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Comparison of SAW, WP, AND TOPSIS Methods in Determining the Best Journalists

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Abstract

Journalists are human resources that have a significant influence on journalistic companies. A system is needed to support the company's decision to select and measure its reporters. PT. Inipasti Communika is one of the journalistic companies that has never previously measured and assessed its journalists, so it has difficulty assessing and measuring its journalists. This study aims to provide a solution using the Decision Support System in decision-making using the SAW, WP, and TOPSIS methods and provide the final decision results based on comparing these methods. This study uses criteria and criteria values from these companies. The company's data related to its journalists is the privacy of PT. It is a Community, so the alternative value used is dummy data that is still by the original standards of the company's data. This study concludes that the three methods can provide the best alternatives with the same results.

Keywords: Decision Support System; SAW Method; WP Method; TOPSIS Method

Abstrak

Wartawan merupakan sumber daya manusia yang memiliki pengaruh besar pada perusahaan jurnalistik. Diperlukan suatu sistem dalam mendukung keputusan perusahaan tersebut untuk memilih dan mengukur wartawan mereka. PT. Inipasti Communika adalah salah satu perusahaan jurnalistik yang sebelumnya belum pernah mengukur serta menilai wartawan mereka, sehingga mengalami kesulitan dalam melakukan penilaian serta pengukuran pada wartawan mereka. Penelitian ini bertujuan untuk memberikan suatu solusi menggunakan Decision Support System dalam pengambilan keputusan dengan menggunakan metode SAW, WP dan TOPSIS serta memberikan hasil akhir keputusan berdasarkan perbandingan metode tersebut. Penelitian ini menggunakan kriteria dan nilai kriteria dari perusahaan tersebut. Data perusahaan terkait wartawan mereka merupakan privasi PT. Inipasti Communika sehingga nilai alternatif yang digunakan merupakan data dummy yang masih sesuai dengan standar asli data perusahaan tesebut. Penelitian ini memberikan kesimpulan bahwa ketiga metode yang digunakan mampu memberikan alternatif terbaik dengan hasil yang sama.

Kata kunci: Sistem Penunjang Keputusan; Metode SAW; Metode WP; Metode TOPSIS

INTRODUCTION

A company with high-quality human resources is an advantage for all companies. A company's progress depends on its employees' performance, so it becomes essential to advancing a company(Hafiz & Ma'mur, 2018). A company certainly has various kinds of benchmarks in assessing their employees' work results. However, not all companies, especially those still developing, have a tool and system for measuring the performance and quality of their employees.

PT. Inipasti Communika is an incorporated mass media company based online that provides information or news about something in general. Media companies are very dependent on their journalists because they rely on the quality and quantity of a piece of news.

This company has never previously measured and assessed the journalists they have, making it difficult to measure and assess their reporters. This research tries to provide a method for overcoming the company's problems in deciding to assess and measure the performance and achievements of their journalists so that the conclusions and results will be a reference in assessing the best journalists in the company.

This research uses a Decision Support System (DSS) to provide conclusions supporting a specific goal for the company. A Decision Support System (DSS) is a system that can provide effective problem-solving so that the results can help in decision-making obtained from the results of processing existing information using various methods. This system is designed to support all decision-making stages, identify problems, select the necessary data, determine the models and approaches used in the decision-making process, and evaluate results(Aisyah & Putra, 2021).

The decision support system has various methods that are used; this research uses Simple Additive Weighting (SAW), Weight Product (WP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods used to help PT. This is the case for Communika in determining a particular decision based on the results of the ranking decision against the company's journalists through the decision support system.

Simple Additive Weighting (SAW) is a method that seeks the weighted summation of the rating in each alternative on all criteria by normalizing the decision matrix into a scale that compares with all existing alternative ratings (Syarief & Suwandana, 2018).

Weight Product (WP) is a method of decision-making using multiplication between predetermined criteria values that are previously the value of each existing criterion raised to the rank of a predetermined criterion (Rizal et al., 2021).

TOPSIS is a method that can provide problem-solving with structured and unstructured conditions. This method provides a prediction and information that can be a benchmark in making a more appropriate decision by choosing alternatives to calculate the nearest value (Hutasuhut et al., 2021).

This study will compare decisions and provide suggestions regarding the results of which journalists' rankings will be used from the method used as a benchmark for PT. Inipasti Communika assists the company in achieving specific goals based on what is produced by the decision support system using the method carried out.

Previously, research has been carried out on accuracy comparison using the SAW and WP. TOPSIS methods where this accuracy comparison if the relevant company already has data on the results of previous decisions and made a new decision using existing methods, as in research (Supiyan, 2019). This study compares TOPSIS and SAW, WP methods in determining BMT EL-Raushan financing. The research concluded that comparing the simple additive weighting Method, Weighted Product, and TOPSIS methods shows that the WP method is more accurate than the SAW and TOPSIS methods. It seems that from the three methods' accuracy level values, the WP method's highest accuracy with an accuracy value of 94%.

The research conducted by (Kungkung & Haryadi Kiswanto, 2018)aims to analyze the comparison of SAW, WP, and TOPSIS using hamming distance in the case study of the selection of new students at SPP Negeri Kupang with the conclusion that based on these three methods, methods that are close to the results of accurate decisions of related parties are the SAW and TOPSIS methods. However, the SAW and TOPSIS methods are closer to the results of the school's decision. These three methods are feasible to be used by the Kupang State Agricultural Tuition in processing new student admissions to support obtaining objective verdict results.

As for the research using a single method, such as (Noval et al., 2020), this research uses the Simple additive Weighting method to determine the best employees at PT. Persada Nusantara Telekomunikasi with the hope of being able to provide a choice objectively for the company. The results offer options with the best value from several alternatives tested using five criteria and show that selecting the best employees is not only indicated by one criterion. Still, some criteria also have a competency value according to existing criteria.

Research conducted by (Salim et al., 2022) uses the TOPSIS method to determine the best employees at PT. Regency Motor, the company, often experiences several problems, such as the calculation of employee criteria values that experience similarities with each other and take a long time in their calculations. It is not uncommon for errors in the computation of values, so the author uses the TOPSIS method to overcome these problems using six criteria, and the results provide results based on the TOPSIS calculations carried out.

Research is also conducted by (Sihaloho et al., 2022) using the Weighted Product method in selecting the best employees on the CV. Neosoft Art Medan, in the study, the problem faced was that managers at the company had difficulty assessing employee performance, so the author helped the manager by using the weighted product method with five criteria. The study concluded that using the wp method could speed up selecting the best employee accurately and make it easier for the manager to decide the company's above employees.

The research only uses methods in a single decision support system based on various studies

that have been carried out in determining and choosing decisions related to the best employees in a company. In this study, three methods will be carried out, namely Simple Additive Weighting (SAW), Weight Product (WP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), so that it are expected to provide conclusions where the results can give a ranking comparison that can provide strong confidence based on the calculation results for PT. This is Communika.

RESEARCH METHODS

This research was carried out with stages, namely data collection, then continued with the calculation stages on various calculation methods. Here is Figure 1 flow chart of research methods.

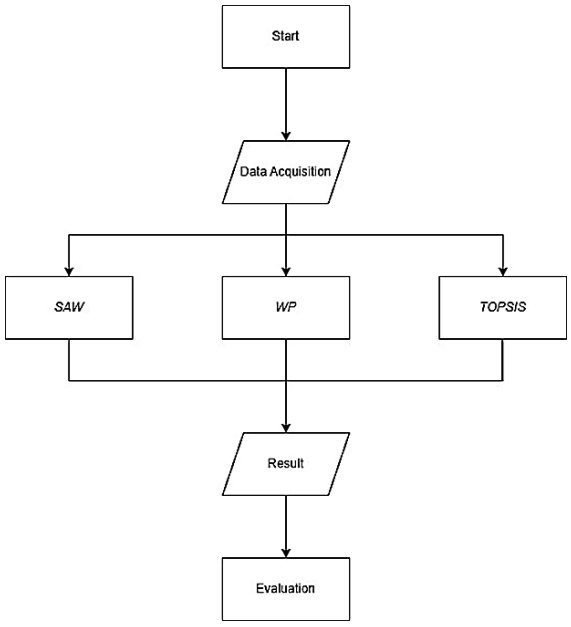

Figure 1. Research method flowchart

Data Acquisition

Based on data obtained from PT. Inipasti communika, here is Table 1 related to the criteria for creating a Decision Support System using existing methods.

Table 1. Criteria and Weights

Code	Criteria	Weight	Attribute
C1	Number of News Releases	35	Benefit
C2	Average of News Views	30	Benefit
C3	Violation of the Code of Ethics	25	Cost
C4	Language Skills	10	Benefit
C5	Length of Service	5	Cost

Based on the table above, five criteria are criteria for assessing journalists at PT. Inipasti communika with the following information:

1. The number of news releases is the total number of news written by journalists and has been published by the release team in 1 entire month
2. Average news views are the average person who reads the news written by each journalist in 1 entire month
3. Violation of the Code of Ethics is how many ethical violations have been committed by journalists since becoming journalists.
4. Language skills are how much of a language journalists speak.
5. Length of Service is how long the journalist worked at the PT. Inipasti Communika.

Here is table 2 of weight values on each criterion.

Table 2. Weights of Each criterion

Criteria	Crips	Weight of Crips
Number of News Releases	<30	10
	30-50	20
	51-70	30
	>70	40
Average of News Views	<100	10
	101-500	20
	501-1000	30
	>1000	40
Violation of the Code of Ethics	0	10
	1	20
	2	30
	>2	40
Language Skills	1	10
	2	20
	3	30
	>3	40
Length of Service	2-6 month	10
	6-12 month	20
	1-2 years	30
	>2 years	40

PT. Inipasti Communika does not want to open alternative data to the public. The company only provides data references, and researchers will use dummy data which can still be used as a standard according to actual company data. Table 3 displays alternative data that will be used in this study.

Table 3. Alternative Values

Alternative	C1	C2	C3	C4	C5
A1	56	764	2	1	7
A2	36	1122	1	2	15
A3	63	342	3	2	36
A4	24	648	2	1	4
A5	52	984	1	2	16
A6	60	498	3	1	11
A7	44	1068	1	2	27

Simple Additive Weighting (SAW)

In the SAW method, there are two attributes, such as the benefit criterion and cost criteria (cost). Both criteria are the basis for the selection of criteria when making decisions. Method SAW is a widely used method to complete the retrieval of Decisions practically (Hermanto & Izzah, 2018)

The Simple Additive Weighting (SAW) method is used to find optimal alternatives from some alternatives with specific criteria. The definition of the Simple Additive Weighting (SAW) method is often also known as the weighted summation method. The basic concept of the SAW method is to look for a weighted summation of the performance rating on each alternative on all attributes. This method requires normalizing the decision matrix X to a scale that can be compared with all alternative ratings (Wijaya & Insan, 2018).

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max_i\, x_{ij}} & (benefit) \\ \frac{Min_i x_{ij}}{x_{ij}} & (cost) \end{cases} \quad \text{.....(1)}$$

Information:
Rij: Normalized performance rating value
Xij: The attribute value that each criterion has
Max xij: The most significant value of each criterion
Min xij: The smallest value of each criterion

The preference value for each alternative (Vi) can be seen in the following equation:

$V_i = \sum_{j=1}^{n} w_j r_j$ .....(2)

Information:
Vi: Rankings for each alternative
wj: The weight value of each criterion
rij: Normalized performance rating value

Figure 2 is a flowchart of the Simple Additive Weighting (SAW) method.

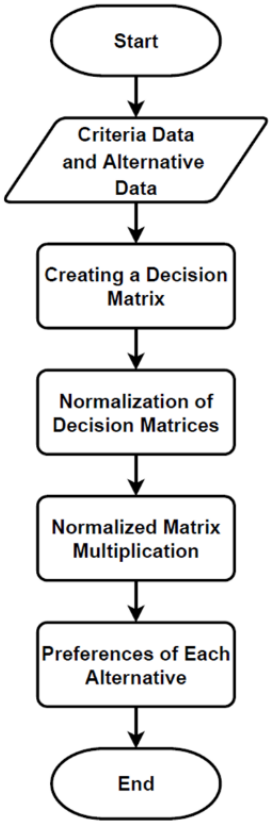

Figure 2. SAW Flowchart

Weighted Product (WP)

The WP method is called dimensioned analysis because its mathematical structure eliminates units of measure. The WP method is a finite set of decision alternatives described in some respects as decision criteria. So this method does not need to be normalized. This method has several advantages. Namely, variable costs and benefits help determine the criteria influencing decisions. This method is more straightforward than others because the calculation is not so complex and easier to understand (Novira et al., 2020).

The Weighted Product (WP) method seeks decisions by multiplying to relate attribute ratings, where the attribute must first be raised to the rank of the attribute in question. In the WP method, normalization is performed before multiplying each attribute's value. The value of weights that are profit (benefit), then the value of the lift is positive while the cost (cost) of the lifting is negative (Rani et al., 2021).

The determination of the normalized weight value with the symbol W can be seen in the following formula:

$$w_j = \frac{w_j}{\sum w_j} \quad \text{.....(3)}$$

The determination of the value of the vector S can be seen in the following formula:

$$S_i = \prod_{j=1}^{n} x_{ij}^{w_j} \quad \text{.....(4)}$$

Information:
S: Alternative preference by analogy as vector S
x: Criterion value
w: Weight of criteria
i: Alternatives
j: Criteria
n: Many criteria

The determination of the value of the vector V can be seen in the following formula:

$$v_i = \frac{\prod_{j=1}^{n} x_{ij}^{w_j}}{\prod_{j=1}^{n} x_j^{w_j}} \quad \text{.....(5)}$$

Information:
V: Alternative preference with vector analogy V
x: Criterion value
w: Weight of criteria
i: Alternatives
j: Criteria
n: Many criteria

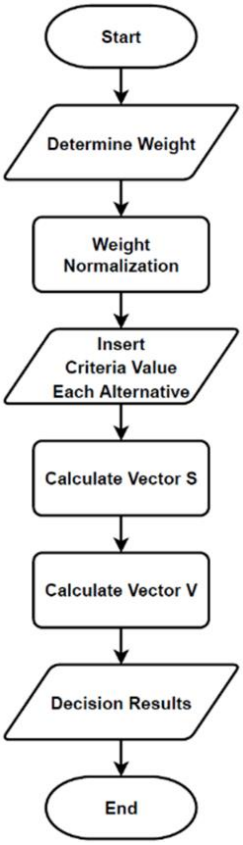

Figure 3. Weight product flowchart

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Designing a decision support system using the TOPSIS method is one of the choices in this study because it can rank selected alternatives, where the best-selected alternatives have the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution. A positive ideal solution is defined as a solution that maximizes the profit attribute and minimizes the cost attribute, while a negative ideal solution is defined as a solution that minimizes the profit attribute and maximizes the cost (Sugiarto, 2021).

Here is the formula for forming a normalized decision matrix:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m}(x_{ij})^2}} \quad \text{..... (6)}$$

Information:
rij: Normalized attribute values
xij: The value of each attribute
m: The value of the attributes available for each criterion

Here is the formula for creating a normalized and weighted decision matrix:

$$y_{ij} = r_{ij} w_j \quad \text{..... (7)}$$

Information:
yij: Weighted normalization
rij: Normalized attribute values
wj: Criterion value

Here is the formula for determining the distance between the values of each alternative with a matrix of positive and negative ideal solutions:

$$D^+ = \sqrt{\sum_{i=1}^{m}(y_i - y_{ij}^+)^2} \quad \text{..... (8)}$$

$$D^- = \sqrt{\sum_{i=1}^{m}(y_i - y_{ij}^-)^2} \quad \text{..... (9)}$$

Information:
D⁺: Positive ideal
D⁻: Negative ideal

Here is the formula for determining the preference value for each alternative:

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad \text{. ..... (9)}$$

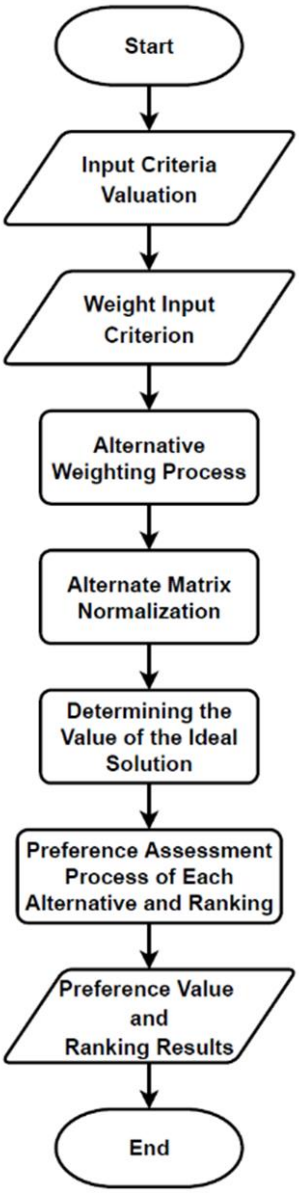

Figure 4. TOPSIS flowchart

Result and Evaluation

Based on the ranking results from the three methods carried out, this stage will combine all the results into one table, and an evaluation will be carried out regarding which method and which results will be a reference for PT. Inipasti Communika.

RESULTS AND DISCUSSION

Simple Additive Weighting (SAW)

Based on the research methods that have been carried out, the following is the result of the match rating of each alternative:

Table 4. Result of match Rating of each alternative Value of SAW

Alternative	C1	C2	C3	C4	C5
A1	30	30	30	20	20
A2	20	40	20	10	30
A3	30	20	40	20	40
A4	10	30	30	10	10
A5	30	30	20	20	30
A6	30	20	40	20	20
A7	20	40	20	10	40

After analyzing the suitability of each alternative, then calculate and make a matrix of its normalization.

Table 5. Normalization Matrix of SAW

Alternative	C1	C2	C3	C4	C5
A1	1	0.75	0.66	1	0.5
A2	0.66	1	1	0.5	0.33
A3	1	0.5	0.5	1	0.25
A4	0.33	0.75	0.66	0.5	0.1
A5	1	0.75	1	1	0.33
A6	1	0.5	0.5	1	0.5
A7	0.66	1	1	0.5	0.25

After creating the normalization matrix, it then determines the preferences of each alternative shown in the following table:

Table 6. Preference for Each Alternative of SAW

Alternative	Total
A1	83.33333333
A2	80
A3	71.25
A4	57.5
A5	89.16666667
A6	72.5
A7	79.58333333

Based on the preference results of each alternative above, an alternative with the highest value, namely the A5 alternative, is obtained.

Weighted Product (WP)

The following is a table of normalized weight values:

Table 7. normalization of weight values

Criteria	Total
C1	0.35
C2	0.30
C3	0.20
C4	0.10
C5	0.5
Total	1

After normalizing the value of the criterion weight, next, calculate the vector S. Table 8 is the result of the value of the vector S:

Table 8. Vector value S of WP

S	Total
S1	25.37674499
S2	25.17092464
S3	17.65389941
S4	17.22810213
S5	29.40334233
S6	20.61250884
S7	25.83518789
Total	161.2807102

After determining the value and the total number of S values, next determine the vector value V, whose results are shown in the following Table 9:

Table 9. Vector value V of WP

V	Values of V
V1	0.1573451962
V2	0.1560690339
V3	0.1094606998
V4	0.1068205994
V5	0.1823115876
V6	0.1278051715
V7	0.1601877116
Total	1

The results of the vector value V above show the highest value in V5, where V5 represents the alternative A5 with the highest value.

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Based on the value of the criterion weight and alternative values in the research method chapter, the following is the result of the calculation of the divisor value and the calculation of the normalized matrix:

Table 10. Divisor value for normalization

Criteria	Divisor
C1	131.2135664
C2	2176.311559
C3	5.385164807
C4	4.358898944
C5	51.88448708

The divisor value in Table 10 above is the result of calculation by summing each alternative value on a criterion that is ranked two, then the result of the summation is rooted.

After performing the divisor calculation, calculate the normalization matrix against the alternate data by dividing the alternate data by the divider. Here is Table 11 the results:

Table 11. TOPSIS Normalization Matrix Table

Alternative	C1	C2	C3	C4	C5
A1	0.4267	0.3510	0.3713	0.4588	0.1349
A2	0.2743	0.5155	0.1856	0.2294	0.2891
A3	0.4801	0.1571	0.5570	0.4588	0.6938
A4	0.1829	0.2977	0.3713	0.2294	0.077
A5	0.3963	0.4521	0.1856	0.4588	0.3083
A6	0.4572	0.2288	0.5570	0.4588	0.2120
A7	0.3353	0.4907	0.1856	0.2294	0.5203
Divisor	131.21	2176.3	5.3851	4.3588	51.884

Next, create a weighted normalization matrix with the results shown in Table 12 as follows:

Table 12. weighted normalization matrix

Alternative	C1	C2	C3	C4	C5
A1	14.937	10.531	7.4278	4.5883	0.6745
A2	9.6010	15.464	3.713	2.2941	1.4455
A3	16.804	4.7140	11.141	4.5883	3.4692
A4	6.4010	8.9325	7.4278	2.2941	0.3854
A5	13.870	13.564	3.7139	4.5883	1.5148
A6	16.004	6.8648	11.144	4.5883	1.0600
A7	11.736	14.722	3.7139	2.2941	2.6019

After carrying out the weighted stages of normalization, it follows to determine the ideal positive and negative solutions with the results spelled out in the following Table 13:

Table 13. Positive and Negative Ideal Solution

Alternative	C1	C2	C3	C4	C5
Positive	16.804	15.464	3.7139	4.5883	0.3854
Negative	6.4017	4.7143	11.141	2.2941	3.4692

Based on table 13, the ideal solution on the positive row is calculated by selecting the most significant value of the weighted normalization value on the weighted criteria while the lowest value on the cost attribute. The damaging row is calculated by selecting the smallest value from the weighted normalization value on the criteria that are attributed benefit. In contrast, in the cost attribute, the most significant value is selected on the weighted normalization value on the criteria.

Table 14 calculates the distance between the weighted values on each alternative to the positive and negative ideal solutions.

Table 14. Alternative Weighted Value Distance To The Ideal Solution

Alternative	D^+	D^-
A1	6.4588	11.557
A2	7.6325	13.605
A3	13.427	10.652
A4	13.037	6.4105
A5	3.6831	14.080
A6	11.413	10.387
A7	6.0345	13.584

Furthermore, it calculates the value of the preference for each alternative.

Table 15. Preference value

Alternative	D^+
A1	0.6414
A2	0.6406
A3	0.4423
A4	0.3296
A5	0.7926
A6	0.4764
A7	0.6924

Based on the results of the preference values from table 15 above, it can be seen that the alternative with the highest value is the A5 alternative.

Result and Evaluation

After carrying out a whole series of stages on the three methods using Simple Additive Weighting (SAW), Weighted Product (WP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), it can be concluded that the three methods provide the same decision regarding the alternatives that get the highest score. Here is a comparison table 16 of rankings using these three methods:

Table 16. Ranking comparison

Alternative	SAW	WP	TOPSIS
A1	2	3	3
A2	3	4	4
A3	6	6	6
A4	7	7	7
A5	1	1	1
A6	5	5	5
A7	4	2	2

Based on the comparison of rankings using the three methods above, it can be seen that the three methods give the highest value decision to the same alternative, A5, as the alternative with the highest value produced by the three methods.

Using the WP and TOPSIS methods, the resulting ranking is the same. However, it is different from using the SAW method, where there are differences in the characteristics of alternatives A1, A2, and A7 to the WP and TOPSIS methods.

CONCLUSIONS AND SUGGESTIONS

Conclusion

From the research conducted and the results obtained, the three methods carried out succeeded in providing the results of the same decision regarding the expectations of PT. Inipasti Communika and researchers that is to get one of the best alternatives based on the three methods, so the difficulty of PT. Inipasti Communika in assessing their journalists to be resolved using the methods carried out. Although the three methods do not succeed in providing 100% of the same ranking, using these three methods can be a reference and add convenience in deciding on PT. Inipasti Communika in measuring the performance of their journalists.

Suggestion

Based on this study, although the three methods do not provide the same ranking results, this study suggests continuing to use these three methods so that the results can be compared as in this study, then choosing the final decision by looking at the most significant number of methods with the results of the ranking the same as the final result of the decision.

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