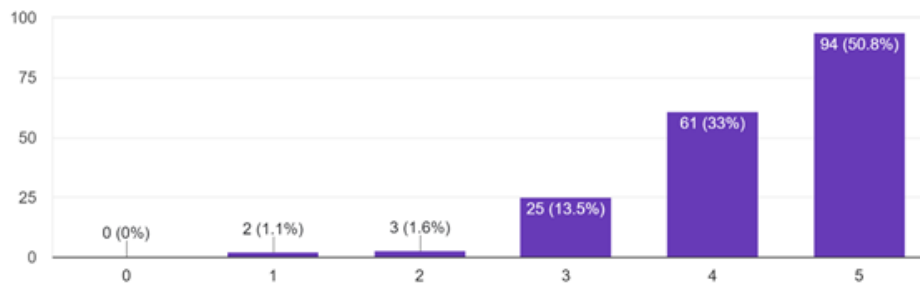
Based on the survey conducted in various institutions, the following data were obtained according to the main questions in the survey.

Intention to continue higher education, where 5 is the highest intention and 0 is the lowest intention.

According to the results, it can be seen that the intention to continue higher education is quite high, with the majority of votes indicating this as a very good trend for universities and the development of the community.

Although the result is positive, there is some contradiction in the responses where students say they do not see it as financially worthwhile or with a good future return. On the other hand, there must be good communication to maintain this motivation during the first semesters and avoid student dropout [16] (See Figure 1).

Figure 1. Bar chart of the intention to continue higher education



Source: Own elaboration, 2024

Source of funds for paying for higher education

Table 1. Methods of payment for university studies

Payment method	percent	people
Parents	56,2%	104
Scholarship	14,6%	27
You	16,2%	30
ICETEX	8,6%	16
Bank credit	3,2%	6
Other	0,5%	1
Public university	0,50%	1

Source: Own elaboration, 2024

Based on the responses obtained, most of the resources for financing higher education come from parents, followed by the students themselves and scholarships. This is an encouraging factor where there is a high probability that most students will continue with their university studies. This, combined with the competitiveness of virtual education, has generated more affordable and flexible offers in terms of both cost and time (See Table 1).

Knowledge about the Bioengineering program or related fields

As shown in Table 2, the ratings given by students regarding their knowledge of the Bioengineering program were positive, with most votes falling between 4 and 5 on the scale. This indicates that the program is already established in the market and is being considered by several potential students. Since it is a niche market where it is not necessary to make it known from scratch, efforts should focus on being competitive and a strong option among other institutions.

Table 2. Percentage of people familiar with the Bioengineering program

Scale	People	Percent
0	18	9,7%
1	10	5,4%
2	26	14,1%
3	32	17,3%
4	66	35,7%
5	33	17,8%

Source: Own elaboration, 2024

Intention to enroll in the Bioengineering program

For the purposes of this study, the responses regarding the intention to enroll in the Bioengineering program show that there is a good market among students, with most of them expressing interest in enrolling in this innovative program. Based on the trends in other institutions, it is a great opportunity for Libre University (See Table 3).

Table 3. Intention to study the Bioengineering program

Scale	People	Percent	Total
1	31	16,8%	32,5%
2	29	15,7%	
3	40	21,6%	21,6%
4	57	30,8%	45,9%
5	28	15,1%	

Source: Own elaboration, 2024

Preference for in-person classes despite new technologies that facilitate education

Based on the results obtained, it is clear that students prefer to study in person, regardless of the new technological tools available for online classes. This is an indicator that should be leveraged, considering that one of the institution's strengths is its well-equipped campus with classrooms, laboratories, workshops, and large green areas where students can feel comfortable and focused. Additionally, both this and other programs are better suited for in-person teaching, which is preferred for both innovative and traditional programs offered by the institution [17] (See Table 4).

Table 4. Percentage of people according to voting on the study modality

Modality	Percent	People
On-site	80,5%	149
Alternating	13%	24
Virtual	6,5%	12

Source: Own elaboration, 2024

Analysis of information from the institutions in the Engativá locality

Based on the study conducted in the secondary schools in the Engativá locality, Bogotá, the data was interpreted using several models of information analysis, such as:

SWOT Analysis: This allows for the analysis of the traceability of the process, its strengths, weaknesses, opportunities, and threats, to establish best practices and potential areas for improvement. The objective of this model is to conduct an internal and external analysis of the institution, facilitating continuous improvement and revealing opportunities for improvement that may not be evident in practice (See Table 5).

Table 5. SWOT Matrix, Internal and External Factors

Bioengineering	Positives	Negatives
INTERNAL	<p>Strengths</p> <p>F1. The University offers high quality programmes that are differentiated and valued by the client with respect to competitors.</p> <p>F2. Competitiveness in terms of facilities</p> <p>F3. The working conditions offered by the university to its employees allow for a greater sense of belonging to the institution.</p> <p>F4. Development of projects and campaigns to raise awareness of environmental education throughout the Unilibrista community.</p>	<p>Weaknesses</p> <p>D1. The University does not have a systematic marketing plan.</p> <p>D2. Customer service is one of the main competitive advantage in the market.</p> <p>D3. Little participation of the University community in regional and national calls for proposals.</p> <p>D4. Strengthen the virtual modality to reach more remote groups.</p>

EXTERNAL	Opportunities O1. Change of laws in countries where free education was provided. O2. Representative number of graduates of the Universidad Libre in managerial positions in companies and in governmental positions O3. Affordability among other institutions O4. Having environmental precedents is very favourable for new programmes.	Threats A1. Generation of new technologies A2. New virtual academic offerings A3. The changing economic situation A4. The rise of informal jobs
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Source: Own elaboration, 2024

The evaluation of the institution's internal factors (IFE) consists of rating the strengths and weaknesses by assigning scores to each item analyzed. Second, the evaluation of external factors (EFE) involves assigning a rating to different items such as changes in trends, government factors, and the offering of new programs, among others [18] (See Table 6).

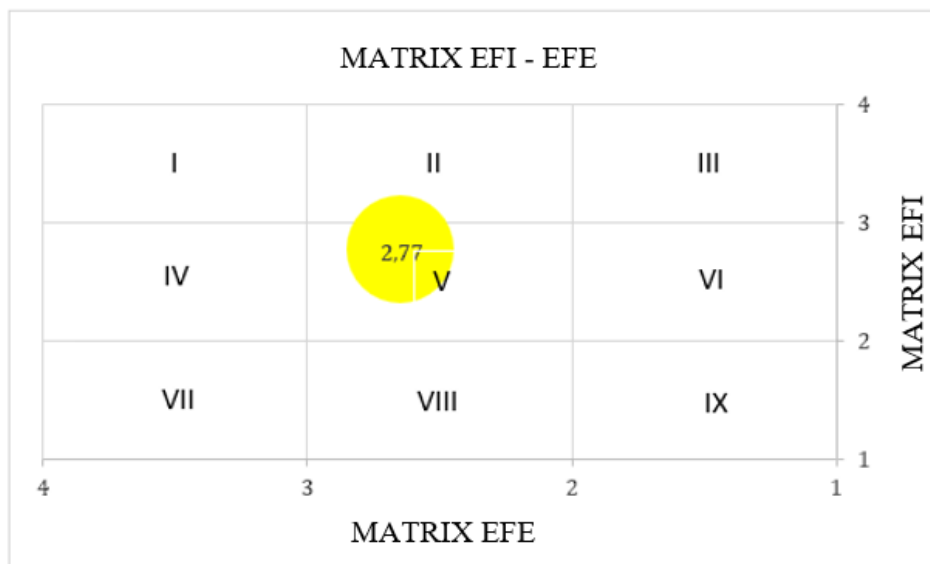
Table 6. Average of the EFE and EFI Matrix

EFE	2.65
EFI	2.77
Average	2.71

Source: Own elaboration, 2024

As seen in the EFI and EFE matrix, with a value of 2.77, the sum of the total values places the institution in Quadrant V, which recommends maintaining the growth philosophy that has been applied, preserving best practices that have demonstrated good results in student enrollment and low dropout rates (See Figure 2).

Figure 2. EFI EFE Matrix with the Roger J. Best approach



Source: Own elaboration, 2024

IV. DISCUSSION

The analysis presents a market study that used surveys as the main tool to collect important data on current trends, student preferences, and behaviors in choosing a professional career. The objective is to assess the viability of implementing a Bioengineering program. Although a positive response was found for the institution, several interesting aspects were identified that will not only benefit the new program but also strengthen other academic offerings and increase Libre University's participation in the market.

In comparison with the project "Study of Higher Education Needs and Preferences Among Youth in the Engativá Locality," there are significant similarities in the general approach. This is due to the drastic change in the perception of education in light of environmental contingencies, among other factors. While the current project seeks to assess the viability of implementing a new program, the aforementioned study establishes more general parameters regarding the state of education in populations similar to the surveyed group [19].

The cited work evaluates the preferences and needs of students from socioeconomic strata 2 and 3 in the Engativá locality, aged between 15 and 19 years, where the majority (60%) are female [20]. On the other hand,

the current study highlights important factors related to declining enrollments, the lack of market research by the institution, and the new dynamics among young people when choosing a university program.

Constant changes in market trends affect academic offerings and, in turn, contribute to the demotivation to pursue higher education. Although many potential students express this demotivation, studies reveal a greater inclination to continue in higher education, especially in traditional programs. Students argue that completing their higher education should not only be for professional or economic reasons but also for family satisfaction and a sense of personal pride.

Another common point is the need to create innovative programs in technological development, taking advantage of tools such as artificial intelligence, accessible equipment, virtual interaction with other cultures, and new teaching techniques supported by virtual platforms. This is a timely opportunity for greater participation in the market.

It was also established as a key factor in both studies that students prefer in-person learning, with 71% of respondents in the mentioned study choosing this modality for their studies. They argue that attending the classroom allows them to identify with the institution and perceive better reception of information and feedback.

In contrast, the need for further research on the perception of the offered programs was identified, not only with students but also with other stakeholders in the education field, such as graduates, teachers, parents, and hiring companies, among others.

V. CONCLUSIONS

Technological advancements have led to new academic offerings and new study modes that reduce obstacles such as distance.

The findings clearly demonstrate the viability of implementing the Bioengineering program at Libre University. The program's creation is well-received due to the institution's strong reputation.

Given the limited number of similar programs nationwide and the rising demand for technology-related fields, this new program would greatly benefit both the Faculty of Engineering and society at large.

The institution is also advised to consider forming strategic alliances with accredited universities that offer medical programs to further strengthen the Bioengineering offering.

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