Performance in Public Management: Comparing Efficiency, Effectiveness and Effectiveness Between Brazilian Federal Universities

Desempenho na Gestão Pública: Comparação de Eficiência, Eficácia e Eficácia Entre Universidades Federais Brasileiras

Alexandre Rodrigues Santos
Doutor em Administração pela Universidade Federal da Paraíba
arsantospi@hotmail.com
Daniel Felipe Victor Martins
Doutor em Administração pela Universidade de Fortaleza
daniel.vmartins@ufrpe.br
Evangelina da Silva Sousa
Doutora em Administração pela Universidade Federal do Ceará
evangelinasousa@gmail.com
Airton Junior Viera Santos
Mestrando em Administração Pública pela Universidade Federal do Piauí
airton@ufpi.edu.br

Endereço: Alexandre Rodrigues Santos
Universidade Federal do Piauí, Ministro Petrônio Portela, Ininga 64049550 - Teresina, PI – Brasil
Endereço: Daniel Felipe Victor Martins
Universidade Federal Rural de Pernambuco, Codai. Rua Dom Manoel de Medeiros, Dois Irmãos, 52171-900 - Recife, PE – Brasil
Endereço: Evangelina da Silva Sousa
Universidade Federal do Piauí, Centro de Educação Aberta e a Distância. Rua Olavo BilacCentro64001280 - Teresina, PI – Brasil
Endereço: Airton Junior Viera Santos
Universidade Federal do Piauí, Ministro Petrônio Portela, Ininga 64049550 - Teresina, PI – Brasil

ABSTRACT

The aim of this present work is to compare the performance in public management among Brazilian federal universities, from indicators, which deal with the levels of efficiency, efficacy and effectiveness extracted directly from the performance management reports of the Federal Court of Auditors. Conducting the research, secondary data comprising a universe of 63 federal universities were used within a time frame between the years 2015 to 2019. Through the application of multivariate statistical techniques of data, such as multiple linear regression and analysis of clusters (conglomerates), it was possible to compare the performance between each Brazilian federal university with the public management indicators adopted by the TCU. The comparative analysis allowed the development of groupings between the federal universities according to the results of each management indicator, in such a way that it made it possible to know the performance of each group by levels of efficiency, effectiveness and effectiveness.

Keywords: Performance. Brazilian Federal Universities. Efficiency. Efficacy. Effectiveness.

RESUMO

O objetivo do presente trabalho é comparar o desempenho na gestão pública entre as universidades federais brasileiras, a partir de indicadores, que tratam dos níveis de eficiência, eficácia e efetividade extraídos diretamente dos relatórios de gestão de desempenho do Tribunal de Contas da União. Para a realização da pesquisa, foram utilizados dados secundários compreendendo um universo de 63 universidades federais em um recorte temporal entre os anos de 2015 a 2019. Por meio da aplicação de técnicas estatísticas multivariadas de dados, como regressão linear múltipla e análise de clusters (conglomerados), foi possível comparar o desempenho de cada universidade federal brasileira com os indicadores de gestão pública adotados pelo TCU. A análise comparativa permitiu o desenvolvimento de agrupamentos entre as universidades federais de acordo com os resultados de cada indicador de gestão, de forma que possibilitou conhecer o desempenho de cada agrupamento por níveis de eficiência, eficácia e eficácia.

Palavras-chave: Desempenho. Universidades Federais Brasileiras. Eficiência. Eficácia. Eficácia.

1 INTRODUCTION

In the last 10 years, the emergence of more studies dealing with the field of public management has been grown substantially, internationally and nationally (Santos et al, 2018; Santos et al, 2017), having attributed, above all, a significant portion of theoretical efforts - empirical in the need to expand the strategies, which search for leveraging the levels of efficiency, efficacy and effectiveness of public organizations.

In Brazil, for example, the emphasis given by most studies on public management, seeks to analyze the performance level of Brazilian federal universities from the measurement of the managerial performance of these universities (Santos & Noronha, 2016; Galvão, Corrêa; & Alves, 2011; Lugoboni, 2010; Melo, Sarrico & Radnor, 2010).

Public universities in Brazil are looking to restructure their performance standards according to the requirements of the Education Ministry – MEC (Steiner, 2005), as well as the Federal Audit Court – TCU (Santos et al, 2017). Because of this, being concerned with the performance of public universities means, therefore, the search for institutional quality.

In the literature through the last 10 years, there are series of models that seek to analyze performance, mainly through investment indicators, on the one hand by measuring the global performance instituion and on the other by the criterion of institutional sustainability (Azma, 2010; Waheed, Khan; & Veitch, 2011). In this sense, performance in public universities may be divided, a priori, into two blocks of analysis, namely: academic performance - related to the quality of teaching, research and the use of graduates in the labor market and the other block mentions performance financial and economic of these institutions.

In the last 10 years, a significant emphasis has been given to studies involving performance analysis, especially within the scope of public organizations, since this practice has been consolidated as a coherent way to minimize bottlenecks resulting from bureaucratic and nebulous processes in the management of Brazilian public universities (Santos et al, 2017).

Then, this research is guided to answer the following question: are there regional similarities in management performance and results among Brazilian federal universities? To answer this question, it has to start from the hypothesis about the existence of evidence on TCU audits that indicate approximate performance indices among some Brazilian federal universities.

In this sense, the general objective was outlined: to compare the performance in public management among Brazilian federal universities, based on indicators that deal with the levels of efficiency, efficacy and effectiveness. Specifically, we sought to: i) identify the indicators with the greatest relationship between universities; ii) measure the existing correlation between the different operational performance indicators and, iii) classify and group the federal universities according to the performance achieved.

The research used real data among the years 2015 to 2019, consisting of the application of multivariate statistical techniques for data analysis. From a universe of 63 federal universities, the research used the multiple linear regression technique, as well as cluster analysis (clusters) seeking to meet the proposed objective. Based on the aforementioned arguments, this work is justified as an analytical scope that seeks to support a possible review of strategies and practices currently adopted by managers of federal universities in Brazil.

2 THEORETICAL FRAMEWORK

2.1 Federal university management in Brazil

The emergence of a more efficient public management has driven a series of changes in the management structure of Brazilian public machine. This perspective has made the State assume a new guideline as a promoter of post- or neo-bureaucratic strategies and management models, oriented towards good results based on performance measures (Brasil, 2009).

This fact is perceived when the federal government instituted in 2005 the GESPÚBLICA program – National Program for Public Management and Debureaucratization which, for its purpose, search for directing public institutions to build specific models for measuring performance, based on a policy inspired by the premise that the management of public bodies and entities may and should be by excellence and compatible with international standards of quality in management (Brasil, 2009). And, good management in the public sector implies the search and achievement of results, regardless of meritorious efforts or intentions that search for meeting demands, collecting interests, as well as the citizens' expectations or organizations that make up society in a realistic and sustainable way (Brazil, 2009).

In order to accompany the process of State reform, in the field of higher education there was a significant replacement of bureaucratic controls, based on a new managerial

culture by incorporating the evaluation policy as a strategic element of public management (Castro, 1997). The logic of the discussion on the necessary expansion of higher education in Brazil implied re-discussing the current policies and organizational and regulatory frameworks, especially in the privatist perspective underlying the regulation and management policies of this level of education (Cunha, 2007).

In this light, Brazilian public higher education institutions have been reaaching the target of several inquiries for three decades, especially due to management problems (Vieira & Vieira, 2004). Then, educational policies were redirected and in tune with neoliberal premises, which emphasize productivity, efficiency and total quality (Oliveira, 2007; Sguissardi & Silva Junior, 2001).

In the FHC government reform (1994-2003), it was understood that the single model, teaching, research and extension, it had been exhausted and it would be unable to adapt to the new conditions of the world economy, as it was inert and inflexible to a range of current demands, requirements and challenges. Using what it would be necessary to make the offer of higher education more flexible and diversify, in order to enable the emergence of new institutional and organizational structures and that existing institutions, especially universities, could rethink their identity and develop skills through association with the demands and regional, local, productive sector and labor market requirements (Brasil, Mec, 1996).

In this way, the search for the modernization and expansion of higher education in Brazil created a scenario, in such a way that competitiveness became an element of institutional pressure for better management practices and, consequently, the constant increase in effectiveness and efficiency (Muriel, 2006).

2.2 TCU Management and Performance Indicators for Brazilian Federal Universities

Several international initiatives have focused their efforts on proposals for evaluation indexes (Yonezawa, 2008; Bertolin, 2007; Navarra, 2004; Biggeri, & Bini, 2001; Dundar, & Lewis, 1999; World Bank, 1994), that is, how instruments to support the process of evaluating the efficiency of universities. Then, the importance of this topic is highlighted, as well as highlighting the various criticisms related to the adequacy and effective usefulness of metrics for the internal and external evaluation process of higher education institutions (Santos et al, 2018; Santos et al, 2017).

The search for greater effectiveness in the mission of the public organization, greater cost reduction, greater degree of efficiency, commitment to the public, as well as

organizational management practices are some of the variables found in public administration that may serve as a parameter to measure the degree of organizational performance. From this perspective, performance management becomes a systematic set of actions that seek to establish the results to be achieved and the resources needed to do then, also including the mechanisms for aligning the implementing structures and the monitoring and evaluation system (Brasil, 2014).

The use of management indicators aims, in this sense, at providing actions which allow a better management of available resources and, at the same time, informing the community about the use of these resources, in addition, it can exercise, from the perspective of the citizen and superior supervisory entities, a better control in evaluating the public managers' performance (Santos et al, 2018; Santos et al, 2017; Reis, 2011). And, in the context of higher education institutions in Brazil, Decree nº 92.200/1985, in Art. 1, item IV, declares as an objective the implementation of a monitoring and evaluation system.

In this sense, it is worth mentioning that in the second half of the 1990s, external evaluation gained relevance from the National Course Examination (ENC) and, in 2002, the establishment of management indicators by the Federal Audit Court together with the Federal Secretariat. of Internal Control and the Higher Education Secretariat of the Education Ministry (SESu) (Brazil, 2014).

And, in 2004, Brazilian Government, through Law No. 10,861 from April 2004, adopted the National Higher Education Assessment System (Brasil, 2014). It was established the following objectives: improving the quality of higher education; expansion and supply orientation; increased institutional effectiveness; academic and social effectiveness; affirmation of autonomy and institutional identity, among others. It is remarkable, however, that the action of measuring the level of efficiency of a public program can be a kind of reflection of the real difficulty of verifying and analyzing the fulfillment of established goals and objectives, correlating them with the costs necessary to achieve these results.

According to the TCU, in its decision no. 408/2002, determined that federal universities should incorporate nine performance indicators in their management reports, with the aim at building a historical series of the evolution of relevant managerial aspects, guiding to the audit of an operational nature in terms of good administrative practices. Such indicators are auxiliary tools in monitoring the performance of entities, serving as an instrument for improving the management from IFES (Brasil, 2014).

In this sense, the use of performance indicators to measure the results achieved by managers refers to a technique related to the concept of performance accountability, and

which also contribute to the process of transparency on how public resources are being managed and what results are being achieved. Still from the point of view of public management, these indicators are presented as a feedback or feedback tool for the organizational learning process, helping both in the preparation of planning and control (Brasil, 2014).

According to Execution Rule No. 5, of December 28, 2007, Annex V (CGU Ordinance No. 1.950/2007, of 12/28/2007), the TCU indicators are separated into groups of indicators: efficiency, effectiveness, effectiveness and comparability; where the 'efficiency indicators' establish the relationship between the results obtained and the resources used; the 'efficacy indicators' refer to the result or even the comparison of goals achieved with planned goals; the 'effectiveness indicators' are related to the effective result and impacts of the Unit's performance that fulfill its institutional responsibilities; and yet, the 'comparability indicators' that have 2.2. TCU Management and Performance Indicators for Brazilian Federal Universities.

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In this sense, the use of performance indicators to measure the results achieved by managers refers to a technique related to the concept of performance accountability, and which also contribute to the process of transparency on how public resources are being managed and what results are being achieved. Still from the point of view of public management, these indicators are presented as a feedback or feedback tool for the organizational learning process, helping both in the preparation of planning and control (Brasil, 2014).

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goals; the 'effectiveness indicators' are related to the effective result and impacts of the Unit's performance that fulfill its institutional responsibilities; and also the 'comparability indicators' that aim to record changes that have taken place over a certain period of time (Brasil, 2014).

Thus, for this work, efficiency, effectiveness and effectiveness indicators were used, as described in Table 1:

Table 1 – Description of efficiency, effectiveness and effectiveness indicators

TYPES	INDICATOR	OBJECTIVE
EFICIÊNCIA	Current cost / equivalent student (CCAE)	Represents current expenditure per student and its value over expenditures at the institution. In principle, a lower cost per student should translate into efficiency in public spending.
	Full-time student / equivalent teacher (ATIPE)	It is understood that the greater the number of professors in relation to the number of students, the better the attention and support to them, favoring greater productivity of the teaching resources' institution.
	Full-time student / equivalent employee (ATIFE)	It is understood that the greater the number of employees relative to the number of students, the better the attention and support given to them, favoring greater productivity at the institution.
	Equivalent employee / equivalent teacher (FEPE)	Represents the size of the indirect support body to the student and the teacher and the size of the support body and direct assistance to the student, having a direct relationship with the student's education.
EFFICACY	CAPES concept (CAPES)	It is an indicator for assessing the quality of graduate courses. A better concept for postgraduate studies can have a positive relationship with the performance of undergraduates, considering that a better postgraduate degree should also indicate quality undergraduate education.
	Qualification index of the faculty (IQCD)	It represents the qualification of the teaching staff in relation to their title, that is, the better the qualification, the better prepared and more involved with research, extension and teaching activities.
	Success rate in University graduate (TSG)	Represents the number of students who complete the course within the expected duration, directly reflecting on the quality and investments in assistance, scholarships, housing, restaurants, by the institution.
EFFECTIVENESS	Student's participation degree (GPE)	It aims to reveal to what degree students use the installed capacity at the IES and the speed of curricular integration, suggesting that the more full-time students, the better for their training and possibly the better their future performance.
	Post-Graduation involvement degree (GEPG)	It aims at portray the degree of involvement in research and postgraduate activities, where greater student involvement favors their performance, and more investments in new laboratories, libraries, research groups and projects, scholarships, among others.

Source: TCU indicators (BRASIL, 2014).

A new variable was also introduced in order to measure the budgetary efficiency institution, defined by the relationship between the planned budget, resulting from an initial allocation, and the one actually executed at the end of the year. From this perspective, it is important to highlight Decree No. 7,233 of July 19, 2010, which provides for budgetary, administrative and financial procedings related to university autonomy, also referring to art. 207 of the Federal Constitution. According to art. 4 of the same decree, for the preparation of annual budget proposals for federal universities, the Education Ministry will take into account the so-called distribution matrix, for the allocation of resources destined to expenses classified as 'other current and capital expenses', in which the elaboration of this matrix must follow previously established parameters (Brasil, 2014).

There has been a continuous effort on the part of academics to validate statistics on the performance from IFES, in order to adjust methods, models, performance indicators, as well as prove whether the benefits provided by IFES serve society adequately (Galvão et al., 2011).

3 METHODOLOGY

The present investigation was based on the paradigm between management and performance, making use of the indicators adopted by the TCU. The choice of IFES was based on the criterion of accessibility to the researched data referring to the years 2015 to 2019 established by the TCU, in its decision no. 408/2002, extracted from management reports. Thus, 63 (sixty-three) IFES in Brazil were obtained as a research sample, which corresponds to 91.3% of all Brazilian federal universities, being excluded from the present research the newly "created" federal universities, namely: Federal University of the Parnaíba Delta, Federal University of Jataí, Federal University of Agreste of Pernambuco, Federal University of Rondonópolis, Federal University of Catalão and the Federal University of Northern Tocantins.

The universities surveyed were: University of Brasília, Federal University of Goiás, Federal University of Mato Grosso do Sul, Federal University of Grande Dourados, Federal University of Mato Grosso, Federal University of Alagoas, Federal University of Bahia, Federal University of Recôncavo Baiano, Federal University of Western Bahia, Federal University of Southern Bahia, Federal University of Ceará, Federal University of Cariri, University of International Integration of Afro-Brazilian Lusophony, Federal University of Maranhão, Federal University of Paraíba, Federal University of Campina Grande, Federal

University of Pernambuco, Federal Rural University of Pernambuco, Federal University of Piauí, Federal University of Rio Grande do Norte, Federal Rural University of the Semiarid, Universidad Federal University of Sergipe, Federal University Vale do São Francisco, Federal University of Amazonas, Federal Rural University of Amazonas, Federal University of Acre, Federal University of Tocantins, Federal University of Rondônia, Federal University of Roraima, Federal University of Amapá, Federal University of Pará, Federal University of Western Pará, Federal University of the South and Southeast of Pará, Federal University of Alfenas, Federal University of Itajubá, Federal University of Juiz de Fora, Federal University of Ouro Preto, Federal University of Lavras, Federal University of Minas Gerais, Federal University of São João Del Rei, University Federal University of Uberlândia, Federal University of Viçosa, Federal University of Triângulo Mineiro, University of the Jequitinhonha and Mucuri Valleys JM, Federal University of the State of São Paulo, Federal University of ABC, Federal University of São Carlos, Federal University of Espírito Santo, Federal University of Fronteira do Sul, Federal University of the State of Rio de Janeiro, Fluminense Federal University, Federal University of Rio de Janeiro, Federal Rural University of Rio de Janeiro, Federal University of Santa Catarina, Federal University of Latin American Integration, Federal University of Health Sciences of Porto Alegre, Federal University of Pampa, Federal University of Paraná, Federal Technological University of Paraná, Federal University of Rio Grande, Federal University of Rio Grande do Sul, Federal University of Pelotas and Federal University of Santa Maria.

Initially, the existence of missing values was not verified. These amounts would not impact the final result. It is also important to mention that the nominal values of the variable current cost per equivalent student (CCAE) were corrected to net present values based on the National Consumer Price Index (INPC), reference values for measuring official inflation. This measure was taken so that we could more accurately and realistically purchase the variable.

Soon after, the average of the variables was measured per year, and later the accumulated average of the period by Ifes. In a second moment, the maximum and minimum values, mean, standard deviation and variance of the indicators were measured over the period from 2015 to 2019. Then, the correlation between the variables was measured, using Pearson's parameters, from - 1 to +1, being negative and/or positive respectively. Finally, the cluster analysis technique was applied, with the objective of grouping the HEIs from the complete set of variables, in order to understand their composition through these groupings.

As mentioned above, a sample of sixty-three IFES was used, corresponding to 91.3% of the universe of federal institutions of higher education in Brazil. Nine performance indicators

were used: current cost/student (CCAE), full-time student/teacher (ATIPE), full-time student/employee (ATIFE), equivalent employee/teacher (FEPE), CAPES concept (CCAPES), qualification index of faculty (IQCD), graduation success rate (TSG), degree of student participation (GPE) and degree of involvement with graduate studies (GEPG), of which four are considered indicators of efficiency, three as indicators of effectiveness and two of effectiveness.

4 ANALYSIS OF RESULTS

4.1 Average performance analysis

Table 1 presents the average values per year of the performance indicators for the periods of 2015, 2016, 2017, 2018 and 2019 considering the universities surveyed.

Table 1 – Average performance by year.

YEAR	CCAE	ATIPE	ATIFE	FEPE	GPE	GEPG	CAPES	IQCD	TSG
2015	R$ 24.345,14	11,62	8,14	1,52	0,73	0,12	3,78	4,25	43,88
2016	R$ 23.084,15	11,75	8,78	1,46	0,75	0,11	3,77	4,30	45,42
2017	R$ 23.535,72	11,63	8,94	1,39	0,75	0,12	3,85	4,35	46,66
2018	R$ 21.626,11	11,73	9,20	1,34	0,76	0,12	5,29	4,32	44,28
2019	R$ 21.364,77	12,08	9,87	1,30	0,76	0,12	3,86	4,46	45,87
Total	**R$ 22.791,18**	**11,76**	**8,98**	**1,40**	**0,75**	**0,12**	**4,11**	**4,33**	**45,23**

Source: Prepared by the authors (2021).

It is noted that the lowest average current cost per student (CCAE) measured occurred in 2019 and the highest in 2015, pointing to a general reduction in current cost per equivalent student over the period. As for the ratio of full-time student and teacher (ATIPE), the lowest ratio occurs in 2015 and the highest ratio occurs in 2019. Regarding the full-time student and employee (ATIFE), the lowest ratio occurs in 2015 and the highest in 2019. Regarding the employee-teacher ratio (FEPE), the lowest ratio occurs in 2019 and the highest in 2015. In this case, a decrease over the period is evident, which may have been due to the increase of the number of professors being hired, probably due to the opening of new courses, to the detriment of the hiring of new employees, destined to support activities and academic activities or purposes of Ifes.

However, we can consider that the targeted performance indicators categorized as efficiency improved over the period, especially in 2019 for having presented the best average

results for the CCAE, ATIPE and ATIFE indicators, that is, three of the four indicators of efficiency.

Regarding the effectiveness indicators, the student participation in undergraduate and graduate studies, stability was observed both in the GPE and in the GEPG over the period, evidencing that there was no increase in student involvement, either at undergraduate or postgraduate levels – graduation, with academic activities. This same trend can be observed for the effectiveness indicators over the period.

Table 2 presents the average values by region of the performance indicators for the periods of 2015, 2016, 2017, 2018 and 2019 considering the universities surveyed.

Table 2 – Average performance by region.

REGION	CCAE	ATIPE	ATIFE	FEPE	GPE	GEPG	CAPES	IQCD	TSG
NORTH	R$ 19.944,10	11,08	9,11	1,26	0,71	0,06	3,34	3,90	47,03
NORTHEAST	R$ 24.684,49	11,30	8,68	1,42	0,78	0,10	3,60	4,23	40,49
MIDWEST	R$ 21.849,50	12,30	9,77	1,28	0,77	0,12	3,85	4,29	45,09
SOUTHEAST	R$ 22.849,57	12,27	8,70	1,49	0,75	0,13	4,91	4,54	48,06
SOUTH	R$ 22.554,85	11,92	9,64	1,36	0,69	0,15	4,23	4,54	46,13
Total	**R$ 22.791,18**	**11,76**	**8,98**	**1,40**	**0,75**	**0,12**	**4,11**	**4,33**	**45,23**

Source: Prepared by the authors (2021).

It may be seen that the North region recorded the lowest average performance, while the Northeast region had the highest considering the CCAE. For ATIPE, it was found that the North region had the lowest ratio, while the Southeast region had the highest ratio. With regard to the ATIFE indicator, it was observed that the smallest relationship presented was in the northeast region, while the largest relationship occurred in the Midwest region. And, considering the FEPE indicator, the lowest ratio was recorded for the North region and the highest for the Southeast region.

For the effectiveness indicators, GPE and GEPG, the best rates were observed for the Southeast and South regions, respectively; and the lowest rate for the North region for both indicators.

Regarding the CAPES indicator, it was found that the best concept was given in the Southeast region, and the lowest in the North region; in relation to the IQCD indicator, the highest index was registered for the Southeast and South regions, with a value of 4.54 for both, and the lowest index for the North region; finally, with regard to the TSG indicator, the best rate was observed for the Southeast region and the lowest rate for the Northeast region.

4.2 Descriptive analysis of variables

Table 2 shows a descriptive analysis of the data indicating the mean, median, standard deviation and variance, reflecting the average performance of the IFES in that exercise.

Table 3 - Descriptive statistics

	N	Average Statistic	Standard Deviation	Variance	Asymmetry		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Standard Error	Statistic	Standard Error
CCAE	315	22.791,18	8.926,248	7.967,790	3,740	0,137	2.111,500	0,274
ATIPE	315	11,76	2,972	8,510	-0,257	0,137	0,836	0,274
ATIFE	315	8,98	3,528	12.447	2,113	0,137	10,692	0,274
FEPE	315	1,40	0,381	0,145	1,019	0,137	3,762	0,274
GPE	315	0,75	0,243	0,059	4,468	0,137	34,955	0,274
GEPG	315	0,12	0,077	0,006	2,224	0,137	14,012	0,274
CAPES	315	4,11	5,636	31,759	17,312	0,137	304,758	0,274
IQCD	315	4,33	0,447	0,200	-3,053	0,137	27,123	0,274
TSG	315	45,23	14,887	221,610	-0,450	0,137	1,362	0,274

Source: Prepared by the authors (2021).

It is possible to measure an accumulated average dispersion of the standard deviation around 45.52% of the variables, where the CAPES variable with the greatest dispersion and the smallest for the IQCD variable with regard to the standard deviation, that is, how much the measured results deviate from the central measures. In relation to asymmetry, there is a departure from the average values, characterizing the behavior of the asymmetric variables, while for kurtosis, a positive trend is perceived in relation to the flattening of the normality curve.

4.3 Correlation analysis

Table 2 represents the correlations between the variables measured over the period surveyed.

Table 2 – Correlation between variables

	VARIABLES	CCAE	ATIPE	ATIFE	FEPE	GPE	GEPG	CAPES	IQCD	TSG
CCAE	Pearson's correlation	1	-.582**	-.467**	.138*	-.288**	-.182**	.026	.099	-.425**
	Sig. (2 extremities)		.000	.000	.014	.000	.001	.643	.081	.000
	N	315	315	315	315	315	315	315	315	315
ATIPE	Pearson's correlation	-.582**	1	.536**	.149**	.348**	.571**	.030	.165**	.651**
	Sig. (2 extremities)	.000		.000	.008	.000	.000	.596	.003	.000
	N	315	315	315	315	315	315	315	315	315
ATIFE	Pearson's correlation	-.467**	.536**	1	-.627**	.242**	.226**	-.021	-.057	.342**
	Sig. (2 extremities)	.000	.000		.000	.000	.000	.705	.317	.000
	N	315	315	315	315	315	315	315	315	315
FEPE	Pearson's correlation	.138*	.149**	-.627**	1	-.013	.123*	.060	.199**	.089
	Sig. (2 extremities)	.014	.008	.000		.822	.029	.286	.000	.117
	N	315	315	315	315	315	315	315	315	315
GPE	Pearson's correlation	-.288**	.348**	.242**	-.013	1	.219**	-.051	-.053	.235**
	Sig. (2 extremities)	.000	.000	.000	.822		.000	.366	.347	.000
	N	315	315	315	315	315	315	315	315	315
GEPG	Pearson's correlation	-.182**	.571**	.226**	.123*	.219**	1	.079	.271**	.296**
	Sig. (2 extremities)	.001	.000	.000	.029	.000		.164	.000	.000
	N	315	315	315	315	315	315	315	315	315
CAPES	Pearson's correlation	.026	.030	-.021	.060	-.051	.079	1	.152**	-.029
	Sig. (2 extremities)	.643	.596	.705	.286	.366	.164		.007	.604
	N	315	315	315	315	315	315	315	315	315
IQCD	Pearson's correlation	.099	.165**	-.057	.199**	-.053	.271**	.152**	1	.188**
	Sig. (2 extremities)	.081	.003	.317	.000	.347	.000	.007		.001
	N	315	315	315	315	315	315	315	315	315
TSG	Pearson's correlation	-.425**	.651**	.342**	.089	.235**	.296**	-.029	.188**	1
	Sig. (2 extremities)	.000	.000	.000	.117	.000	.000	.604	.001	
	N	315	315	315	315	315	315	315	315	315

Source: Prepared by the authors (2021).

Through the correlation analysis, the positive or negative influence of one variable in relation to the other between the values from -1 to +1 is perceived. Thus, in relation to CCAE, median and negative relationships were verified with the variables ATIPE, ATIFE and TSG, weak relationships FEPE, GPE, GEPG, CAPES and IQCD. However, the relationship with the TSG is noteworthy, as the CCAE can be directly influenced by the students' departure within the allotted time, at the time when there should be a strong positive relationship with the ATIPE and ATIFE, as it is directly related to the relationship with teachers. in the final activity and with the technicians in the support activity.

Regarding the relationships measured between the highlight only the median relationship with the TSG, while the IQCD has a weak relationship, which points to the qualification of the teaching staff.

4.4 Cluster Analysis

To know specific and multivariate clusters of the IFES, a k-means procedure was performed, where the number of clusters is pre-defined and an agglomeration procedure is used. For this case, the criterion called furthest neighbor was used, which groups similar objects in each cluster while reinforcing the dissimilarity between them, at the same time that the number of clusters was determined as five, considering that there are five regions in the Brazil.

Table 3 presents the profile or cluster centers based on the variables.

Table 3 – End cluster centers

VARIABLES	CLUSTER				
	1	2	3	4	5
CCAE	R$ 29.296,00	R$ 60.004,00	R$ 43.885,00	R$ 16.286,00	R$ 21.670,00
ATIPE	10,21	3,89	6,78	13,38	14,42
ATIFE	6,44	3,78	4,05	11,19	8,82
FEPE	1,41	1,10	1,72	1,28	1,44
GPE	0,69	0,47	0,57	0,30	0,75
GEPG	0,13	0,02	0,03	0,12	0,12
CAPES	3,69	2,20	3,04	3,77	3,88
IQCD	4,33	4,70	4,32	4,28	4,35
TSG	36,69	11,00	36,26	49,19	47,47

Source: Prepared by the authors (2021).

It is possible to observe through Table 3 the grouped or similar values of each variable for each formed cluster, where the values found tend to represent similar behavior among the universities surveyed.

Table 4 distributes the researched IFES by cluster, thus providing a better understanding of the similarities and similarities assessed.

Table 4 – Distribution of Ifes by cluster

CLUSTER	IFES	TOTAL
1	UFFS, UFGD, UFPel, UFRJ, UFRR, UFRRJ, UNIFESP, UNILA, UNIRIO	9
2	UFSBA	1
3	UFOB, UNILAB	2
4	UFAL, UFAM, UFBA, UFC, UFERSA, UFLA, UFOPA, UFPA, UFPI, UFS, UFSJ, UnB, UNIFAL, UNIFEI, UNIVASF	15
5	FURG, UFAC, UFABC, UFCA, UFCG, UFCSPA, UFES, UFF, UFG, UFJF, UFMA, UFMG, UFMS, UFMT, UFOP, UFPB, UFPE, UFPR, UFRA, UFRB, UFRGS, UFRN, UFRPE, UFSC, UFSCar, UFSM, UFT, UFTM, UFU, UFV, UFVJM, UNIFAP, UNIFESSPA, UNIPAMPA, UNIR, UFTPR	36

Source: Prepared by the authors (2021).

It is verified that Cluster 1 is noted that the universities UNILA, UNIFESP, UNIRIO, UFRJ and UFRRJ are from the Southeast region, the universities UFFS and UFPel from the South region, the UFRR university from the North region, and the UFGD university from the Midwest region. It is observed that it is not possible to point out a similarity of results to regionality, considering universities from different regions.

In Cluster 2, there was only one university, UFSBA, in the Northeast region. That is, in a way, we can say that these two universities presented very different behavior of indicators or results from the others, whether positive at times or even negative. In relation to Cluster 3, two universities were observed, being UFOB and UNILAB in the Northeast region.

Regarding Cluster 4, the universities UFAM, UFPA and UFOPA in the North region were observed; UFAL, UFBA, UFC, UFERSA, UFPI, UFS and UNIVASF in the Northeast region; UFLA, UNIFAL, UFSJ and UNIFEI from the Southeast region; and, only UnB in the Midwest region.

Finally, in relation to Cluster 5, the universities UFAC, UFRA, UNIFESSPA, UFT and UNIFAP in the North region were noted; UFCA, UFCG, UFPB, UFMA, UFRB, UFPE, UFRPE and UFRN in the Northeast region; UFG, UFMS and UFMT in the Midwest region; UFABC, UFES, UFF, UFJF, UFMG, UFOP, UFSCar, UFTM, UFU, UFV, UFVJM and UNIR in the Southeast region; and, FURG, UFCSPA, UFRGS, UFSM, UNIPAMPA, UFPR, UTFPR and UFSC in the South region.

4.5 ANALYSIS AND DISCUSSION

In Brazil, performance analysis in Brazilian federal universities has been guided by performance measurement (Santos & Noronha, 2016; Galvão, Corrêa; & Alves, 2011; Lugoboni, 2010; Melo, Sarrico & Radnor, 2010). In this sense, the search for efficiency has

guided new governmental directions in the face of economic, technological and social transformations, modifying the scope of public services (Melo, 2010; Duan, 2019).

It is possible to perceive important differences and similarities between institutions and their regions from the average performance and the groups formed through interactions. Initially, Table 1 reveals a negative accumulated variation of the current cost per student of around -12.55%, indicating a more efficient application of resources over the period; and, converging with an accumulated value of 3.94% of the student/teacher ratio, 20% of the student/employee ratio, and 4.73% of the success rate; it is noteworthy that these values are ratified in the analysis of the correlations measured in table 2.

Given the differences and similarities found, it converges with the position of Cunha (2007) on the need to re-discuss policies and their current organizational and regulatory frameworks.

Still in relation to the current cost per student, the northern region stands out with a negative variation of the order of 12.49% lower in relation to the general average, while in the northeast region there was a positive variation in relation to the average of the order of 8 .31%, that is, the northern region promoted a reduction in its current cost per student, while the northeast region increased its current cost. Therefore, effectiveness, cost reduction, efficiency, best practices and standardized technology are some of the variables found in public management that can serve as a parameter to measure organizational performance (Averson, 2002).

It was also found that the graduation success rate in the northeast region showed a negative variation of 10.48% in relation to the general average, which conflicts with the increase in the current cost variation.
Another important indicator with verified accumulated variation was the CAPES Concept, with an accumulated positive variation of around 12.23% over the period, with the Southeast region having the highest positive variation in relation to the average of 19.46%, and the northern region with the greatest negative variation of 18.73% in relation to the general average.

Regarding the CAPES Concept, the positive relations of the index with the current cost per student of 0.643, with the student/teacher ratio of 0.596, with the student/employee ratio of 0.705, which seems to be a point out of the curve, are highlighted. a priori it should not present a direct and strong relationship; and with a success rate of 0.604, relating to the training of undergraduate students.

It follows, therefore, that a better concept for graduate studies may have a positive relationship with the performance of undergraduates, considering that a better graduate course should also indicate quality undergraduate education (Brasil, 2014). Still in relation to the CAPES Concept, there was a low relationship with the teacher qualification index, which should have a strong relationship with this concept, since it is assumed that the most qualified teachers should be in postgraduate programs.

In short, the northern region presented the greatest negative variations in relation to the general average for the indicators CCAE, ATIPE, FEPE, GEPG, CAPES and IQCD; the northeast region stood out with the greatest positive variation for the CCAE, which is bad, as it denotes an increase in cost, and the greatest negative variation for the TSG in relation to the general average, indicating that even with the increase in expenses with the student and a greater participation of this student in teaching activities, according to GPE, there were bad results; in relation to the central west region, the ATIPE and ATIFE indices stood out, that is, it presented the greatest positive variations in relation to the general average; for the Southeast region, the positive variation of the CAPES Concept in relation to the general average stood out, pointing to a better development of graduate programs in the region; and finally, the southern region had the greatest negative variation of the GPE index, which measures student participation in teaching activities, in contrast with a greater positive variation of the GEPG index, which evaluates the participation of postgraduate students. graduation in activities, and also the greater positive variation in relation to the general average of the ATIFE, which conflicts with the GPE, as it showed an increase in the student/employee ratio, that is, more employees to meet the academic demands.

In this sense, the composition of the Clusters revealed similarities and differences between the various institutions in different regions. Cluster 1 stood out only for presenting the best GEPG index, where seven of the nine HEIs are from the Southeast and South regions; Cluster 2 showed the worst results, with the exception of the index IQCD, but also composed of only one HEI, which characterizes it as an outlier that needs to be analyzed in greater depth to better understand its actions and relationships; Cluster 3, composed of two HEIs in the northeast region, stood out for presenting the best ratio of the FEPE index, that is, the best relationship between professor and employee; Cluster 4, composed mostly of HEIs in the northeast and north, respectively, stood out in the CCAE indicators, with the lowest cost, ATIFE, with the best relationship and the TSG with the highest success rate; and Cluster 5, composed mostly of HEIs from the Southeast and South, stood out for presenting the best ATIPE, GPE and CAPES index.

5 FINAL CONSIDERATIONS

Considering the relevance of studies involving performance in public management, it was possible to understand their relationship based on variables of efficiency, effectiveness and effectiveness, especially within the scope of federal universities.

In the meantime, secondary data comprising a universe of 63 federal universities within a time span between the years 2015 to 2019 were used to understand this relationship, where multivariate data techniques were used from cluster analysis (clusters).

Based on the identified clusters, it was possible to conclude on the impossibility of directly regionalizing the results measured over the delimited period. In addition, it was also possible to identify that universities have different and similar behaviors regardless of their region, since managers are assigned the decision to reallocate resources differently from what was previously established.

Thus, the performance of the university itself will present itself differently, reinforcing the need to align strategic planning and performance evaluation (Usoh & Preston, 2017), while it becomes evident that universities are complex organizations (Rabovsky, 2014) , and that resource allocation decisions are guided and based on evidence capable of pointing out "what works" and "why it works", in terms of public interventions (Barbosa et al, 2020).

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Contribuição dos Autores	A. R. Santos	D. F. V. Martins	E. S. Sousa	A. J. V. Santos
1) concepção e planejamento.	X	X	X	X
2) análise e interpretação dos dados.	X	X	X	X
3) elaboração do rascunho ou na revisão crítica do conteúdo.	X	X	X	X
4) participação na aprovação da versão final do manuscrito.	X	X	X	X