

## THE SWOT MATRIX AS A STRATEGIC MANAGEMENT TOOL FOR A PUBLIC HIGHER EDUCATION INSTITUTION

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### ABSTRACT

Higher Education Institutions (HEIs) need strategic investment tempered with good academic, economic, social, and environmental performance from their managers. This study aims to provide a vision in different layers about the internal and external factors present in the administration of the State University of Norte Fluminense Darcy Ribeiro (UENF), proposing initiatives to deal strategically with existing weaknesses and threats. In this sense, a questionnaire was applied to 60 servers, with the effective participation of 56.7% of this sample, followed by the validation of three managers of the institution. The set of tools that supported the research was the SWOT - Strengths (S), Weaknesses (W), Opportunities (O), and Threats (T) – SWOT Matrix, along with the prioritization technique GUT – Gravity, Urgency, and Tendency. One of the perceptions of 97.1% of the participants was that the financial resource management policies of the State Government of Rio de Janeiro were a negative factor in the development of the university due to the contingency of resources that frequently occurs in public administration. The environmental commitment of the institution was rated as average, and the fact that there is no adequate infrastructure for the disposal of flammable chemical waste corroborates this perception. On the other hand, national recognition and university autonomy, among other factors, are significant positive points. The SWOT analysis showed a global panorama of strengths, weaknesses, opportunities, and threats to the institutional mission of UENF, highlighting the need to carry out periodic strategic diagnoses, including with the broader participation of the university community.

**Keywords:** Public Sector; SWOT Analysis; Strategic Diagnosis; University Management; GUT Matrix.

## INTRODUCTION

Higher Education Institutions (HEIs) play a crucial role in society. Knowledge multiplication and accumulation have become the great strengths of a country, and organizations must adapt to this new scenario and its requirements (Lahikainen *et al.*, 2019).

The contemporary knowledge revolution and its technological dimensions have the great challenge of depending primarily on the effort, thought, creativity, and discoveries made by humans, and there is no doubt about the role of these institutions in this process as agents of change (Shumali *et al.*, 2021). Strategic actions encompassing economic, social, and environmental requirements serve as causes of positive effects reflected in suppliers, students, and other stakeholders in these organizations (Jiménez *et al.*, 2019).

There are 2,608 HEIs in Brazil, among which 13.1% are public. In 2019, 1.25 million students completed undergraduate courses and, of this amount, 20.1% came from the public network (INEP, 2019), which is responsible for more than 90% of the scientific research produced in the country in graduate courses, with a ranking that encompasses the 15 universities with the highest scientific production, and these are responsible for 60% of all nationally-authored research (CAPES, 2019).

There are four public HEIs in the state of Rio de Janeiro: the State University of Rio de Janeiro (UERJ), the West Zone State University Center Foundation (UEZO), the Technical School Support Foundation (FAETEC), and the State University of Norte Fluminense Darcy Ribeiro (UENF). The UERJ campuses cover the capital, metropolitan, mountain, and southern regions. The activities of UEZO are concentrated in the western parts of Rio de Janeiro, Itagua, and Nova Iguaçu. FAETEC operates in the capital and in the northern, northwestern, southern, and mountainous regions of the state. Besides the Leonel Brizola Campus, UENF campuses include the Villa Maria House of Culture, the Center for Research in Animal Science and Plant Production at the Antônio Sarlo State Agricultural School, the Research Support Unit at the PESAGRO Experimental Station, all in Campos dos Goytacazes, as well as the Experimental Area in Itaocara and the Carlos Alberto Dias Campus in Macaé.

UENF was created in 1990 by State Law No. 1740, and in 1993, its first class of undergraduate students graduated, also initiating research and post-graduation activities. Its structure is composed of a set of bodies responsible for specific functions, such as the Rector's Office, Superior Councils, Chambers, Teaching and Research Centers, and the Complementary, Supplementary, and Auxiliary Bodies, with the work of 303 professors and 564 technical-administrative staff, all permanent employees.

As a mission, UENF “seeks excellence in teaching, research, and extension for the training of competent professionals, inserted into the Brazilian reality and, especially, the regional reality”. This mission is achieved through the production and application of scientific, technological, cultural, and artistic knowledge in the various areas of knowledge and the training of human resources with the ability to propose innovative solutions to the challenges of today's society while exercising full citizenship (UENF, 2016).

The strategic analysis has been proposed with satisfactory results in case studies in the educational field. With the methodological support of the SWOT matrix – Strengths (S), Weaknesses (W), Opportunities (O), and Threats (T) – but without the proposition of a prioritization tool for critical factors.

Shumali *et al.* (2021) evaluated the Palestinian public universities, and their results showed the perception that the SWOT matrix is used to develop strategies that contribute to sustainable development with the participation of stakeholders. In addition, they also demonstrated that there are few financial resources allocated to the management of these institutions, and the political instability of the country negatively affects the achievement of planned objectives, recommending solutions to the problems encountered.

Ab's (2020) study focused on an Islamic state university, conducting a self-assessment diagnosis of policies that were developed from 2013 to 2016 using the SWOT Matrix analysis method to develop a competitive strategy so that the institution could compete nationally and internationally.

The SWOT matrix can offer a systemic vision of the organization's positioning, collaborating as a useful tool for strategic planning and developing good management practices (Gill, 2009; Manhães *et al.*, 2020).

This study aims to prepare a strategic analysis of UENF through the joint application of the GUT (Severity (G), Urgency (U), and Tendency (T)) and SWOT matrices, as a support to the institution's strategic planning.

## BIBLIOGRAPHIC REVIEW

### SWOT analysis and strategic planning

Strategic planning consists of an analytical process to define actions necessary to face future situations and achieve the organization's goals. The initiatives can range from the reallocation of resources to the development of new operations (Mendonça *et al.*, 2017) through strategies that neutralize threats, seize opportunities, use strengths, and elimi-

nate the institution's weaknesses to achieve the previously defined mission (Tavares, 1991).

The usefulness of strategic planning falls into five categories, as enumerated by Ab (2020): (i) providing better functional guidelines for all levels of the organization; (ii) anticipating changes, new opportunities, and the emergence of threats; (iii) providing the manager with logical reasoning about resource allocation; (iv) assisting the decision integration of the organization's managers; and (v) fostering a more reactive than defensive management attitude.

According to Mian *et al.* (2020), the SWOT matrix is an analytical, collaborative, and versatile tool. It is widely used to encompass the perspectives of the members of a company, facilitating the process of dealing with challenges to achieve strategic goals.

The set of perceptions is divided into strengths and weaknesses present in the organization and opportunities and threats in the environment in which it operates. This combination of factors allows consistent parameters to be established regarding competitiveness and provides a complete picture. The confrontation between external developments and internal capabilities enables the development of strategies for specific government guidelines (Silva Neto and Pizolato, 2001).

The environment external to the institution must be analyzed to identify, predict, and evaluate its environmental, socioeconomic, and cultural impacts, providing the correct perception of the opportunities and threats of the context analyzed. The organizational strategic diagnosis evaluates the resources available in the institution, making use of them to plan a joint and integrated application, obtaining a competitive advantage (Chiavenato and Sapiro, 2020).

The global educational system was affected by the first and second industrial revolutions, and many institutions still adopt passive learning models. However, the third and fourth industrial revolutions demand that institutions adapt to new conceptions of learning, teaching, working, and managing due to automated production and the creation of intangible values (Fahim *et al.*, 2021).

The SWOT Matrix applied in the analysis of a public Arab higher education institution showed that institutional strengths should be used to take advantage of the opportunities provided by Industry 4.0, thus requiring effective financial planning, well-trained staff, increased partnerships with industries, advanced infrastructure, curriculum review, and constant workshops.

Industry 4.0 has its own requirements based on specific workforce skills, predominantly in the areas of Information

Technology, Data Analytics, and Adaptive Thinking. In this context, universities have the great challenge of adapting by modernizing their programs, facilities, and infrastructure through efficient strategic planning (Mian *et al.*, 2020).

## METHODOLOGY

### Definition

The research is classified as applied from the standpoint of its qualitative nature due to the exploratory and descriptive ways of approaching the problem as to its objectives, thus performing an institutional (Gil, 2002; Silva and Menezes, 2005) and bibliographical (Gil, 2002) cutout. As classified by Silva and Menezes (2005), the intentional sampling technique was used since 52% of the interviewees were managers directly involved in the formulation of the institution's guidelines.

### Data collection

Initially, a review of theoretical references related to strategic analysis in universities in Brazil and in other countries was carried out. Next, questionnaires were applied to UENF's servers, and by analyzing the data obtained, the institution's SWOT matrix was built with the application of the GUT matrix to prioritize the critical points found, developing a proposition of defensive strategic initiatives for the institution.

This analysis relied on information provided through Questionnaire 1 in Appendix A by 34 UENF employees working at the Leonel Brizola campus in Campos dos Goytacazes-RJ. These servers are directly or indirectly involved in the formulation of organizational policies and play various roles in the institution, including the Rector, Vice-Rector, Directors, Professors, and Professionals at the higher, middle, and elementary technical levels. The questionnaire was developed by the authors using the Google Forms application and was sent to 60 participants via institutional e-mail.

**Questionnaire 1** ("Strategic Diagnosis - SWOT Analysis of UENF") was composed of a brief presentation of the tool, containing questions such as: name, position, and number of years working in the institution; then, considering actions aimed at sustainable practices, the participants were asked to choose and/or suggest which factors are most appropriate for each dimension of the SWOT Matrix 1, with questions composed of multiple choices and space for the participants to include more information they deem relevant, according to each thematic area.

For a better analysis of the scenario, data on the university's budget profile were collected from the Rio de

Janeiro State Treasury Department database and interviews with employees in the planning and auditing areas at UENF.

In addition, we sought to find out the perception of the participants regarding the visibility of possible actions existing at the university in terms of sustainable initiatives, requesting an evaluation on a linear scale from 1 to 5 (where 1 = a little and 5 = a lot), and about the degree of environmental commitment at UENF, requesting an opinion on a linear scale from 1 to 5 (where 1 = low and 5 = high).

### Information processing

The variables were plotted in graphs and tables using the Microsoft Excel program to tabulate and analyze qualitatively the data obtained by the research.

After grouping all the factors listed by the authors and suggested by the participants, the Rector, the Vice-Rector, and the General Director of Administration – who have a broad strategic vision of the institution due to their senior management roles – were asked to validate the new internal and external factors through **Questionnaire 2** in Appendix B, using the Google Forms application.

From the answers in **Questionnaire 2**, the relevant factors in terms of opportunities, threats, strengths, and weaknesses, directly or indirectly related to environmental, economic, and social sustainability, were defined to develop a suitable strategic diagnosis of the institution.

The selection criteria to compose the SWOT Matrix 2 was based on the items that had two or three votes from the managers who participated in the final validation, and the internal critical factors were submitted to analysis in a GUT matrix for prioritization.

The GUT Matrix stands out as a prioritization tool that can be applied in strategic planning, project management, or process management, in a way due to the simplicity of its use, with satisfactory results. Three criteria are used: Severity (G), Urgency (U), and Trend (T) help managers determi-

ne which factors are more important and require immediate action (Baldam *et al.*, 2014).

According to Queiroz *et al.* (2012), each criterion presents a form of classification: severity takes into account the level of damage that a problem or risk factor can cause; urgency is related to the time in which the effects of a certain problem should appear; and tendency relates to the unfolding of a problem if no action is taken.

**Table 1** describes the scoring scale and the prioritization form used in the GUT Matrix elaboration, which is calculated by multiplying the scores defined for each criterion.

After the GUT stratification, the SWOT Matrix 2 was finalized, listing the factors that relate to the internal environment (strengths and weaknesses) and the external environment (opportunities and threats) of the institution. The crossing of this information in the final matrix was the basis for formulating management strategies with distinct purposes but with a common goal: the achievement of better institutional performance and competitive advantage.

## RESULTS AND DISCUSSION

### UENF's budget profile

In public universities, discretionary expenses are related to investments defined by the managers of the educational institution as involving the security service, cleaning, water and sewage treatment, and purchases of materials for daily use, for example. Regardless of differences, universities are organizations that consume goods and services and should place a premium on efficient management in economic, social, and environmental aspects (Jain and Pant, 2010).

The State University of Norte Fluminense Darcy Ribeiro (UENF) has been contributing to foster scientific research and skilled labor since 1993. It is a reference for the regional socioeconomic development with its achievements in teaching, research, and extension, promoting the strengthening of institutions of Science, Technology and Innovation in the

**Table 1.** GUT Scale

Score	G	U	T	Sum	Priority
5	extremely serious	act immediately	It will worsen quickly	From 90 to 125	Critical
4	very serious	act with some urgency	It will worsen soon	From 60 to 89	High
3	serious	act as soon as possible	It will worsen in the medium term	From 30 to 59	Average
2	not very serious	can wait	It will get worse in the long term	Less than 30	Low
1	not serious	no rush	It will not worsen/may improve		

Source: Queiroz *et al.* (2012)

State of Rio de Janeiro. From 2011 to 2020 the average annual number of enrollments was 600 students and in 2021, the increase in the student body was 9.4%, which requires greater investments.

The Annual Budget Laws (LOA) from 2011 to 2020 (SEFAZ, 2021) show that the proposed budget for UENF, starting in 2015, had a relevant increase every 12 months, peaking in 2019, with a considerable decrease in 2020 (**Table 2**).

However, when compared to the data from the institution's budgetary balances for the same period, another reality is verified. From 2011 to 2014, the authorized expenditure was higher than the initial appropriation provided for in the LOA of each year, which is positive. On the other hand, from 2015 to 2019, the expenditure actually authorized by the State Government remained below the forecast for the same period, drawing attention to the year 2019, in which this difference was around 33% less. In the year 2020, this relationship remained stable, with a positive variation of less than 0.2% between the LOA and the amount actually authorized. **Figure 1** shows this evolution.

The Expenses Paid were lower than the Initial Appropriations and the Authorized Expenses throughout the historical series. This situation increases the challenge for public administration to be efficient with the restricted budget and effective in educational projects and in the application and execution of available resources, which reinforces the importance of good management strategies and strategic planning.

### Participant profile and SWOT matrix 1

**Questionnaire 1** - "Strategic Diagnosis - SWOT Analysis of UENF" was answered by 57% of all servers contacted in the survey (**Figures 2 and 3**).

In the study, an institutional cutout was used in relation to the participation of servers involved in university man-

agement, with the contribution of the Rector, the Vice-Rector, and professors who work in advisory functions and laboratory head positions, as well as professors active in teaching and research, corresponding to 29% of the respondents. Of the university's four center directors, 75% answered the questionnaire. Among the technical-administrative employees, the highest adherence was from higher level professionals (26% of the 34 participants), followed by middle level professionals and employees who hold management positions (**Figure 2**).

It can be observed that a representative sample of experienced employees who have been performing administrative, managerial, and educational functions for 16 to 20 years at the institution can be observed. Another considerable group stands out for having 21 to 28 years of working at UENF. Most interviewees are PhD professors and professionals with at least a college degree (**Figure 3**).

Both the environmental factors and the institution's own specific factors, positive and negative (**Figure 4**), were part of **Questionnaire 1**, for validation and suggestion of new relevant aspects by the participants.

### Participants' perceptions of the SWOT matrix 1

Of the 10 opportunities listed, all were mentioned by the participants. The scientific research funding agencies and the monthly transfers of twelfths have great relevance as external factors to contribute to the institutional mission, with a percentage of 76.5% each (**Table 3**).

According to 67.6% of the respondents, greater efficiency in the application of public resources could create great opportunities for the university's development. The economic development of the North and Northwest Fluminense regions, accounting for 64.7%, creates new opportunities for action, and there may be direct application of the knowledge produced, either through technical cooperation agreements with local governments, companies, or industries.

**Table 2.** UENF's Budget - 2011 to 2020

Financial Year	Initial Appropriation - LOA	Authorized Expenditures	Paid Expenses
2011	159,252,989.00	176,245,826.37	113,254,750.50
2012	151,073,687.00	165,092,539.58	124,573,139.05
2013	136,706,221.00	151,569,979.96	121,574,970.49
2014	142,399,094.00	155,803,582.38	126,524,566.88
2015	190,787,439.00	169,657,877.22	141,144,623.01
2016	182,704,294.00	161,596,645.29	127,950,813.24
2017	197,011,492.00	189,742,238.54	129,297,098.46
2018	205,434,358.00	191,075,652.50	168,044,027.84
2019	304,850,089.00	205,525,566.91	182,840,717.96
2020	263,965,838.00	264,456,655.24	172,966,416.08

Source: Elaborated from SEFAZ (2021)

The possibility of public-private partnerships was a positive factor for 61.8% of the participants. In this sense, it can implement the technological pole, promoting the execution of projects in partnership with private initiatives, using the structure and the knowledge produced by the institution to generate revenue. In the same vein, 58.8% of these employees believe that partnerships with international institutions have as a consequence the projection of the university worldwide.

According to 52.9%, the factor of developing technological innovations that cause less environmental impact favors UENF in the sense of seeking better results with environmental, social, and economic responsibility.

The A3P program - Environmental Agenda in Public Administration, developed by the Ministry of Environment in Brazil, aimed at encouraging the compatibility of consumption and investment needs of public institutions, considering socio-environmental management (Vieira et al., 2020; Brazil, 2021a), was last but no less important. This is because 35.3% believe that UENF can benefit by participating in the agenda. The last placement of this factor in the list of opportunities may be linked to the lack of knowledge of the government initiative (Vieira et al., 2020b).

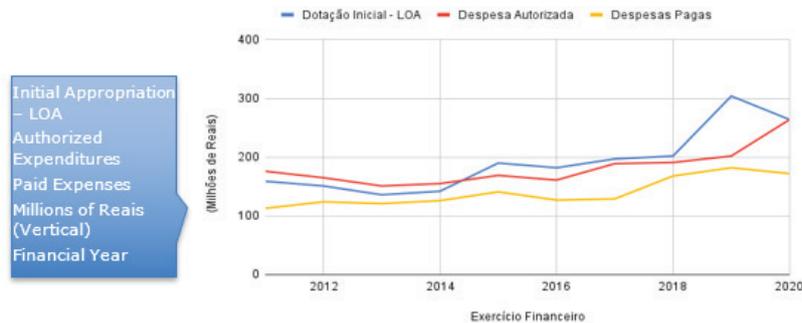


Figure 1. UENF budget evolution 2011-2020

Source: Prepared based on SEFAZ (2021) and UENF's Annual Budget Balance

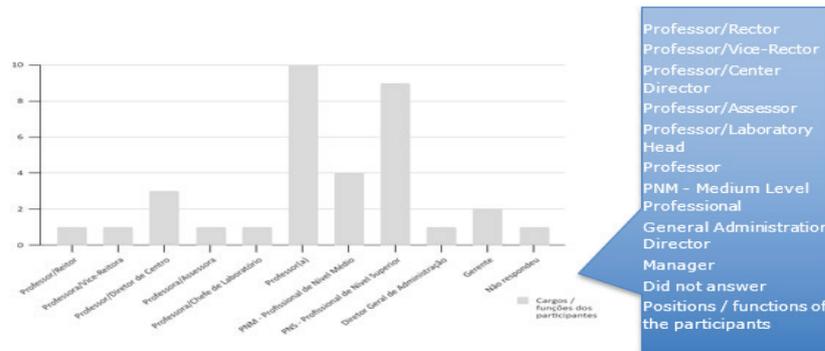


Figure 2. Servers participating in the survey by position/function

Source: The authors

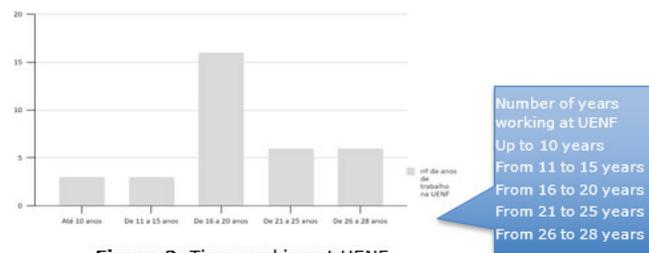


Figure 3. Time working at UENF

Source: The authors

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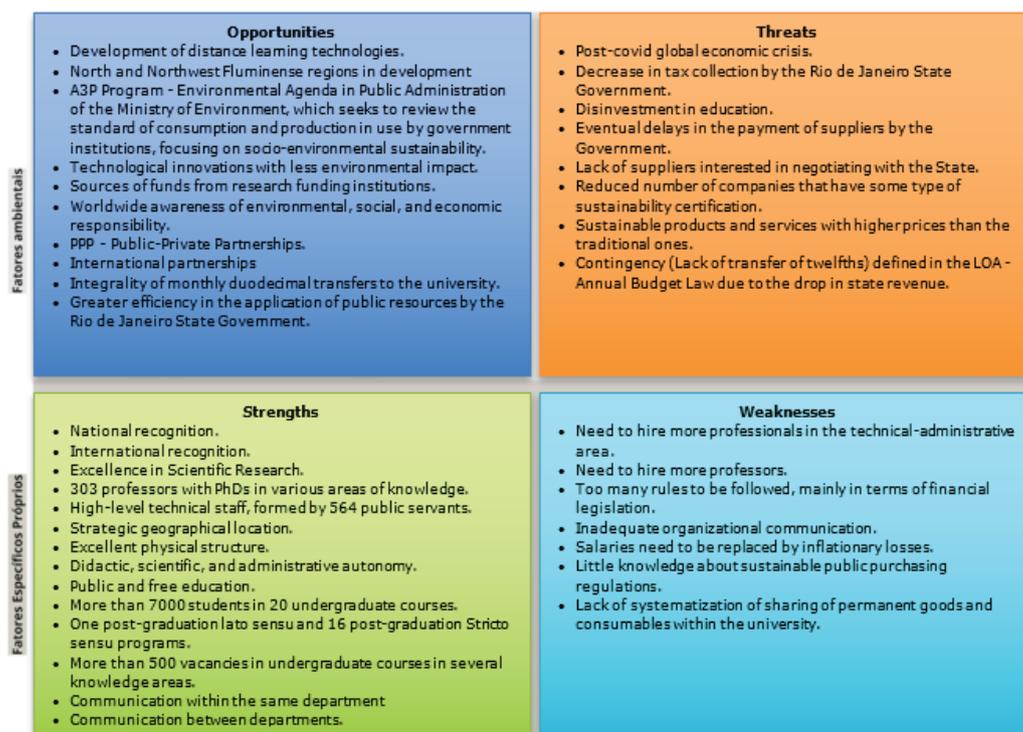


Figure 4. SWOT Matrix 1 - Proposed by the authors

Source: The authors

Table 3. Participants' perceptions of the opportunities proposed by the authors

OPPORTUNITIES	NO. OF VOTES	% OF TOTAL PARTICIPANTS
Sources of funds from research funding institutions.	26	76.5
Integrity of monthly transfers of twelfths to the University.	26	76.5
Greater efficiency in the application of public resources by the RJ State Government.	23	67.6
Development of the North and Northwest regions of Rio de Janeiro.	22	64.7
PPP - Public-private partnerships.	21	61.8
International Partnerships.	20	58.8
Technological innovations with less environmental impact.	18	52.9
Development of distance learning technologies.	14	41.2
Global awareness of environmental, social, and economic responsibility.	14	41.2
A3P Program - Environmental Agenda in Public Administration, from the Ministry of Environment, which seeks to review the consumption and production standards in use by government institutions, with a focus on socio-environmental sustainability.	12	35.3

Source: The authors

Regarding the higher education market as a whole, the fact that 91.2% of the participants consider the free tuition aspect as a major strength (Table 4) represents an important competitive strategy. According to Porter (2021), this allows gaining a competitive advantage in the educational industry by offering a differentiated service. The gratuity is a relevant competitive stimulus to attract new students.

In its staff, 100% of the teachers are PhDs with exclusive dedication and wide experience in teaching and research, which was pointed out as an essential factor in 76.5% of the answers. According to the report of the National Institute of Educational Studies and Research Anísio Teixeira (INEP), in the framework of public higher education teachers, there are two PhD professors for every three educators, configuring a mostly specialized workforce (INEP, 2019), and UENF corroborates this figure.

Another positive internal factor (70.6%) is the existence of a high-level technical staff, which interacts in all sectors of the university, in many cases, performing management functions, representing a strategic differential for the effective management of the institution.

Excellence in scientific research accounted for 67.6% of the choices. From a search in the SCOPUS database (Elsevier, 2020) for UENF's affiliation, the scientific production published in international journals since 1995 was 4,007 papers, of which 91% were scientific articles. In the Web of Science database, following the same search criteria since 1997, the number of published papers was 3725. According to the Academic System, since the beginning of the university's activities, the number of approved dissertations was 3606 and the number of theses was 1562.

UENF has been among the 15 best universities in the country since 2008 (PDI-UENF, 2016). According to a recent announcement by the Ministry of Education and Culture (MEC), the university obtained the highest score in the 2019 General Index of Courses (IGC) (INEP, 2021), and is one of only two HEIs with the highest score in the state of Rio de Janeiro.

National Recognition is also a very visible strength in the academic and technical community since 64.7% considered this aspect. The UENF Collaborations Map (Figure 5) illustrates more than 130 partnerships among individuals and with other renowned universities and institutions at national and international levels, through Covenants, Cooperation Agreements, and Memorandums of Understanding (MOU), which have had a positive impact on the institution (UENF, 2021).



Figure 5. UENF Collaborations Map (UENF, 2021).

Currently, the university offers 20 undergraduate programs, 16 of which are on-site (five undergraduate and 11 graduate), three distance learning undergraduate programs, one bimodal program, 16 graduate programs (master's and/or doctorate), and one lato sensu post-graduate program, with a student body of approximately 7,000 students. These data are considered to be a significant strength for 50% of the respondents.

Table 5 deals with the threats that can be impediments to UENF's development, according to Questionnaire 1.

The perception of 97.1% of the interviewees (Table 5) points out that the dependence on state fiscal policy is a very fragile connection, which, in periods of economic crisis, can threaten the strategic planning of the organization due to the contingency of transfers. The university has employees competent enough to manage with autonomy the funds due and parsimony when necessary.

Table 4. Participants' perceptions of the strengths proposed by the authors

STRENGTHS	NO. OF VOTES	% OF TOTAL PARTICIPANTS
Free, public education.	31	91.2
303 professors with PhDs in several areas of knowledge.	26	76.5
High level technical staff formed by 564 public servants.	24	70.6
Excellence in Scientific Research.	23	67.6
National recognition.	22	64.7
One lato sensu post-graduation and 16 Stricto sensu post-graduation programs.	17	50
Didactic, scientific, and administrative autonomy.	16	47.1
More than 7,000 students in 20 undergraduate courses.	16	47.1
Excellent physical structure.	12	35.3
Strategic geographical location.	11	32.4
More than 500 undergraduate courses in several knowledge areas offered annually.	10	29.4
International recognition.	4	11.8
Communication among people of the same department.	4	11.8
Communication between departments.	3	8.8

Source: The authors

Other relevant threats are the constant reductions in public funds directed to education, with 85.3%, according to the interviewees' opinion, reflecting the destructuring of the sector.

Rio de Janeiro is a state undergoing fiscal recovery. Therefore, the drop in tax collection and, consequently, the transfer of financial resources worries 82.4%. This fact, added to the reduction in the amount of the special participation of states and municipalities derived from oil royalties, corroborates this scenario.

The global economic crisis, which has been caused by the COVID-19 pandemic, is considered a relevant threat to the institution's purposes by 76.5%. Moreover, economic-financial issues also cause delays in payments to suppliers, generating concern in 52.9% of the interviewees.

The internal negative points have been listed in **Table 6**, with the view of the participants.

It is noted that financial autonomy is again evidenced as a point of managerial improvement to deal with the main weaknesses (**Table 6**), especially with regard to the replacement of inflationary losses in the salaries of servers, which has not occurred since 2014.

Furthermore, regarding the institution's staff, the perception is that, in addition to the outdated salaries, there is also a need to hire more professionals in the technical-administrative area (67.6%). In its history of almost 30 years, UENF has had only three public competitions for the entry of servers in this category: in 1997, 2001, and 2012. On the other hand, 58.8% consider that there is a need for more professors to join the staff. These needs occur, among other factors, due to the expansion of the university, retirements, and deaths.

### Participants' suggestions for including internal and external factors

In addition to the selection of factors proposed by the authors, the participants suggested the aspects listed in

**Figure 6**, which were grouped according to each one's nature.

**Figure 6** shows that the participants suggested more internal than external factors, an important fact to be considered in the institutional diagnosis and, in the future, in the elaboration of a strategic planning taking advantage of the existing strengths to solve the problems pointed out. Thirteen new strengths of the institution, 18 internal weaknesses, five opportunities, and four threats were suggested.

One of the forces of great relevance is the fact that UENF can expand its lines of action (teaching, research, and extension) with institutional gains and for the region, fostering economic development (industrial, agricultural, cultural, environmental, and sustainable) of the Norte Fluminense region, which lacks the diffusion and application of new technologies.

### Participants' view on sustainability at the university

The survey also verified the participants' opinions on issues involving sustainability - an important theme in the development of an institutional diagnosis. Elkington (2012) defines sustainability as the principle that ensures that our actions today will not limit the range of economic, social, and environmental options available to future generations. For Savitz (2006), the Triple Bottom Line (TBL) demonstrates its essence by measuring the impact of an organization's activities on the planet, which includes its profitability, shareholdings, and human, social, and environmental capital.

Fahim et al. (2021) point out that universities have a key role in changing people's mentality, having as a great challenge the development of means to meet contemporary demands, incorporating sustainable development into the vision, mission, and institutional values in the strategic plans and organizational culture.

**Table 5.** Participants' perceptions of the **threats** proposed by the authors

THREATS	NO. OF VOTES	% OF TOTAL PARTICIPANTS
Contingency (Lack of transfer of twelfths) defined in the LOA - Annual Budget Law due to the decline in state revenues.	33	97.1
Disinvestment in education.	29	85.3
Decrease in tax collection by the Rio de Janeiro State Government.	28	82.4
Post-Covid global economic crisis.	26	76.5
Eventual delays in the payment of suppliers by the Government.	18	52.9
Lack of suppliers interested in negotiating with the State.	17	50
Sustainable products and services with higher prices than traditional ones.	8	23.5
Reduced number of companies with some type of sustainability certification.	5	14.7

Source: The authors

**Table 6.** Participants’ perceptions of the **weaknesses** proposed by the authors

WEAKNESSES	NO. OF VOTES	% OF TOTAL PARTICIPANTS
Servers’ salaries in need of replacement due to inflationary losses.	28	82.4
Need to hire more professionals in the technical-administrative area.	23	67.6
Need to hire more professors.	20	58.8
Insufficient organizational communication.	15	44.1
Lack of systematization of sharing permanent goods and consumption materials inside the university.	14	41.2
Excess of norms to be followed, mainly in terms of financial legislation.	11	32.4
Little knowledge of sustainable public purchasing regulations.	6	17.6

Source: The authors

The existence at UENF of works adhering to various areas of knowledge, involving the 2030 Agenda for Sustainable Development objectives (UN, 2015), was one of the points mentioned by research participants. Marcuz Junior et al. (2020) point out that Brazilian public universities should participate in the effectiveness of this Agenda because Brazil is a signatory country and because of the great importance of Brazilian public institutions of higher education, many of which are part of the Network ODS Universities Brazil, including UENF (REDE ODS, 2015), and may have positive effects on developing actions on campus such as waste management, including disposal of laboratory materials, and improving water and energy management.

In this sense, considering the possibility of adopting Sustainable Public Procurement (SPP) criteria by the institution (Figure 7), being SPP a procurement of goods or services that considers environmental aspects (OECD, 2021), 82.4% of the participants marked the option “energy supply”, followed by the category “automotive vehicles”, with 52.9% of the markings, and then “daily used consumption materials (papers, disposable cups, etc.)”, with 50% of the choices.

This item demonstrates that the proper treatment of solid waste at the university, such as the screening of sewage from bathrooms and laboratories, shows the need for a policy that effectively follows the 2030 Agenda (UN, 2015). This consumption material for practical classes and the opinion that all the areas listed are relevant and that the one with the best cost/benefit ratio should be prioritized, were suggested by the participants and became part of the SWOT Matrix 2.

Sixteen of the 34 participants (47.10%) perceive these sustainable initiatives in a medium way, and only one interviewee considered these initiatives very visible (Figure 8).

Regarding the degree of environmental commitment of UENF, one participant (2.9%) considers this indicator very low. On the other hand, two servers responded that they

believe it is very high, and 19 participants (55.9%) visualize a medium level of this indicator (Figure 9).

Investments for modernization in terms of renewable energy are being sought for the installation of a photovoltaic power generation system on the roof of two buildings of UENF Research Centers to generate electricity by capturing and converting energy from sunlight, and the expansion of the research room in alternative energy with benefits in the use of this type of system and the deepening of research in this area. The project number 863577/2017 will be funded with resources from an agreement with the National Fund for Education Development (FNDE) and is in the final stage of documentation (BRASIL, 2021b).

### GUT Matrix Application

The prioritization of internal critical factors (weaknesses) identified after the voting of the servers participating in the survey, considering the severity, urgency, and tendency of these aspects, was identified using the GUT Matrix (Table 7).

According to the GUT Matrix results, the critical priority factors are the correct management of waste produced by the university, including: the disposal of laboratory materials; the definition of a proper place for the storage and handling of flammable chemicals and/or chemicals controlled by the Federal Police or the Army; and the salary situation of the institution’s employees, who have not received inflationary loss replacement since 2014, requiring immediate attention.

Next, with high criticality, are the lack of training programs for technical-administrative employees, the lack of engagement of a significant percentage of teachers and technicians in the demands of the university, and the lack of systematic internal sharing of university assets. In this sense, it could lead to better use of available resources and the improvement of water and energy management systems.

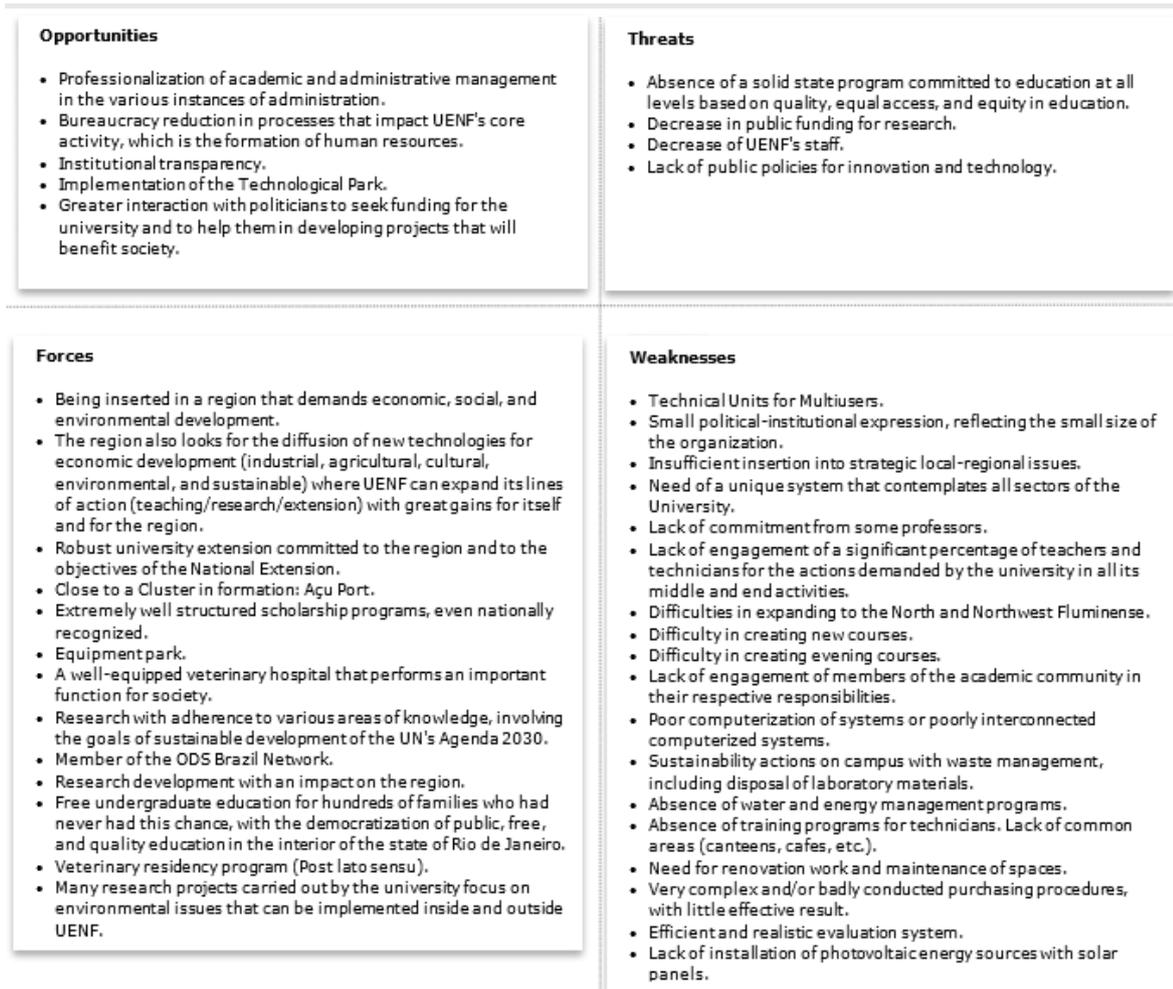


Figure 6. Participants' suggestions for including factors in the SWOT Matrix

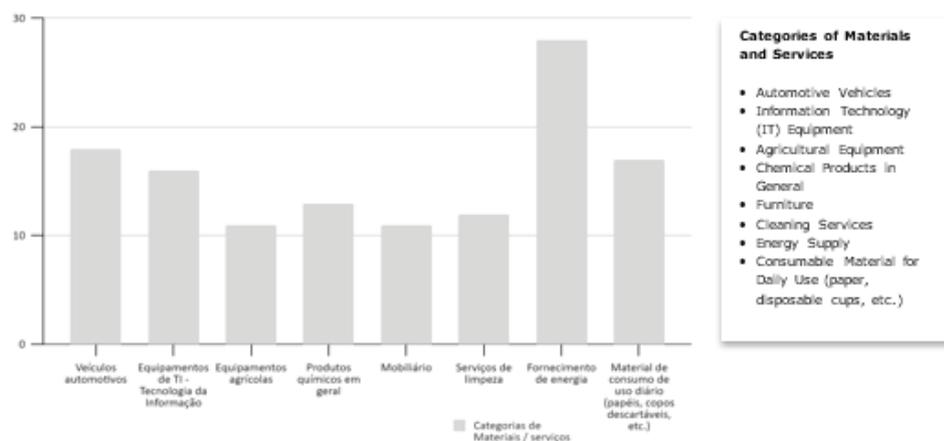


Figure 7. Prioritization in terms of sustainable hiring (according to the participants)

Source: The authors

### Construction of SWOT Matrix 2 and Strategic Diagnosis

Following the validation of **Questionnaire 2** by the university’s Rector, Vice-Rector, and Director General of Administration and after applying the GUT analysis, UENF’s SWOT 2 Matrix was designed and the strategies were defined (**Figure 10**).

The interrelationship of the strategic factors (Opportunities, Threats, Strengths, or Weaknesses) enriches the analysis and allows the identification of positive points that can be integrated in an attempt to mitigate the impacts of the negative points.

The proposition of strategies to seize opportunities and prevent threats through strengths, as well as for opportunities to minimize weaknesses and for potential dangers in the sectors where weaknesses meet threats to be reduced is the basis for the institution’s strategic planning.

The changes in the external environment, whether positive or negative, have the potential to interfere with the results of an HEI’s management; thus, the ability to perceive these changes external to the institution, adapting in an agile manner, will minimize the consequences of threats and take better advantage of opportunities (Cavalcanti and Guerra, 2019).

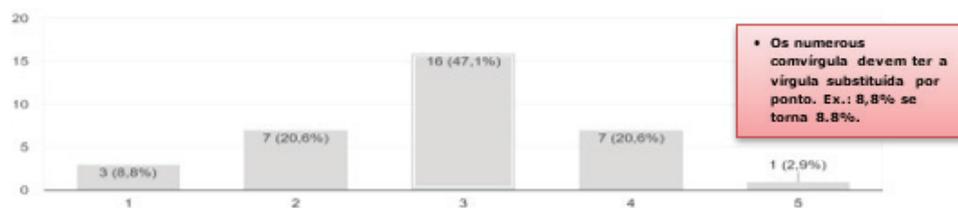
### FINAL CONSIDERATIONS

HEIs operate in a competitive environment, necessitating management methods that support their managers’ decisions, which the SWOT analysis can do effectively. The objective of this work was achieved to the extent that a global overview of the strengths, weaknesses, opportunities, and threats to UENF’s institutional mission was successfully developed.

The number of weaknesses and threats related to the financial issue stands out, especially with regard to government support in the face of the importance of the university’s research, development, innovation, and extension projects, ratified by the institution’s budget analysis from 2011 to 2020.

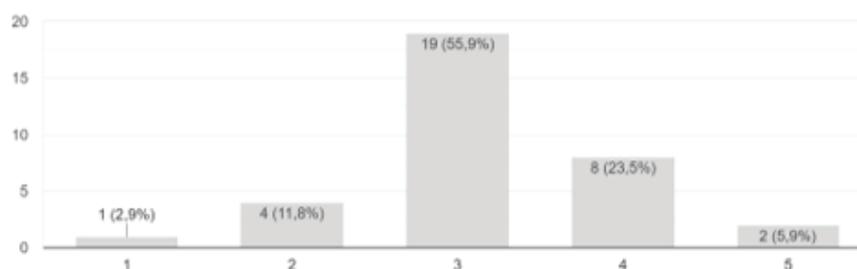
Besides improving communication internally, with legislators, and with society, increasing the visibility of educational programs and their benefits for civil and academic society, and of actions related to university administration, can contribute to fostering public-private partnerships and investments in innovation projects.

The SWOT matrix construction with the participation of the institutional grouping of servers was crucial to the visualization of a panorama that does not favor the university in aspects such as the correct storage of chemical materials that are harmful to people and the environment but essential to scientific research. The disposal of waste produced



**Figure 8.** Level of perception of sustainable initiatives at UENF

Source: The authors



**Figure 9.** Level of perception about UENF’s environmental commitment

Source: The authors

**Table 7.** GUT prioritization matrix

INTERNAL CRITICAL FACTORS	G	U	T	G*U*T	PRIORITY
Lack of a proper place for storage, handling, and disposal of flammable chemicals and/or chemicals controlled by the Federal Police or Army.	5	5	4	100	CRITICAL
Sustainability actions on campus, such as waste management, including disposal of laboratory material.	5	5	4	100	CRITICAL
Employee salaries in need of replacement of inflationary losses.	4	5	5	100	CRITICAL
Lack of Multiuser Technical Units, with systematization of sharing permanent goods and consumables within the university.	4	4	4	64	HIGH
Absence of water and energy management programs.	4	4	4	64	HIGH
Absence of training programs for technicians.	4	4	4	64	HIGH
Lack of commitment/engagement of a significant percentage of teachers and technicians for the actions demanded by the university in all its middle and end activities.	4	4	4	64	HIGH
Shortage of professionals in the technical-administrative area.	4	3	3	36	AVERAGE
Shortage of professors in some areas of knowledge.	4	3	3	36	AVERAGE
Difficulty in creating new courses, including for the evening period.	4	3	3	36	AVERAGE
Difficulties to expand the university's activities to the North and Northwest Fluminense.	3	3	3	27	LOW
Absence of social spaces (canteens, cafés, etc.).	3	3	2	18	LOW

Source: The authors

as a result of the work developed at the university and the lack of salary replacement for servers related to inflationary losses indicate a lack of immediate action to mitigate the effects of these problems.

It is recommended, for future work, the broad participation of the entire university community in the construction of a new SWOT matrix, including teachers, technicians, and students, involving all Campi UENF, as well as the opinion of society in general, serving as the basis for the preparation of an annual or biennial institutional strategic planning, an exercise to be carried out by each sector of the university with the active participation of servers, developing metrics for the monitoring and control of this planning, defining objectives and measures derived from the strategic vision of the institution from the financial, customer, internal processes, learning, and growth perspectives, as Kaplan and Norton (1997) demonstrate in the Balanced Scorecard (BSC) methodology, building the balanced indicators of institutional performance.

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Environmental Factors	Opportunities	Threats
<p><b>Own Strengths</b></p> <ul style="list-style-type: none"> <li>• Didactic, scientific, and administrative autonomy.</li> <li>• 303 professors with PhDs in various areas of knowledge.</li> <li>• High level technical staff, formed by 564 public servants.</li> <li>• Democratization of public, free, and quality education in the interior of the state of Rio de Janeiro, with the opportunity to educate hundreds of families who had never had this chance.</li> <li>• Annual offer of more than 500 vacancies in undergraduate courses in several knowledge areas.</li> <li>• Strategic geographical location, inserted in a region that demands economic, social, and environmental development, still lacking the diffusion of new technologies for economic development (industrial, agricultural, cultural, environmental, and sustainable) where UENF can expand its lines of action (teaching, research, and extension) with great gains for itself and for the region.</li> <li>• Robust university extension committed to the region and the objectives of the National Extension.</li> <li>• Extremely well-structured scholarship program, recognized nationally.</li> <li>• A well-equipped Veterinary Hospital, which performs an important function for society.</li> <li>• Research of scientific excellence, with adherence to various areas of knowledge, involving the objectives of sustainable development of the UN's Agenda 2030.</li> <li>• Development of several research projects with impact for the region, including those focused on environmental issues; many with the potential to be implemented inside and outside UENF.</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Lack of proper place for storage, handling, and disposal of flammable chemicals and/or chemicals controlled by the Federal Police or Army.</li> <li>• Sustainability actions on campus, such as waste management, including disposal of laboratory material.</li> <li>• Salaries of employees in need of replacement due to inflationary losses.</li> <li>• Lack of Multiuser Technical Units, with systematization of sharing permanent goods and consumables within the university.</li> <li>• Absence of water and energy management programs.</li> <li>• Absence of training programs for technicians.</li> <li>• Lack of commitment/engagement of a significant percentage of teachers and technicians for the actions demanded by the university in all its middle and end activities.</li> </ul>	<p><b>Strategies for making use of opportunities through strengths</b></p> <ul style="list-style-type: none"> <li>• Promoting the university on a national and international level, with greater dissemination of research and developed actions, especially on topics involving sustainability.</li> <li>• Prioritizing the efficient financial execution of resources from research funding acts.</li> <li>• Establishing ppp's for the maintenance of the Veterinary Hospital and other aspects of the university complex.</li> <li>• Implementing research with the local/regional society that can promote education and gains in the social, economic, and environmental areas through university extension.</li> <li>• Maintaining digital inclusion programs aimed at low-income students.</li> </ul>	<p><b>Strategies to prevent threats through strengths</b></p> <ul style="list-style-type: none"> <li>• Stimulating the participation of faculty members in calls for research funding.</li> <li>• Carrying out political negotiations with the State Government in order to mitigate the contingency of resources of the duodecimal provided by Law.</li> <li>• Negotiating with the government about the promotion of public competitions based on the regional and national importance of the university.</li> <li>• Promoting improvements in the organizational culture, with greater participation of public servants in university management.</li> <li>• Developing internal and external policies to foster innovation, stimulating entrepreneurship at the local and regional level and seeking other sources of funding.</li> </ul>
<p><b>Strategies for making use of opportunities to minimize weaknesses</b></p> <ul style="list-style-type: none"> <li>• Seeking approval from research funding agencies for the construction of their own place to store highly hazardous chemicals.</li> <li>• Elaborating a plan for the collection, handling, and proper disposal of all types of waste on the campuses, including a partnership with local municipalities.</li> <li>• Seeking funding for renewable energy sources.</li> <li>• Elaborating a water management plan for the campuses, including adequate rainwater collection and use.</li> <li>• Creating a center for sharing specific laboratory equipment, as well as a single registry of all purchased consumables that can be used by several laboratories.</li> <li>• Promoting constant training and capacity building offered by high-level public institutions as a way to improve the engagement of unmotivated employees.</li> <li>• Promoting participative management, with the periodic elaboration of strategic planning of the sectors.</li> </ul>	<p><b>Strategies to minimize potential dangers in sectors where weaknesses meet threats</b></p> <ul style="list-style-type: none"> <li>• Developing activities that positively and directly impact the lives of communities so the university can have more popular support.</li> <li>• Seeking greater political support for the institution.</li> <li>• Seeking international funding.</li> <li>• Creating internal policies to encourage technical and administrative staff training through extension courses, master's, and doctoral degrees in partner institutions and in the university itself.</li> <li>• Promoting greater transparency in the institution by publishing relevant data about research and financial execution on the institution's website.</li> <li>• Implementing the systematic use of performance indicators in a strategic and sectoral way, seeking to maximize institutional and administrative efficiency.</li> <li>• Promoting the improvement of communication between sectors and among public servants, with gains in efficiency and improvement of the organizational climate.</li> <li>• Implementing a knowledge management policy, disseminating information, and strengthening the bond between employees.</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Contingency (Lack of transfer of twelfths) defined in the Annual Budget Law (LOA) due to the decline in state revenues.</li> <li>• Post-COVID global economic crisis.</li> <li>• Reduction of public funds for research.</li> <li>• Lack of public competitions to meet the university's personnel.</li> <li>• Disinvestment in education.</li> <li>• Lack of public policies for Innovation and Technology.</li> <li>• Decrease in tax collection by the Rio de Janeiro State Government.</li> <li>• Absence of a solid state program committed to education at all levels based on quality, equal access, and equity in education.</li> </ul>

Figure 10. SWOT Matrix 2

Source: The authors

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**Appendix A - Questionnaire 1** - Developed by the authors and sent to the participants. [https://drive.google.com/file/d/1auYlod\\_6jiW6VICbLfbeUI8WBo6fe0bc/view?usp=sharing](https://drive.google.com/file/d/1auYlod_6jiW6VICbLfbeUI8WBo6fe0bc/view?usp=sharing)

**Appendix B - Questionnaire 2** - Validation of the SWOT Matrix after inclusion of new factors suggested by the participants and validated by three top university management. <https://drive.google.com/file/d/1N9gyAsxFoQGeUwhDQFWxthYjcQTCZjib/view?usp=sharing>

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