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Governance Applicable to Public Organizations: An Analysis based on the Multicriteria Method (MCDM) Parsimonious AHP (PAHP) under the perspective of the Leadership Mechanism in the light of the Union Court of Audits (TCU)

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Abstract

Objective: This study aims to analyze and classify the best public organizations in terms of Good Public Governance Practices related to the Leadership Mechanism based on the assessment of governance carried out by the Federal Court of Accounts. **Method:** For this analysis, ranking and evaluation of public organizations regarding Governance, the Multicriteria Decision Support Method (MCDM) Parsimonious AHP (PAHP) was used. **Results:** The PAHP method was able to rank 378 public organizations that were audited by the TCU following a pre-established questionnaire by this Court of Accounts. **Contributions:** This work contributed to Scientific Research in the area of Operational Research applied to Public Administration, as it brought relevant issues to academia and society.

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Keywords: Parsimonious AHP (PAHP), Public Governance, Leadership.

1. Introduction

The Federal Court of Auditors is the public entity of external control that exercises the function of evaluating the governance of public organizations. According to the Strategic Plan of the Federal Court of Accounts, Governance can be described as a system by which organizations are directed, monitored, and encouraged, involving relationships

between society, senior management, servers or collaborators and governing bodies. control. In this context, the TCU foresees that Public Governance is the application of Leadership, Strategy and Control practices, which allow the representatives of a public organization and the interested parties in it to assess their situation and demands, direct their actions and monitor its operation, in order to increase the chances of delivering good results to citizens.

Concerning [1 - 20], Operations Research covers the following areas: Mathematical Programming, Game Theory, Simulation and Discrete Events, Graph Theory, Queuing Theory, Multicriteria Decision Support (MCDM), Data Envelopment Analysis, Prospective Scenarios among others. Thus, this study aims to analyze, from the perspective of the Leadership mechanism, the Governance applicable to Public Administration Bodies and Entities through the Multicriteria Decision Support Method (MCDM) Parsimonious AHP (PAHP).

For this analysis, the TCU Database on Organizational Public Governance was used, which can be found in Court's website. Like this, this work is structured in 6 Sections: 1. Introduction; 2. Theoretical Foundation; 3. Methodology; 4. Problem Solution Proposal; and 5. Discussion and Results.

2. Theoretical Background

According to [21], Governance is a term widely used in different sectors of society, with different meanings depending on the perspective of analysis. Still under the vision of this Court apud IFAC 2013, Governance comprises the structure (administrative, political, economic, social, environmental, legal and others) put in place to guarantee that the results intended by the interested parties are defined and achieved.

In this sense, Public Governance can be understood as a set of techniques and mechanisms that seek harmony between the Public Power and the interested parties involved in the result intended by this Power. According to [22], those involved in this system that seeks a common balance between the Public Power and interested parties are citizens, elected representatives (governments), senior management, managers and employees.

In order to standardize activities carried out by those responsible for Public Governance, the TCU published the "Basic Reference on Organizational Governance" applied to public organizations and other entities under the jurisdiction of the TCU. In this Reference, the [23] synthesized the concept that Organizational Public Governance essentially comprises the Leadership, Strategy and Control Mechanisms put into practice to evaluate, direct and monitor the performance of management, with a view to conducting public policies of interest of society.

Based on this, the authors of this study decided to use a Multicriteria Decision Support Method (MCDM), known as Parsimonious AHP (PAHP), to analyze, from the perspective of the Leadership mechanism, which Public Administration Bodies and Entities, under the jurisdiction of the TCU, were more effective in Public Governance. For this, the TCU Database on Organizational Public Governance was used. According to this Reference, the TCU carried out extensive audits that evaluated governance from different perspectives and, in all of them, public bodies were evaluated and grouped into three stages of governance - Initial, Intermediate and Improved - in order to allow an easy-to-view diagnosis that contributes to its improvement and monitoring [23].

To compose the Reference, TCU summarized the Mechanisms and Practices of Public Governance, as shown in Figure 1. This work will use the PAHP Method and will focus only on the Leadership Mechanism to analyze the best organizations according to the best Leadership Practices that are understood by Public Governance.

The TCU Referential mentions that OECD highlights that Leadership is a crucial element to promote good public governance. In addition, this Court says that the commitment of agents at the highest political and managerial levels of the public sector is essential for the success in the development and implementation of the values, strategies, policies and processes necessary for good governance and the improvement of the results that are delivered. the society.

Therefore, it is a fundamental role of leadership to evaluate the adopted governance model and adjust it to the organizational context and objectives, properly communicating it to stakeholders [23]. In this way, members of the leadership of public organizations must have the necessary skills to fulfill their objectives. To comply with the Leadership Mechanism, TCU presents three Good Governance Practices, as shown in Fig. 1: Establishing the Governance Model; Promote Integrity; and Promoting Leadership Capability.

Like this, the TCU carried out the Public Governance to verify the situation of Governance in the public sphere and to encourage Public Administration Bodies and Entities to adopt good governance practices. As a result, this Parquet of Accounts has unified, since 2017, four governance surveys carried out with a focus on public organizations. As a result, in 2021 it presented a Report containing the Integrated Governance and Public Management Index.

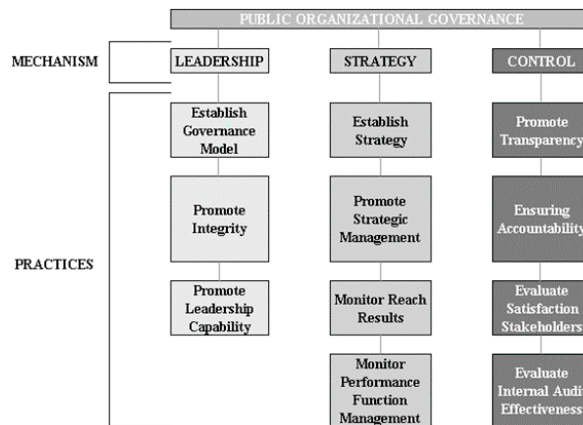


Fig. 1. Mechanisms and Practices of Public Governance

The TCU database was the basis for this study. Therefore, the authors chose to use a Multicriteria Decision Support Method to analyze the best Bodies and Entities of Public Administration regarding the Leadership Mechanism.

3. Methodology

This study used the MCDM PAHP Method to analyze, rank and evaluate Brazilian public organizations regarding Good Governance Practices related to the Leadership Mechanism evaluated by the Federal Court of Accounts. Thus, the research methodology used in this study regarding the study approach was quantitative research because the process for applying the PAHP Multicriteria Method is sequential, deductive and analyzes the objective reality of the problem. The methodological steps were: Introduction; Theoretical foundation; Methodology; Proposal for a Solution with the application of the PAHP Multicriteria Method; Discussion and Results.

To apply the PAHP Method, the database made available by the TCU at the electronic address <https://portal.tcu.gov.br/governanca/governanca-no-tcu/levantamento-de-governanca-resultados-do-tcu/>. In this worksheet, there is a division of the Governance Context or Mechanism into: Leadership, Strategy, Control and, additionally, Operations. The object in question for this study is Leadership, as previously mentioned.

Within the Leadership Mechanism, there is a division of the three Good Governance Practices, which are: Establishing the Governance Model; Promote Integrity; and Promoting Leadership Capability. Within each of these good practices, the TCU elaborated questions pertinent to Public Governance. In addition to the questions already mentioned, Parquet of Accounts created sub-questions within each of the questions already mentioned. These sub-questions were prepared in such a way that the answers were binary, that is, if the public organization met what was requested in the TCU questionnaire, it was assigned a value of one and, otherwise, the value of zero was assigned. Thus, the TCU servers attributed values to each sub-question of the questionnaire, according to the survey carried out. This Database served as a reference for the application of the PAHP Method in ordering and ranking public organizations in relation to Good Governance Practices related to the Leadership Mechanism.

4. Solution Proposal

The PAHP method is a MCDM developed by [24]. According to the authors, this new method is an improved version of the AHP method by [25]. The original AHP method involves many pair-to-pair comparisons between considered objects, which may be alternatives in relation to the considered criteria or criteria between them, that is, it works with pair-to-pair comparative judgments to compose its Decision Matrix. Thus, according to [26] to [39], as the complexity of the decision-making problem and the number of decision-makers increase, there may be judgment consistency problems and, therefore, matrix consistency problems.

In this sense, to solve this problem, the Parsimonious AHP Method (PAHP) was developed, which aims to reduce these pair-by-pair comparisons of the original method. Its methodology is strongly based on the concept of Point of Reference and has the advantage of reducing the number of pair-to-pair comparisons between alternatives and, in addition, avoids problems of reversion or inversion of classification, that is, changes in order of prioritization due to the addition or removal of one or more objects from the set of considered objects. The PAHP consists of 5 steps:

1st Step: Direct evaluation of the objects in question:

For each criterion g_j , the decision maker assigns a ranking to the alternatives in Decision Matrix A .

We denote by $r_j(a)$ the classification given to alternative a with respect to the criterion g_j .

2nd Step: Selection of reference points.

For each criterion g_j , the decision maker must set t_j reference evaluations $\gamma_{j1}, \dots, \gamma_{jt_j}$ on the common scale considered ordered from smallest to largest.

3rd Step: Application of the original AHP method to the reference points.

At this point, there is the definition of the weights of the criteria j and the reference points j_s using the Pair-by-Pair Comparison Matrix.

There is also a normalization of the reference points $u(\gamma_{js})$ for all $j = 1, \dots, n$ and for all $s = 1, \dots, t_j$.

4th Step: Consistency test of pair-by-pair comparisons and verification of compatibility between the classification and the prioritization obtained for the reference evaluations.

According to the original method by [5], the decision maker verifies the consistency of the comparisons, based on the principle of transitivity, proportionality and reciprocity, and, consequently, identifies the reliability of the weights obtained by using the Consistency Index (CI) and the Consistency Ratio (CR):

- Violates the principle of transitivity if $a_i > a_j, a_j > a_k$, but $a_i < a_k$.
- Violates the principle of proportionality if $a_{ij} = 2a_{ik}; a_{ik} > 3a_{kj}; a_{ij} \neq 6a_{kj}$.
- Violates the principle of reciprocity if $a_{ij} \neq 1/a_{ji} \forall i, j; a_{ii} \neq 1 \forall i$

5th Step: The priorities of all other evaluations, which are not reference points or evaluations, are obtained by linear interpolation according to the priority values obtained for the reference evaluations.

Thus, the definition of local priority is performed using linear interpolation.

For each $r_j(a) \in [\gamma_{js}, \gamma_{js} + 1]$, the following value is calculated (1):

$$u(r_j(a)) = u(\gamma_{js}) + \frac{u(\gamma_{js+1}) - u(\gamma_{js})}{\gamma_{js+1} - \gamma_{js}}(r_j(a) - \gamma_{js}) \quad (1)$$

Finally, the global priority (ω) is obtained as an aggregation of the weights of the criteria J and the local priority:

$$u(r_j(a)) : \omega = \sum_{j=1}^J u(r_j(a_k)) \cdot \omega_j \quad (2)$$

While in the original AHP method the decision maker has to carry out a pairwise comparison of all pairs of alternatives in all the considered criteria, in the PAHP the decision maker must perform the classification of the alternatives in the considered criteria and, later, apply the AHP in small subsets of assessments or benchmarks defined for each criterion. It is important to highlight that if the considered criterion has an objective quantitative or numerical evaluation, the above procedure can be applied replacing this numerical evaluation by the direct classification provided by the decision maker in Step 1.

In this study, the TCU Database was used for the application of the PAHP Method in ordering and ranking public organizations in relation to Good Governance Practices related to the Leadership Mechanism.

4.1. 1st Step: Direct evaluation of the objects in question

As mentioned in the methodology, TCU auditors evaluated public organizations with respect to Good Governance Practices related to the Leadership Mechanism and made the results available on their website. This Base served for the 1st stage of the PAHP method, which is the direct evaluation of the objects in question.

This Court elaborated questions pertaining to Public Governance and numbered each question with a number. For example, the Practice of Establishing the Governance Model was numbered 1110. The Practice Promoting Integrity was numbered 1120. The Practice Promoting Leadership Capacity was numbered 1130.

Within each of these Practices, TCU prepared questions and each one of them also received a number. Thus, the question "Is the organization's internal governance structure in place?" received the number 1111 and the question "Does the organization ensure the adequate balance of power for making critical decisions?" was numbered 1112. In addition, for each of these questions, the Court developed sub-questions. Thus, for question 1111, 6 sub-questions were elaborated and they were numbered: 1111A, 1111B, 1111C, 1111D, 1111E and 1111F. This methodology was applied to all Governance Practices within the Leadership Mechanism.

In view of this, the authors of this study applied the PAHP method using this Database as a reference with the questionnaire results already completed, that is, the binary evaluation carried out by the TCU auditors in all sub-questions was already completed in a spreadsheet.

After that, the sum of these evaluations was carried out, concentrating the results in a column of the spreadsheet, as shown in Table 1.

Table 1. Practice Establishing Governance Model

	1111A	1111B	1111C	1111D	1111E	1111F	1112A	1112B	1112C	1112D	Sum
A1	1	1	1	1	1	0	1	1	1	0	8
A2	1	1	1	1	0	0	1	1	0	0	6
A3	1	1	1	0	1	0	1	1	1	1	8
A4	1	1	1	1	0	0	0	0	0	0	4
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
A378	0	0	0	0	0	0	0	0	0	0	0

4.2. 2nd Step: Selection of Reference Points

The decision maker chose to set 5 reference levels for all criteria and the chosen reference points were $\gamma_1 = 6$, $\gamma_2 = 12$, $\gamma_3 = 18$, $\gamma_4 = 24$ e $\gamma_5 = 30$. These reference points were set between the values of 0 to 30 are the same as those used by the authors of the original article on the method.

For this current study, the authors decided, within each criterion, to use these reference points according to the sum of the evaluations of the sub-questions. For example, the first criterion (Establish the Governance Model) has 10 sub-questions that were assessed. Thus, as the maximum reference point is 30, it was decided to divide this maximum point by the number of sub-questions, which in this case are 10, leaving the result with 3 units of measurement. With this, each value found in the “Sum” column of Table 1 will be multiplied by 3 and the compilation of these values was inserted in Table 2 and received the name “Ponto Ref”, as detailed in Table 2.

Table 2. Reference Points in Criterion 1 (1110) - Establish Governance Model

	1111A	1111B	1111C	1111D	1111E	1111F	1112A	1112B	1112C	1112D	Sum	Points Ref
A1	1	1	1	1	1	0	1	1	1	0	8	24
A2	1	1	1	1	0	0	1	1	0	0	6	18
A3	1	1	1	0	1	0	1	1	1	1	8	24
A4	1	1	1	1	0	0	0	0	0	0	4	12
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
A378	0	0	0	0	0	0	0	0	0	0	0	0

After that, the Decision Matrix was elaborated, according to Table 3.

Table 3. Decision Matrix

	C1 - 1110	C2 - 1120	C3 - 1130
A1	24	13	3
A2	18	16	9
A3	24	12	21
⋮	⋮	⋮	⋮
A378	15	14	21

4.3. 3rd Step: Application of the original AHP method to the reference points

Table 4. Pair-to-Pair Comparison between Reference Points

	C1 - Establish Governance Model					C2 - Promote Integrity					C3 - Promote Leadership Capacity				
	$\gamma_1 = 6$	$\gamma_2 = 12$	$\gamma_3 = 18$	$\gamma_4 = 24$	$\gamma_5 = 30$	$\gamma_1 = 6$	$\gamma_2 = 12$	$\gamma_3 = 18$	$\gamma_4 = 24$	$\gamma_5 = 30$	$\gamma_1 = 6$	$\gamma_2 = 12$	$\gamma_3 = 18$	$\gamma_4 = 24$	$\gamma_5 = 30$
$\gamma_1 = 6$	1.0000	0.5000	0.2500	0.1667	0.1250	1.0000	0.5000	0.2500	0.1429	0.1111	1.0000	0.5000	0.3333	0.1667	0.1429
$\gamma_2 = 12$	2.0000	1.0000	0.3333	0.2000	0.1429	2.0000	1.0000	0.3333	0.2000	0.1250	2.0000	1.0000	0.2500	0.2000	0.1667
$\gamma_3 = 18$	4.0000	3.0000	1.0000	0.2500	0.1667	4.0000	3.0000	1.0000	0.2500	0.1667	3.0000	4.0000	1.0000	0.2500	0.2000
$\gamma_4 = 24$	6.0000	5.0000	4.0000	1.0000	0.2000	7.0000	5.0000	4.0000	1.0000	0.2500	6.0000	5.0000	4.0000	1.0000	0.2500
$\gamma_5 = 30$	8.0000	7.0000	6.0000	5.0000	1.0000	9.0000	8.0000	6.0000	4.0000	1.0000	7.0000	6.0000	5.0000	4.0000	1.0000

After performing the Pair-to-Pair Comparison between the Reference Points, this step generated the local priority vector only for the initially fixed reference points, according to Table 5. For the other values, which were not chosen as reference points, the priority will be calculated using linear interpolation, presented in the 5th Step of this method.

Table 5. Vector Priority of Reference Points in each Criterion

	C1	C2	C3
$\gamma_1 = 6$	0.0359	0.0340	0.0391
$\gamma_2 = 12$	0.0535	0.0521	0.0521
$\gamma_3 = 18$	0.1029	0.1029	0.1067
$\gamma_4 = 24$	0.2231	0.2406	0.2333
$\gamma_5 = 30$	0.5219	0.5248	0.4543

After that, and using the same methodology used by the authors of the seminal article, a Pair-by-Pair Comparison was performed between the three criteria to generate the vector of weights between them.

Table 6. Comparison between the Criteria and generation of the Criteria Weight Vector

	C1	C2	C3	Vector Weights
C1	1.0000	0.3333	2.0000	0.2294
C2	3.0000	1.0000	5.0000	0.6477
C3	0.5000	0.2000	1.0000	0.1219

4.4. 4th Step: Test of Consistency of Pair-to-Pair Comparisons

At this stage, the Consistency Test provided for in the original AHP method was performed. It can be seen, through Table 7, that the Pair-by-Pair comparison between the Reference Points in all criteria was consistent, as the Consistency Ratio (CR) was less than 0.1, that is, less than 10% in all of them.

Table 7. Consistency Test

	C1	C2	C3
λ_{\max}	5,387	λ_{\max} 5,279	λ_{\max} 5,421
CI	0.097	CI 0.07	CI 0.105
CR	0.086	CR 0.062	CR 0.094

4.5. 5th Step: Local and Global Priority

As seen before, for the values, which were not chosen as reference points, the local priority is calculated using linear interpolation. For example, in the first Criterion “Establish a Governance Model”, the reference point 7, that is, $\gamma = 7$, was 0.0389, according to equation (1).

In this context, initial reference points (γ_6 , γ_{12} , γ_{18} , γ_{24} and γ_{30}) were fixed by Pair-to-Pair Comparison and the other points fixed by linear interpolation.

Table 8. Reference Points

	C1	C2	C3
γ_0	0.0000	0.0000	0.0000
γ_1	0.0060	0.0057	0.0065
\vdots	\vdots	\vdots	\vdots
γ_6	0.0359	0.0340	0.0391
\vdots	\vdots	\vdots	\vdots
γ_{30}	0.5219	0.5248	0.4543

The global priority (ω) is calculated as the aggregation of the weights of the criteria J and the local priority, as exposed in table 9.

Table 9. Partial results

	Evaluation of Decision-makers			Local Priority			Vector Weights Criteria			Global Priority (ω)
	C1	C2	C3	C1	C2	C3	C1	C2	C3	Aggregation
A1	24	13	3	0.2231	0.0606	0.0196	0.2294	0.6477	0.1219	0.092801126
A2	18	16	9	0.1029	0.0859	0.0456				0.084829116
\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots				\vdots
A377	30	20	21	0.5219	0.1488	0.1700				0.236820256
A378	0	0	12	0.0000	0.0000	0.0521				0.006351504

After the result of the global priority, the PAHP method orders the alternatives, generating the final ranking, as table 10 exposes.

Table 10 - Ordering of Alternatives

Administration	State Power	Legal nature	Ranking
A72	Indirect	Public Company	0.51503384
\vdots	\vdots	\vdots	\vdots

A97	Indirect	Executive	Mixed Economy Society	0.51503384
⋮	⋮	⋮	⋮	⋮
A268	Indirect	Executive	Autarchy	0.51503384
⋮	⋮	⋮	⋮	⋮
A257	Direct	Executive	Public Agency	0.4880927
⋮	⋮	⋮	⋮	⋮
A320	Parastatal	Parastatal	Autonomous Social Service	0.48435382
⋮	⋮	⋮	⋮	⋮
A213	Parastatal	Parastatal	Private Non-Profit Association	0.13117628
⋮	⋮	⋮	⋮	⋮
A368	Parastatal	Parastatal	Autonomous Social Service	0

5. Conclusion

The objective of this study was to use the MCDM PAHP method to analyze, rank and evaluate 378 Brazilian public organizations regarding Good Governance Practices based on the TCU Database. Using the PAHP method, it was possible to analyze, rank and evaluate 378 public organizations that were audited by the TCU. This is possible because its methodology is based on the concept of Reference Point and, in addition, the use of these reference points avoids the problem of reversion or inversion of classification of alternatives.

In this sense, the results presented in the study show that among the 378 public organizations audited by TCU, only 11 received the maximum score in all Good Governance Practices in the Leadership Mechanism. In addition, it is observed that all of them belong to the Indirect Administration of the Executive Branch. That is, no Direct Administration Body obtained the maximum grade in the evaluation. Another possible discussion concerns the average ranking of public organizations audited. Of these, 240 organizations scored below average. With this, it is observed that approximately 64% of these organizations are under average in relation to Good Governance Practices. This shows that public organizations in Brazil need to develop actions to improve the Leadership Governance.

As the PAHP manages to rank a large number of objects considered, it can be used as a reference for the realization of clusters found in the Database. For this reason, a suggestion for future work would be to use the PAHP to rank and evaluate a large database and find possible clusters in this database.

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