

## **EVALUATION OF IFES PERFORMANCE BEFORE AND DURING THE COVID-19 PANDEMIC: AN ANALYSIS BASED ON TCU INDICATORS**

### **AVALIAÇÃO DE DESEMPENHO DE IFES ANTES E DURANTE A PANDEMIA DA COVID-19: UMA ANÁLISE A PARTIR DOS INDICADORES DO TCU**

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## **ABSTRACT**

The present study proposes an analysis about the behavior of the performance indicators for IFES of TCU in 2018 and 2019, or period preceding the Emergency Remote Education (ERE) due to COVID-19 pandemic, and in 2020 and 2021, period in which emergency remote education lasted, diagnosing the performance indicators classified as efficiency, efficacy and effectiveness of the seven IFES that comprise the sample based on the TCU indicators. The indicators data were extracted from the management reports of the IFES in PB, PE and RN. The research is classified as descriptive, bibliographic and documental with a quantitative approach through the application of statistical methods. It was verified that UFPE (2018) and UNIVASP (2019) ranked first in efficiency. In the efficacy ranking, UFPE led in the two years analyzed, whereas UNIVASP ranked first in effectiveness in the four periods analyzed. In 2020 and 2021, the duration of ERE, UFPE led in the efficiency ranking in both years and in the efficacy ranking in 2020. UFRPE ranked first in efficacy in 2021.

**Keywords:** Emergency Remote Education – ERE. TCU Performance Indicators. COVID-19.

## **RESUMO**

O presente estudo se propõe a analisar o comportamento dos indicadores de desempenho para IFES do TCU, nos anos de 2018 e 2019, ou período que antecede o ensino remoto emergencial (ERE) devido à COVID-19, e, nos anos de 2020 e 2021, período em que durou o ensino remoto emergencial, diagnosticando o desempenho dos indicadores classificados como de eficiência, eficácia e efetividade das 7 IFES que compõem a amostra com base nos indicadores do TCU. Os dados dos indicadores foram extraídos dos relatórios de gestão das IFES da PB, PE e RN. A pesquisa se classifica em descritiva, bibliográfica e documental com uma abordagem quantitativa através da aplicação de métodos estatísticos. Constatou-se que ficaram em primeiro lugar em eficiência a UFPE (2018) e a UNIVASP (2019). No ranking de eficácia, a UFPE liderou nos dois anos analisados, ao passo que a UNIVASP ficou em primeiro lugar em efetividade nos 4 períodos analisados. Nos anos de 2020 e 2021, período em que durou o ERE, a UFPE liderou no ranking de eficiência nos dois anos e no de eficácia no ano de 2020. A UFRPE ficou em primeiro lugar em eficácia no ano de 2021.

**Palavras-chave:** Ensino Remoto Emergencial – ERE. Indicadores de Desempenho do TCU. COVID-19.

## **1 INTRODUCTION**

According to the data from the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2020), around 1.5 billion students in more than one hundred countries were affected by the academic interruption. On March 17, 2020, the Ministry of Education published the Ordinance n. 343 that authorizes the replacement of classroom by remote classes. In this context, Brazilian Federal Universities suspended their classroom classes (MELO *et al.*, 2020).

In that scenario, the IFES need to readjust and adapt their teaching plans, in order to offer classes, previously in classroom, to remote modality through the digital platforms, and continue with their important development role of research and extension projects and products for society.

Even with the difficulties imposed by the implementation of Emergency Remote Education without the prior planning, Federal Universities need to search solutions to continue offering quality education and ensure the entry and egress of students from the various curses of the institutions, without losing sight of academic and institutional performance required by society as a whole.

The performance of higher education institutions (IES) is analyzed from two strands: management performance and academic performance. Santos *et al.* (2017) described management performance as relative to financial, economic and budget part of the institution, while academic performance is related to the quality of teaching, research, the use of graduates in the labor market, among others. In this context, the performance indicators are used as indispensable tools for management control.

In Brazil, in order to measure comparatively the results achieved by the management of IFES, the Federal Audit Court determined – by Decision n. 408/2002 – that they should publish nine performance indicators in their management reports in order to develop a historical series and serve as a tool for monitoring the performance of entities. Yet, the performance indicators constitute a feedback tool for the organizational learning process (SANTOS *et al.*, 2017).

From the foregoing, the work is justified by the contribution of informing the IFES performance in the period of important change in academic education, in which it was necessary to rethink and reconstruct the way the Federal Universities operate to avoid complete interruption of their operation during the pandemic period.

Given the above, this paper aims to answer the following research question: Through the TCU indicators, what is the IFES performance, before and during the COVID-19 pandemic? Therefore, it aims to evaluate the IFES performance before and during the COVID-19 pandemic based on the TCU indicators.

## **2 THEORETICAL REFERENTIAL**

In order to support the research, it was analyzed about the emergency remote education (ERE), the performance indicators – classified in efficiency, efficacy and effectiveness, as proposed by Santos *et al.* (2017) – and the selection of variables for the study. To this end, this chapter refers to the theoretical framework based on the literature about it.

### **2.1 EDUCAÇÃO REMOTA EMERGENCIAL EM TEMPOS DE COVID-19**

Due to the emergence of the Sars-Cov-2, a viral infection has spread around the world, causing a pandemic. There was a need to comply with distancing measures, contributing to various sectors interrupted their classroom activities. In this perspective, the academic routine was also affected (MELO *et al.*, 2020). In middle of 2020, about 70% of students around the world were unable to attend classes. Considering the context, several countries adopted school attendance strategies through the mediation of digital information and communication technologies. However, the remote education strategy presented reports of impasses regarding to management and implementation of remote learning due to several aspects such as difficulties of students and teacher to attending classes and inaccessibility to information and communication technologies by part of the population (ARRUDA, 2020).

Then, Arruda (2020) argued that the Ministry of Education – MEC indicated the possibility of using the distance modality in higher education as a measure to enable the continuity of teaching-learning process in Brazil, according to Ordinance n. 343/2020, and, later, it presented the Provisional Measure n. 934 that removed the requirement to comply 200 school days, maintaining the minimum workload in different educational levels. Making decisions concerning the operating model of elementary education was placed under the care of States that have taken initiatives which were targeted to the replacement of classroom education by remote classes or adoption of distance modality in elementary education.

Therefore, educational institutions, including higher education, adapted their teaching plans and performance evaluation of students for the remote modality based on the use of information and communication technologies systems.

Emergency Remote Education (ERE) is different from Distance Education, in sense that the first refers to a temporary change in the way of ministering the curriculum content for the remote and digital model, due to the crisis situation. Distance Education is a comprehensive concept because it implies not only in the use of on-line, but also analogical systems, such as printed materials (ARRUDA, 2020).

It was emphasized that educational institutions did not have a previous planning for a possible change in the way of teaching the curriculum contents, even though it was temporary. The shift to digital and remote learning had to be implemented to avoid damage that a total interruption of teaching could bring students and society as a whole.

As federal institutions of higher education (IFES), the federal universities linked to the Ministry of Education (MEC) enjoy didactic-scientific, administrative, financial and patrimonial management autonomy, as well as they offer f classroom and distance courses. However, due the pandemic, the Ordinance MEC n. 544 of June 17, 2020, was published and it authorized the replacement of classroom by remote classes while the COVID-19 pandemic persists (BRASIL, 2020).

Melo *et al.* (2020) pointed out that the interruption of classroom education due the COVID-19 pandemic and subsequent implementation of remote modality brought a number of challenges, such as: difficulty in performing practical activities, demand for digital aids for acquisition of Internet and electronics tools, lack of ability for the use of digital tools, both by educators and students. In their research, the authors analyzed that there were delays in the provision of financial aids for digital inclusion and many public universities were against the implementation of remote education due to lack of conditions to offer support for vulnerable students and because they feared the loss of the quality of teaching.

In general, IFES took time to implement an action plan either by the internal bureaucracy that afflicts administrative resources or, even, due to movements opposed to remote education (MELO *et al.*, 2020). According to the same authors, despite the initial resistance, most universities have adopted remote education as a way of continuing teaching in the research, extension and educational context, and it resulted in relative success in implementation, especially among universities in the Northeast, Southeast and South, which

offered more than one remote period. The pioneering universities in adhering to remote education are located in the Northeast and Southeast.

The role of IFES in society ranges from the training of professionals able to join the workforce to their contribution to science and community through research and extension. Thanks to the successful implementation of their activities remotely and digitally, universities have continued to fulfill their role, making an important contribution to Brazil in combat against COVID-19 pandemic.

Emergency Remote Education lasted from March 17, 2020 to early 2022, when the IFES gradually returned to classroom education, guided by Resolution CNE/CP n. 2 of August 5, 202, and internal resolutions.

## 2.2 EFICIÊNCIA, EFICÁCIA, EFETIVIDADE E OS INDICADORES DE DESEMPENHO DO TCU

The pressure for efficiency and quality of teaching in public higher education has been constant (DOMBROSKI; SANTOS; VOESE, 2019). In Brazil, the Federal Audit Court (TCU), based on the argument that universities should prioritize efficiency and effectiveness in managing their resources with focus on better results, established by Decision n. 408/2002 that IFES should show nine performance indicators in their Management Reports (SOARES, 2018).

Maximiano (2021) defined efficiency as the way the organization uses its resources productively and economically or how it uses a smaller number of resources to produce more. The author defines efficacy as the word that indicates that the organization accomplishes its objectives: the higher the degree of achievement of objectives, the more effective the organization is. Finally, Maximiano (2021) conceptualized effectiveness as synonymous with the word 'impact', where it was evaluated by the final effects of the objectives achieved. Then, it was possible to analyze the IFES performance from these three concepts, considering the management indicators proposed for the institutions by the TCU.

According to Santos *et al.* (2017), the Implement Regulation n. 5 of December 28, 2007, Annex 5, (Ordinance n. 1.950/2007), the TCU indexes were determined by the following groups of indicators: efficiency, efficacy and effectiveness, in which the efficiency measures established the relationship between results obtained and results employed; the efficacy measures refer to the result or even the comparison of planned with objectives met; the effectiveness measures were related to the effective result and the impacts of the unit's



performance that follow its institutional responsibilities. The, each group of TCU indicators has parameters in its definitions. The Chart 1 below organizes the indicators according to the author's classification in indicators of efficiency, efficacy and effectiveness.

**Chart 1** Description of efficiency, efficacy and effectiveness indicators

TYPE	INDICATOR	DESCRIPTION	OBJECTIVE	AUTHORS
EFFICIENCY	Current cost / Equivalent student (CCAIE)	It represents the current expenditure per student and its value on the expenses in the institution. Criterion minimized by considering that the lowest is equivalent to the best efficiency.	It aims to measure the current expenses per students, searching to present how to resources allocated in the production of education and research are being used. The criterion of minimization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
	Full-time student / Equivalent professor (ATIPE)	Ratio that indicates how many full-time students there are for each equivalent professor in the institution.	It establishes a productivity measure of teaching resources of the institution. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
	Full-time student / Equivalent employee (ATIFE)	Ratio that indicates how many full-time students there are for each equivalent employee in the institution.	It establishes a productivity measure of the technical-administrative resources of the institution. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
	Equivalent employee / Equivalent professor (FEPE)	It represents the size of the indirect support team to the student and the professor, and the size of the support and direct service team to the student, having a direct relationship with his/her education.	It is a productivity indicator complementary to indicators II and III and it tends to quantify the composition of human resources, regarding to the middle and end activities of the institution. The criterion of minimization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
EFFICACY	CAPES Concept (CCAPES)	It is an evaluation indicator of the quality of post-graduation courses. A better concept for post-graduation courses may have a positive relationship with the performance of graduation students, considering that a better post-graduation should also indicate a higher quality graduation education.	It is a quality indicator of the post-graduation courses of the IFES. It aims to quantify the average concept of the post-graduation courses of the institution. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
	Faculty Qualification Index (IQCD)	It represents the qualification of the professors in regarding to their degree, that is, the better the qualification, the better prepared and more involved with the research, extension and educational activities.	It aims to measure the qualification of the faculty of the institution based on the degree of professors. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).

TYPE	INDICATOR	DESCRIPTION	OBJECTIVE	AUTHORS
	Graduation Success Rate (TSG)	It represents the number of students who complete the course in the expected duration, reflecting directly on the quality and investments in assistance, scholarships, housing and restaurants by the institutions.	It identifies the index of students who completed the degree in the standard duration time provided for each course, presenting the relationship between the number of graduates and the total number of incoming students. The criterion on maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
EFFECTIVENESS	Degree of student participation (GPE)	It aims to present the degree in which the students use the capacity installed in IES and the speed of curricular integration, suggesting that the more full-time students, the better will be for their education and, possibly, the better their future performance.	It quantifies the intensity of utilization of the installed capacity of the university by the students and the speed of curricular integration. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).
	Degree of Involvement with the Post-Graduation (GEPG)	It aims to show the degree of involvement in research and post-graduation activities, where broad student involvement favors their performance, and more investments in new laboratories, libraries, groups and research projects, scholarships, among others.	It aims to point out the relationship between the number of students linked to master and doctoral programs and the total number of students enrolled in graduation and post-graduation courses. The criterion of maximization was adopted.	Nora (2014), Santos <i>et al.</i> (2017), Lima (2019).

Source: Adapted from studies of Nora (2014), Santos *et al.* (2017), Lima (2019).

Como se pôde perceber, os indicadores de produtividade relativos às questões de eficiência, eficácia e efetividade foram explanados considerando os fatores que são observados relativos à produtividade.

As can be seen, the productivity indicators related to the issues of efficiency, efficacy and effectiveness were explained in view of factors that were observed related to productivity.

### 2.2.1 Correlates Studies on the Theme

The studies presented below were developed on the theme of performance evaluation and its different approaches in the context of higher education institutions.

Santos *et al.* (2017) analyzed the Federal Institutions of Higher Education (IFES) regarding the degree of efficiency of the resources applied based on the management indicators of Federal Audit Court (TCU). The results obtained by applying the multivariate statistics of the data and their analysis contribute significantly to the provision of elements



that allow regulatory agencies to diagnose effectively possible deficiencies in public management, as well allowing the prospection of long-term strategies to correct any failures in the processes of performance evaluation and budget execution.

Melonio (2017) analyzed the efficiency of the IFES in regarding to the expenditures of public resources in REUNI (2010 a 2012) and post-REUNI period (2013 a 2015). The performance indicators of Federal Audit Court (TCU) were used to analyze the quality of spending on IFES. Based on the results presented in the research, it was not possible to affirm that the end of the REUNI project has directly impacted the IFES performance, but it was evident to verify aspects that indicate the occurrence of significant changes.

Ferreira, Santos and Pessanha (2013) conducted a study with the objective of analyzing the indicators established by the TCU for IFES in order to identify relationships between the various evaluative areas, through an exploratory analysis with comparative basis. As a result, the research verified what input indicators exert more influence on the performance universities, relevant the fact that the quality indicators of professors and the degree of involvement with post-graduation courses present as the most important to obtain better results in the CAPES evaluation and for a more expeditious curricular integration.

Lima (2019) developed the research work through the Multicriteria analysis to evaluate the performance of Federal Universities belonging to Brazilian Northeastern region concerning to the management indicators established by the TCU and Indicators applied to public balance sheets, from 2015 to 2017. As a result, the author points out that this comparative evaluation becomes useful to highlight what institutions have excelled in public management. In addition, the analysis allows the managers of these institutions to identify and analyze the situation in which their performance is found, and it can provide subsidies for the control agencies, civil society and other stakeholders to monitor institutional activities that contribute large amounts of public resources.

Freire, Barbosa e Crisostomo (2011) conducted their research with the objective of analyzing possible relationships between management indicators of the IFES (TCU indicators) and student performance assessed through the National Student Performance Exam (ENADE). For this purpose, a sample of 52 IFES was investigated from 2006 to 2008. In fact, the results indicated that some management indicators seem to be able to influence student performance. For example, it was the case of the cost per students that had a positive effect of student performance.

Dombroski, Santos e Voese (2019) developed a study that analyzed the relationship between management indicators proposed by the Federal Audit Court (TCU) for the Federal Institutions of Higher Education (IFES) with the rankings General Courses Index (ICG) and the University Ranking of Folha from 2013 to 2017. Among the main results obtained, it was noteworthy that the following management indicators: student cost, degree of involvement with post-graduation courses and the amount of students helped by a professor were explanatory variables of both RUF and IGC.

Paula and Almeida (2020) wrote an article that aims to analyze the possible differences and influences of the Program to Support Plans for Restructuring and Expansion of Federal Universities (REUNI) about the evolution of performance indicators of Brazilian Federal of Higher Education (IFES). The results showed an increase in expenditures to maintain new and reformed university structures, improvements in the level of involvement and faculty graduation which reflected increasing the average concept of the courses evaluated by the Coordination for Improvement of Higher Education Personnel (CAPES).

Nora (2014) developed a study with the objective to analyze and compare the performance indicators of IFES in the Southern Region of Brazil in the period between 2007 and 2011, aiming to relate the to the academic performance of these institutions, measured through the General Course Index (IGC). The research showed an analysis of possible relationships between the Performance Indicators and the concepts obtained in IGC. Moreover, it was noteworthy that international studies can be observed on the theme, according to the examples that will be highlighted below.

Initially, Berlanga and Corti (2022) conducted a study with the objective of proposing a model to obtain performance rankings for universities, regardless their size, public or nature, taking into account the production of teaching, research and global production.

Reis *et al.* (2021) developed a study on students' perception before and during COVID-19 pandemic about the change in higher education to the online modality with exploratory research, which aimed to perceive these differences in perceptions, performance indicators of institutional professors in relation to the quality evaluation system in a Portuguese Higher Education Institute.

Camilleri (2021) analyzed systematically the quality of higher education service, discussing the opportunities and challenges faced by higher education institutions (IES) after the outbreak of the coronavirus (COVID-19) pandemic. The conclusion of the study was that

IES leaders should adopt online education models and virtual systems, because they are here to remain in the post-COVID-19 era.

As observed, there were several initiatives on the theme of performance measurement in the context of IFES and that reinforce the relevance of the debate to the perspective of public management. However, it was understood that the study innovates as it aims to combine the use of performance measures in the public sector and multicriteria analysis.

### **3 METHODOLOGY**

This research was classified as quantitative in its approach, where it aimed to observe, record and correlate facts or phenomena without manipulating them (CERVO; BERVAN; SILVA, 2007). It was also descriptive in regarding the objectives, bibliographical as to the sources and documentary as to the technical procedures. For the study, the multicriteria analysis was adopted through the PROMETHEE II method, using the Visual PROMETHEE software

There were several indicators that can measure the IFES performance, but the preparation of indicators by the TCU facilitated the standardization and availability of this information through the Management Reports of Universities (MELONIO, 2017).

The study sample consisted of the seven Federal Universities of Paraíba, Pernambuco and Rio Grande do Norte, a total of eight IFES namely: Federal University of Paraíba (UFPB), Federal University of Campina Grande (UFCG), Federal University of Pernambuco (UFPE), Federal Rural University of Pernambuco (UFRPE), Federal University of San Francisco Valley (UNIVASF), Federal University of Rio Grande do Norte (UFRN) and Federal Rural University of the Semi-Arid (UFERSA). Information available from 2018 to 2021 was used, though the management reports of these IFES, from which the data referring to the TCU performance indicators were extracted. It was emphasized that the Federal University of the Agreste of Pernambuco (UFAPE) was not included in the research due to the lack of information in its management reports, possibly because it was created in 2018, from the Federal Law n. 13.651, of April 11 2018. Thus, in Chart 2, the parameters for the application of the PROMETHEE II method were defined especially the Usual Type I function:

**Chart 2** Parameters established in PROMETHEE II

Parameter	Definition
Type of Criteria	Maximization
Criteria Weight	Equal (1,0)
Preference Function	Usual $u_j(x_i) - u_j(x_k) > 0 \quad P_j(x_i, x_k) = 1$ $u_j(x_i) - u_j(x_k) \leq 0 \quad P_j(x_i, x_k) = 0$
Thresholds	Non-Existent

Source: Bezerra and Carvalho (2018).

Regarding to the type of criterion used, it was considered that, as shown in Chart 1, seven indicators that, given their nature, have the characteristic of maximization, that is, the higher the values for these criteria, the better the performance of the alternative. Only the variable current cost per equivalent student (CCAIE) and equivalent employee per equivalent professor (FEPE) presented the characteristic of maximization, that is, the lower the value presented the better the performance. The weight defined for each indicated was equal (1,0), that is, for the research, it was chosen by not distinguishing between the nine indicators associated the performance of universities.

The indicators were also organized according to the classification brought by Santos *et al.* (2017) in indicators of efficiency, efficacy and effectiveness, as indicated in Chart 3 namely:

**Chart 3** Indicators

Efficiency Indicators - CCAIE, ATIPE, ATIFE and FEPE;
Efficacy Indicators - CCAPES, IQCD and TSG
Effectiveness Indicators – GPE and GEPG

Fonte: Bezerra e Carvalho (2018).

Based on the classification above, it was possible to analyze the occurrence of the indicators chosen in 2018 and 2019, that is, a period that precedes emergency remote education due to COVID-19 education, as well as 2020 and 2021, a time when the ERE lasted, diagnosing indicators performance classified as efficiency, efficacy and effectiveness of seven IFES comprised the study sample.

## 4 ANALYSIS OF RESULTS

### 4.1 CONTEXT OF 2018

When considering the results of the management indicators of the TCU, in 2018 (Table 1), it was possible to observe that UFPE ranked first in the ranking of indicators that measure the efficiency of IFES, which are the CCAE, ATIPE and FEPE. The result is due to the fact that the Phi of the institution was of 0.92. This means that it performed better when analyzing the current cost per equivalent professor (ATIPE), the ratio between full-time students and equivalent professor (ATIFE) and the ratio between equivalent employee and equivalent professor (FEPE). According to Santos *et al.* (2017), efficiency is reflected in the relationship between results obtained and resources employed. Thus, UFPE used more efficiently the resources employed in the institution.

The effectiveness indicators are the Degree of student participation (GPE), which shows the use of installed capacity of the university and the speed of cuticular integration, and the Degree on involvement with the post-graduation (GEPG), which aims to point out the relationship between the number of students linked to master and doctoral programs, as well as the total number of students enrolled in graduation and post-graduation courses. Santos *et al.* (2017) related the effectiveness to the effective results and the impacts of the unit's performance that fulfill its institutional responsibilities. In 2018, UNIVASP presented Phi of 1.0, that is, it overcomes all the IFES analyzed by demonstrating its best performance in regarding to effectiveness.

**Table 1** Efficiency, Efficacy and Effectiveness Indicators – Context of 2018

Efficiency Indicators 2018			Efficacy Indicators 2018			Effectiveness Indicators 2018								
Ranking	Action	Phi	Ranking	Action	Phi	Ranking	Action	Phi	Ranking	Action	Phi	Ranking	Action	Phi
1	UFPE	0,92	1	UFPE	0,92	1	UFPE	0,92	1	UFPE	0,92	1	UFPE	0,92
2	UFERSA	0,33	2	UFERSA	0,33	2	UFERSA	0,33	2	UFERSA	0,33	2	UFERSA	0,33
3	UFRN	0,25	3	UFRN	0,25	3	UFRN	0,25	3	UFRN	0,25	3	UFRN	0,25
4	UFCG	0,00	4	UFCG	0,00	4	UFCG	0,00	4	UFCG	0,00	4	UFCG	0,00
5	UNIVASP	-0,17	5	UNIVASP	-0,17	5	UNIVASP	-0,17	5	UNIVASP	-0,17	5	UNIVASP	-0,17
6	UFPB	-0,42	6	UFPB	-0,42	6	UFPB	-0,42	6	UFPB	-0,42	6	UFPB	-0,42
7	UFRPE	-0,92	7	UFRPE	-0,92	7	UFRPE	-0,92	7	UFRPE	-0,92	7	UFRPE	-0,92

Source: Prepared by the authors (2022).

Regarding to the efficacy indicators indicated by the TCU, UFPE presented the Phi of 0.78 during the context of 2018. This group of indicators analyzed data from the Caps Concept (CCAPES), the Faculty Qualification Index (IQCD) and the Graduation Success

Rate (TSG). It is important to note that TSG represents the relationship between the number of graduates and the total number of incoming students. This set of indicators refers to the results or even to the comparison of the planned with the objectives achieved by IFE (SANTOS *et al.*, 2017).

**Table 2** TCU Indicators - Context of 2018

<b>Ranking</b>	<b>action</b>	<b>Phi</b>	<b>Phi+</b>	<b>Phi-</b>
1	UFPE	0,74	0,87	0,13
2	UFRN	0,24	0,61	0,37
3	UNIVASP	-0,04	0,48	0,52
4	UFPB	-0,07	0,46	0,54
5	UFCG	-0,11	0,44	0,56
6	UFERSA	-0,24	0,37	0,61
7	UFRPE	-0,52	0,24	0,76

Fonte: Elaboração própria (2022).

#### 4.2 CONTEXT OF 2019

Considering the results of the TCU management indicators (Table 3), in 2019, it was possible to observe that UNIVASP ranked first in the ranking of indicators that measure the efficiency of IFES. The result was due to the Phi of the institution, that is, the value of 0.71. From the Nora's study (2014), it means that IFES stood out in the productivity indexes resources of professors, technical-administrative employees and lower costs per student. Thus, it was understood that UNIVASP had better performance in the management of direct and indirect resources in the education of its students in 2019.

In the TCU indicators that indicated better efficacy and effectiveness, in 2019, the context was the same as 2018, when UFPE ranked first in effectiveness, with Phi of 0.89, and UNIVASP ranked first in effectiveness, with Phi of 1.0. Thus, based on the studies of Santos *et al.* (2017) and Nora (2014), it was verified that these IFES stood out in the degree of utilization of the installed capacity of the university and that their students present had a high degree of involvement with the post-graduation courses, reflecting the best performance of them.



**Table 3** Efficiency, Efficacy and Effectiveness Indicators – Context of 2019

Efficiency Indicators 2019					Efficacy Indicators 2019					Effectiveness Indicators 2019				
Rank	action	Phi	Phi+	Phi-	Rank	action	Phi	Phi+	Phi-	Rank	action	Phi	Phi+	Phi-
1	UNIVASP	0,71	0,83	0,13	1	UFPE	0,89	0,94	0,06	1	UNIVASP	1,00	1,00	0,00
2	UFERSA	0,50	0,63	0,13	2	UFRPE	0,22	0,61	0,39	2	UFPE	0,50	0,75	0,25
3	UFPE	0,46	0,71	0,25	3	UFPB	0,17	0,56	0,39	2	UFRN	0,50	0,75	0,25
4	UFRN	-0,04	0,46	0,50	4	UFRN	0,00	0,50	0,50	4	UFPB	0,00	0,50	0,50
5	UFCG	-0,29	0,33	0,63	5	UFCG	-0,17	0,39	0,56	5	UFCG	-0,50	0,25	0,75
6	UFRPE	-0,63	0,17	0,79	6	UFERSA	-0,44	0,28	0,72	6	UFERSA	-0,67	0,17	0,83
7	UFPB	-0,71	0,13	0,83	7	UNIVASP	-0,67	0,17	0,83	7	UFRPE	-0,83	0,08	0,92

Source: Prepared by the authors (2022).

**Table 4** TCU Indicators – Context of 2019

<i>Ranking</i>	<i>action</i>	<i>Phi</i>	<i>Phi+</i>	<i>Phi-</i>
1	UFPE	0,61	0,80	0,19
2	UNIVASP	0,31	0,65	0,33
3	UFRN	0,09	0,54	0,44
4	UFERSA	-0,07	0,41	0,48
5	UFPB	-0,26	0,35	0,61
6	UFCG	-0,30	0,33	0,63
7	UFRPE	-0,39	0,30	0,69

Source: Prepared by the authors (2022).

#### 4.3 CONTEXT OF 2020

The context of 2020 (Table 5) presented UFPE as the best in efficiency and efficacy, with Phi referring to efficiency indicators of 0.75 and Phi effectiveness of 0.89. Once again, UNIVASP presented the best performance in effectiveness, with Phi of 1.0. The indicators that most declined in the pandemic period form the TSG and the GPE. The graduation success rate (TSG) is translated into the number of students who finished the course on time, reflecting on quality and investments.

The degree of student participation quantified the intensity of use of the installed capacity of the university and the speed of curricular integration (NORA, 2014). The results were very affected in the pandemic period because the delay in the implementation of remote education difficulted the beginning of curricular integration, and consequently, it caused a reduction in the number of graduates on the campuses.

**Table 5** Efficiency, Efficacy and Effectiveness Indicators – Context of 2020

Efficiency Indicators 2020					Efficacy Indicators 2020					Effectiveness Indicators 2020				
Ranking	action	Phi	Phi+	Phi-	Ranking	action	Phi	Phi+	Phi-	Ranking	action	Phi	Phi+	Phi-
1	UFPE	0,75	0,88	0,13	1	UFPE	0,89	0,94	0,06	1	UNIVASP	1,00	1,00	0,00
1	UFRN	0,75	0,88	0,13	2	UFPB	0,28	0,61	0,33	2	UFPE	0,50	0,75	0,25
3	UFCG	-0,08	0,46	0,54	3	UFRPE	0,22	0,61	0,39	2	UFRN	0,50	0,75	0,25
4	UNIVASP	-0,17	0,42	0,58	4	UFRN	0,00	0,50	0,50	4	UFPB	-0,08	0,42	0,50
5	UFPB	-0,33	0,33	0,67	5	UFCG	-0,28	0,33	0,61	5	UFCG	-0,33	0,25	0,58
6	UFERSA	-0,42	0,29	0,71	6	UFERSA	-0,33	0,33	0,67	6	UFRPE	-0,58	0,17	0,75
7	UFRPE	-0,50	0,25	0,75	7	UNIVASP	-0,78	0,11	0,89	7	UFERSA	-1,00	0,00	1,00

Source: Prepared by the authors (2022).

**Table 6** TCU Indicators – Context of 2020

Ranking	Institution	Phi	Phi+	Phi-
1	UFPE	0,74	0,87	0,13
2	UFRN	0,22	0,61	0,39
3	UNIVASP	0,04	0,52	0,48
4	UFPB	0,00	0,48	0,48
5	UFCG	-0,28	0,33	0,61
6	UFERSA	-0,30	0,35	0,65
7	UFRPE	-0,43	0,28	0,70

Source: Prepared by the authors (2022).

The contexts of universities presented above in Table 5 and 6 – related to the 2020 – have been UFPE highlighting the indicators of efficiency and efficacy, while UNIVASF prevailing in the effectiveness indexes.

#### 4.4 CONTEXT OF 2021

The context of 2021 (Table 7) presented UFPE, UFRN and UFERSA tied in efficiency, with Phi of 0.42 in each institution. It is translated into better cost performance in institutions, the productivity of education and technical-administrative resources, generating a better service to students, contributing to their training (SANTOS *et al.*, 2017; NORA, 2014).

In the efficacy indicators, which refer to the indicators that represents the achievement of the final objectives, the first place in the ranking was the UFRPE, with the Phi of 0.78 This Phi is due to the better performance of IFES in the CCAPES and IQCD indicators.

In 2021, it was verified the retention of students demonstrated from the decline of the indicator graduation success rate (TSG), which had a reduction of more than 50% in some of the IFES.

Again, UNIVASP presented the best performance in effectiveness, with Phi of 1.0.

**Table 7** Efficiency, Efficacy and Effectiveness Indicators – Context of 2021

Efficiency Indicators 2021					Efficacy Indicators 2021					Effectiveness Indicators 2021				
Rank	action	Phi	Phi+	Phi-	Rank	action	Phi	Phi+	Phi-	Rank	action	Phi	Phi+	Phi-
1	UFPE	0,42	0,71	0,29	1	UFRPE	0,78	0,89	0,11	1	UNIVASP	1,00	1,00	0,00
2	UFRN	0,42	0,71	0,29	2	UFPE	0,67	0,83	0,17	2	UFPE	0,33	0,67	0,33
2	UFERSA	0,42	0,71	0,29	3	UFPB	0,22	0,61	0,39	2	UFRN	0,33	0,67	0,33
4	UFCG	-0,17	0,42	0,58	4	UFRN	0,00	0,50	0,50	4	UFRPE	0,08	0,50	0,42
5	UFPB	-0,21	0,38	0,58	5	UFERSA	-0,22	0,39	0,61	5	UFPB	-0,33	0,33	0,67
6	UFRPE	-0,25	0,38	0,63	6	UFCG	-0,67	0,17	0,83	6	UFERSA	-0,67	0,17	0,83
7	UNIVASP	-0,63	0,17	0,79	7	UNIVASP	-0,78	0,11	0,89	7	UFCG	-0,75	0,08	0,83

Fonte: Elaboração própria (2022).

**Table 8** TCU Indicators – Context of 2021

Rank	action	Phi	Phi+	Phi-
1	UFPE	0,48	0,74	0,26
2	UFRN	0,26	0,63	0,37
3	UFRPE	0,17	0,57	0,41
4	UFERSA	-0,04	0,48	0,52
5	UFPB	-0,09	0,44	0,54
6	UNIVASP	-0,31	0,33	0,65
7	UFCG	-0,46	0,26	0,72

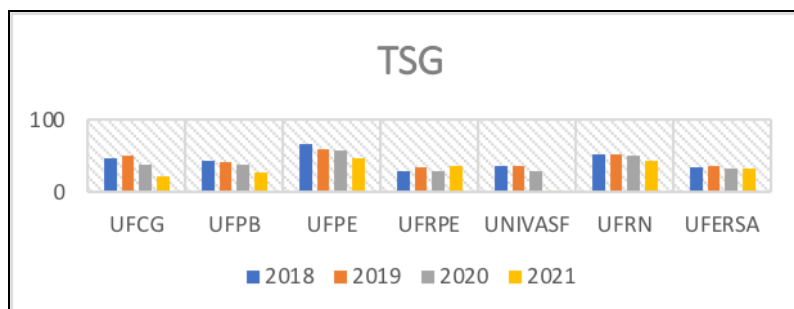
Source: Prepared by the authors (2022).

It was verified that UFPE remained ahead in the overall ranking of performance by multicriteria analysis in all contexts, both in the period preceding Emergency Remote Education (ERE) as a result of COVID-19 (2018 and 2019), and in the period that lasted the ERE (2020 and 2021).

In the periods covered in the research, the indicator that most showed the difficulties faced for the implementation of ERE by IFES was the TSG, where UFPE stood out the best performance, which had a graduation success rate of 66,62% in 2018 and decreased to 46,3% in 2021. In contrast to, the TSG of UNIVASP, which was 34,91%, in 2018, decreased to 2,12% in 2021. According to Santos *et al.* (2017), the index indicates a “reprisal” of students in the period. The decline in the TSG was observed in all the IFES of the sample, which

reflects that the delay in the implementation of the ERE resulted in the delay of the completion of several academic periods, where the costs and structure could not be properly used by the students.

**Graph 1** TSG: Period 2018-2021



Source: Prepared by the authors (2022).

## 5 FINAL CONSIDERATIONS

In this research, it was sought to evaluate the performance of IFES in PB, PE and RN regarding to efficiency, efficacy and effectiveness based on multicriteria analysis of the indicators established by the TCU, during the period preceding the ERE due to COVID-19 pandemic (2018 and 2019) and in the period of emergency remote education (2020 and 2021). Seven Federal Universities were analyzed through data extracted from their management reports.

From the classification brought by Santos *et al.* (2017), in which nine TCU management indicators were divided into efficiency (CCAIE, ATIPE, ATIFE e FEPE), efficacy (CCAPE, IQCD e TSG) and effectiveness (GPE e GEPG), and the multicriteria method PROMETHEE II was applied in each group of indicators in order to establish performance ranking among the IFES considered.

From the classification, it was possible to analyze the behavior of the chosen indicators, in the years 2018 and 2019, or period that preceded the emergency remote education due to COVID-19 pandemic, which UFPE (2018) and UNIVASF (2019) ranked first in efficiency, demonstrating the best performance in using their resources. In the efficacy ranking, UFPE led in two years analyzed, showing better results in the indicators of success in graduation and qualification of the faculty, while UNIVASF ranked first in effectiveness in four periods analyzed, which means that the institution had good results in the use of the installed capacity by students, speed of curricular integration and broad participation in the

post-graduation courses of the IFE. In 2020 and 2021 – the period in which the ERE lasted – UFPE led the efficiency in both years and the efficacy ranking only in 2020, while UFRPE ranked first in efficacy in 2021.

When analyzing the set of indicators for each context, it was verified that UFPE remained ahead in the ranking of performance by multicriteria analysis in all years, both in the period preceding the Emergency Remote Education (ERE) due to COVID-19 pandemic (2018 and 2019) and in the period that the ERE lasted (2020 and 2021). It is translated into better student performance, broad participation in post-graduation courses, more investments in labor, libraries, groups and research projects, scholarships, among others (SANTOS *et al.*, 2017).

It was also possible to highlight that the indicator that most reflected the difficulties faced by IFES for the implementation of the ERE was the TSG, which UFPE stood out as the best performance, with a graduation success rate (TSG) of 66.62% in 2018 and declined to 46.3% in 2021. In contrast to, it could be evidenced that the TSG of UNIVASP, which was 34.91% in 2018, declined to 2.12% in 2021. The data indicate that there was a specific "repression" of students during the period of emergency remote education.

The performance showed the ability of IFE to adapt and implement emergency remote education, overcoming the challenges that have arisen in the period since the lack of training for the use of digital tools, both by professors and students, until the delay in supporting students through financial aid for digital inclusion.

Camilleri (2021) pointed out that COVID-19 pandemic has caused many professors to use new teaching methodologies, including synchronous and interactive meetings to continue developing their contents and educational programs. The sudden and unprecedented lockdown has led them to experience virtual education and engage with their students in real time through video conferencing software. New teaching methodologies experienced during the pandemic motivated them to rethink the traditional teaching models.

As limitations of study, it is pointed out the seven IFES used as small sample and the absence of qualitative analysis on the decisions and events inherent to each of the institutions for the implementation of the ERE and to remedy the difficulties arising from this type of education.

Finally, for further studies, it is suggested the expansion of sample and the deepening of practices adopted in the scope of each Federal University to implement the emergency

remote education resulting from a possible paralysis to classroom activities, and to evaluate the IFES performance in the period after the ERE, proposing a comparison between performances.

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