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Decision Support System for admission of new employees by applying a combination of ANP-TOPSIS Methods

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Abstract: Acceptance of new employees is one of the routine activities carried out to find reliable employees in their fields and become a benchmark to reflect the face of the company to the entire community. Currently, the problem that occurs is that the management process for new employee recruitment is centralized based on internal selection calculations by only one party, so that the results of assessment and decision making tend to be less objective and efficient at this time. So that the decisions taken can trigger the tendency of subjectivity in one of the prospective registrants which results in brokering at the selection stage.. To answer the challenge, ANP and the Technique were used to create a Decision Support System (DSS). Sort Preferences based on their similarity to the ideal solution. (TOPSIS) approach for hiring and retaining new employees by determining the optimum solution based on that strategy. The ANP was employed in this study to assign a weight to each criteria. The TOPSIS ranking technique is used to compute the weight.

Keywords: DSS; ANP-TOPSIS; employee; Acceptance; company

INTRODUCTION

The problems experienced by company is currently still conducting employee selection manually by HRD, the assessments made are not objective and impure, due to the presence of a third party in recruiting new employees. What is meant by a third party here is a person who has an interest both from inside and outside the company that affects the company's HDR so that it is not objective to give an assessment in selecting prospective new employees. Based on these problems we need a system to help the director of the company for selecting candidates or job applicants objectively and in accordance with existing company competency standards. To solve this problem, it can be solved by using a system called System Of Decision Support The Decision Support System is a component of the Information System(adhitiawarman et al., 2021). This is used for semi-structured data processing and issue solving. This semi-structured dilemma is commonly encountered by businesses or organizations throughout the decision-making process. To tackle current challenges, a Decision Support System is required. The Decision Support System may be used to locate eligible applicants based on the company's requirements for filling openings. The ANP-TOPSIS approach was combined in this study. The Analytic Network Process (ANP) approach is one that may depict the degree of interest of different parties by taking into account the interrelationships between existing criteria and sub-criteria. This model is an extension of AHP, hence its complexity exceeds that of the AHP approach.

The TOPSIS (Technique. For. Order. Preference. By. Similarity. To. Ideal. Solution.) method. is. based. on. the concept that the best chosen alternative not. only has. the shortest. distance from the positive ideal solution, but Also Has The Longest. Distance From The Negative Ideal solution(Journal et al., 2022). The reason these two methods were chosen is because the ANP method is able to represent the level of importance of various criteria by considering the interrelationships between the existing criteria and sub-criteria, and the TOPSIS method was chosen because the TOPSIS method is based on the concept that the best chosen alternative does not only have the shortest distance from the ideal solution(Hejazi, 2016). positive but also has the longest distance from the negative ideal solution. The ANP method will later be used to weight and provide values and information on criteria with the existing level of importance, and then the TOPSIS method will be used for ranking based on criteria data, and alternative data and weights given.

To support the research process carried out, a support is needed based on previous research that has been done. In research conducted in 2018 by Titin Kristiana, the results related to the TOPSIS method, namely from

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the calculation process of the TOPSIS method, are in the form of information on selecting the location of the pulse wholesaler that is closest to the choice desired by the company(Abdel-Basset et al., 2018). And in 2019 other research was also carried out by Ade Mubarok, et al with the result that a financing feasibility decision support system was built as a tool for determining financing feasibility. In addition to previous research from the TOPSIS method, there are also previous studies related to the ANP method as a reference(Flory, 1967). As done by Ginanjar Setyo Permadi, et al in 2019 got the ANP results as a basis for decision making by evaluating lecturer learning materials with a sample of teachers. And another study conducted by Usman Effendi, et al in 2018 the results of the ANP study were used to identify priority sub-criteria(Maturo & Contini, 2009)

LITERATURE REVIEW

The Analytic Network Process (ANP) approach is one that may depict the degree of interest of different parties by taking into account the interrelationships between existing criteria and sub-criteria(Wu et al., 2010). This model is an extension of AHP, hence its complexity exceeds that of the AHP approach. Meanwhile, Decision Support System, according to Alter, is an interactive information system that delivers information, modeling, and data manipulation(Gunawan, 2021). The technique is used to help people make judgments in semi-structured and unstructured circumstances when no one knows for sure how decisions should be made. Based on the opinions of the experts above, it can be concluded that the decision support system is a tool for providing solutions in decision making, but it can also be used by decision makers (managers) to solve some problems with structured, semi-structured, and unstructured data by providing several options for making a decision(Chang et al., 2015).

METHOD

The ANP approach is a decision-making process that uses many criteria to address current issues. According to Santoso, the ANP approach evolved from the AHP method(Shahroudi & Rouydel, 2012). The ANP technique can compensate for AHP's shortcoming in the capacity to tolerate links between criteria or alternatives. The ANP method's model is in the form of a network, thus the interrelationships between each element that is on the same criterion, or even against components with different criteria, may be observed(Tavana et al., 2013). Because this model is an evolution of AHP, it is more sophisticated than the AHP technique. Based on the two methods have the ability and weakness in solving a problem from different alternatives and criteria(Alam-tabriz et al., 2014). Where the ANP method later in this study is used to perform weighting according to the alternatives and existing criteria, the final results of the ANP weighting will be ranked by combining the TOPSIS method from the previous results(Sugiyarti et al., 2018). And the final result of the method will be chosen to be a good ideal solution in a decision support system. The steps for making ANP according to the method for solving problems are as follows(Muslihudin et al., 2019).

1. Create a decision network hierarchy that shows the relationships between decision factors
2. Make a pairwise comparison matrix of the elements influencing the choice. This matrix of pairwise comparisons is required. to figure out the effect on the options being evaluated using a 1. Measuring ratio scale-9 (table 1) created by Saaty

Table.1Saaty's 1-9 preference scale for AHP

Level Interest	Definition
1	Equally important
3	A little more important
5	More important
7	Very important
9	AbsoluteMore Important
2, 4, 6, 8	Middle value

The comparison value is used for inverse comparison, namely $a_{ij} = 1/a_{ji}$ where aij or (a_{ji}) indicates the level of importance of the I or jth element. As in AHP, pairwise comparisons in ANP are performed within the framework of a matrix and local priority vectors can be derived from estimates of the relative importance with respect to the elements (clusters) being compared by solving the equation, as in formula 1:

$A*W = max * W$.....(1)

Where A is the pairwise comparison matrix, w is the eigenvector, and max is the largest eigenvalue of A. To approach the value of w.

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3. Calculate the relative importance weight vectors of the existing factors. The level of inconsistency in the response is called the inconsistency ratio (CR). The steps in calculating CR are as follows:
   a. The pairwise comparison value is multiplied by the matrix by the weight (eigen) so as to produce a result value. The resulting values will then be divided by the eigenvalues of each row to get the average value. Next calculate the value of phi.
   b. The phi value is obtained from the number of result values divided by the number of indicators being compared (formula 2)
      Phi = (Total Result Value)/(Number of Indicators)..... (2)
   c. The consistency index (CI) value comes from the calculation of the phi value minus the number of indicators, after that it is divided by the number of indicators minus 1 (formula 3)
      C = (Number of phi-Number of Indicators)/(Number of Indicators-1)..... (3)
   d. Consistency Ratio (CR) is derived from the value (formula 4)
      CR = CI / RI..... (4)
      Where :
      CR:Consistent Ratio
      CI : Consistency Index
      RI : Random Indeks

Table. 2 Index Random Value

Matrix Order	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

4. Supermatrix formation. and. analysis. supermatrix. is. a. matrix. composed. of. relative. importance. weight vectors. Then. normalize. the. supermatrix. so. that. the. numbers. in. each. column. in. the. supermatrix. have. a. total. value. of 1 (one). Calculating the final weight Calculate the final weight by increasing the supermatrix by 2n+1, where k is any large number until the weight stability occurs, where the values in the supermatrix do not change when multiplied by itself, or often called convergent.

TOPSIS METHOD (Technique for Order Preference by Similarity to Ideal Solution) because it may be utilized to address the issue of multi-criteria decision making (MCDM)(Meade & Sarkis, 1999). Furthermore, the TOPSIS approach offers a straightforward and basic notion, as well as efficient computing. having the capacity to compare the relative performance of different decision-making strategies.

1. Determine the normalized decision matrix (R) such as Equation 1 below:

$$rij = \frac{xij}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}}, (i = 1,2, \dots n; j\ 1,2, \dots m)\ ) \text{.....(5)}$$

   Information:
   Xij is the i-th alternative performance branch against the jth attribute
   Rij is an element of a normalized decision matrix.

2. Determine the weighted decision matrix (Y) such as equation 2

$$Y = \begin{matrix} y11 & y22 & \dots yij \\ y21 & y22 & \dots y2j \\ \dots & \dots & \dots \\ yi1 & yi2 & yij \end{matrix} \quad \text{For Yij = Wj nj} \text{.....(6)}$$

   Description:
   Wj = is the weight of the j criteria
   Yij = elements of the weighted normalized decision matrix
   A+ = (y1 + ,y2 + ,...,yj +)..... (7)
   A- = (y1 - ,y2 - ,...yj -)..... (8)
   With

$$YJ+ = \begin{matrix} \max\limits_{i} yij, & if\ j = profit \\ \min yij, & if\ j = cost \end{matrix} \{ \text{.....(9)}$$

$$YJ\ -= \begin{matrix} \max\limits_{i} yij, & if\ j = profit \\ \min yij, & jika\ j = cost \end{matrix} \{ \text{.....(10)}$$

3. Determine the distance between the alternative values of the positive ideal solution matrix (di +) and the negative ideal solution matrix (di -), the distance of the positive ideal solution (di +) as equation 7.

$$di+ = 2\sqrt{\sum_{j}^{m} = 1(yij_{yj}+)} \text{.....(11)}$$

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description:
yj- is an element of the positive ideal solution matrix negative ideal solution distance (dj+) as equation 8

$$di = \sqrt{\sum_{j}^{m} = 1(y_{ij-} y_j -)^2} \quad \text{.....(12)}$$

description:
yi- is an element of the negative ideal solution matrix

4. Determine the preference value (ci) for each alternative. The preference value is the proximity of an alternative to the ideal solution, such as equation 9.

$$C_I = \frac{d_i}{d_i + d_d -} \quad \text{.....(13)}$$

Tendency:
A larger ci value indicates an alternative priority.

RESULT

A. Determine the criteria

From the case study of new employee recruitment company with the ANP method uses 3 criteria along with sub-criteria that will be used as an assessment, which can be seen in the explanation below, namely:

1. (K1) Interview scores obtained from the average value of the sub-criteria, namely:
   a. (K11) Communication
   b. (K12) Character
   c. (K15) Competence

Information	Score
Not good	0-50
Enough	51-69
Good	70-84
Very good	85-100

2. (K2) Psychological test scores obtained from the average value of the sub-criteria, namely:
   a. (K21) Verbal Test Score
   b. (K22) Numerical Test Score
   c. (K23) Image Test Score

Information	Score
Not good	0-50
Enough	51-69
Good	70-84
Very good	85-100

3.(K1) Educational scores obtained from the average value of the sub-criteria, namely:
   a. (K12) Education value D3
   b. (K13) Educational Value Strata-1 (S1)
   c. (K14) Master's education value (S2)

Level of education	Value Assumption
D3	1
S1	2
S2	3

B. Determining the Interdependence Effect Relationship between Criteria

After determining the criteria for new employee acceptance company, then these criteria are formed into an ANP network structure as shown in the figure below to identify relationships that influence each other.

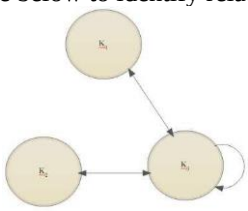

Fig. 1 The Interdependence Effect Relationship Between Criteria

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C. Forming a Pairwise Comparison Matrix

Pairwise Comparison Matrix in recruiting new employees at PT. Universal Gloves were searched using three criteria as a reference, namely the interview test score criteria, psychological test score criteria, and education criteria. This criterion is made based on the results of the criteria set by the company in finding new employees who are ideally competent to boost the performance of the company PT. Universal Gloves. These criteria can be seen in the information below, namely:

1.The criteria for the interview test scores are 3 times more important than the psychological test scores.
2. Criteria for interview test scores are 4 times more important than educational scores.
3. Criteria for psychological test scores are 2 times more important than educational scores.

Table. 3 Pairwise Comparison . Matrix

Criteria	K1	K2	K3
K1	1	3	4
K2	1/3	1	2
K3	□	1/2	1

In the pairwise comparison matrix table above, it is obtained based on the importance of each criterion set by the company which is then converted into decimal form and obtained the amount in each column, it can be seen as in the table below.

Table. 4 Matrixpairwise comparison in decimal form

Criteria	K1	K2	K3
K1	1.00	3.00	4.00
K2	0.33	1.00	2.00
K3	0.25	0.50	1.00
Amount	1.58	4.50	7.00

After the values in the pairwise comparison matrix in the table above are converted into decimal numbers, then each column value in the pairwise comparison matrix table above is divided by the number of each column of criteria and the results can be seen in the following table.

Table. 5 MatrixThe result of dividing each column by the number of columns

Criteria	K1	K2	K3
K1	0.632	0.667	0.571
K2	0.211	0.222	0.286
K3	0.158	0.111	0.143

The results of the division of each column by the number of existing columns as in the table above are then added to each row and then divided by 3 (the number of criteria set by the company) and the results are as shown in the table below. Table 6MatrixThe result of the sum of each row in the table

Criteria	K1	K2	K3	Number of rows	Eigen Vector
K1	0.632	0.667	0.571	1,870	0.623
K2	0.211	0.222	0.286	0.718	0.239
K3	0.158	0.111	0.143	0.412	0.137

From the results of the calculations in the table above, the results of the priority order of criteria can be obtained as shown in the table below.

Table. 7 Results of Priority Order for each criterion

Criteria	Number of rows	Eigen Vector	Priority
K1	1,870	0.623	1
K2	0.718	0.239	2
K3	0.412	0.137	3

Calculating the consistency ratio to find out whether the criteria comparison assessment is consistent

a. Determine the Maximum Eigenvalue (λmax) = (1.58 * 0.623) + (4.50 * 0.239) + (7.00 * 0.137) = 3.025

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b. Consistency Index (CI) = (λmax – n) /n-1 = (3,025 - 3) /3-1 = 0.013

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

c. Consistency Ratio (CR) = CI/RI = 0.013/0.58 = 0.022
d. CR < 0.100 means the weighting preference is consistent.

D. Determination of new employee acceptance using TOPSIS method

The ANP-TOPSIS method is a method used in decision making with different multi-criteria to solve existing problems. in the case of selecting new employees at PT. Universal Gloves. In this section, before designing the system, an analysis of the data that is the source of the database that will be used in making the system is carried out first.Determination of the acceptance of new employees at PT. Universal Gloves uses three criteria, namely interview test scores, psychological test scores, and education. In this study, the data used is sample data obtained from the company in the form of names of prospective employees who will be selected at PT. Universal Gloves are as in the table below:

Table. 8 Criteria for Sample data

Job Applicant Name	Criteria		
	Interview value (K1)	Psychological Test Score (K2)	Education (K3)
Helen Sinaga	80	70	2
Shadow princess	70	90	3
André swandana	60	80	2
Kesuma Irwansyah	90	70	3
Denis Sidabutar	70	90	1
Lina Simarmata	90	70	3
Novayanti manalu	80	60	2
Rijal Abidin	70	90	2
Tedy Rezadian	90	70	3
Angga Firmansyah	70	90	2

The following is the assessment process for the three alternatives on the acceptance of new employees at company using the TOPSIS method and the weights given by the ANP method. The following are the steps for calculating the TOPSIS method:

1. Form a weighted normalized (R) decision matrix using the formula (5)

$X1 = \sqrt{80^2 + 70^2 + 60^2 + 90^2 + 70^2 + 90^2 + 80^2 + 70^2 + 90^2 + 70^2}$
$= 60300$

$r11 = \frac{80}{60300} = 0.0013267$
$r21 = \frac{70}{60300} = 0.001160862$
$r31 = \frac{60}{60300} = 0.000995025$
$r41 = \frac{90}{60300} = 0.001492537$
$r51 = \frac{70}{60300} = 0.001160862$
$r61 = \frac{90}{60300} = 0.001492537$
$r71 = \frac{80}{60300} = 0.0013267$
$r81 = \frac{70}{60300} = 0.001160862$
$r91 = \frac{90}{60300} = 0.001492537$
$r101 = \frac{70}{60300} = 0.001160862$

$X2 = \sqrt{70^2 + 90^2 + 80^2 + 70^2 + 90^2 + 70^2 + 60^2 + 90^2 + 70^2 + 90^2}$
$= 62000$

$r12 = \frac{70}{62000} = 0.001129$
$r22 = \frac{90}{62000} = 0.001452$
$r32 = \frac{80}{62000} = 0.00129$

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$r42 = \frac{70}{62000} = 0.001129$
$r52 = \frac{90}{62000} = 0.001452$
$r62 = \frac{70}{62000} = 0.001129$
$r72 = \frac{60}{62000} = 0.000968$
$r82 = \frac{90}{62000} = 0.001452$
$r92 = \frac{70}{62000} = 0.001129$
$r102 = \frac{90}{62000} = 0.001452$

$X3 = \sqrt{2^2 + 3^2 + 2^2 + 3^2 + 1^2 + 3^2 + 2^2 + 2^2 + 3^2 + 2^2}$
$= 57$
$r13 = \frac{2}{57} = 0.035088$
$r23 = \frac{2}{57} = 0.052632$
$r33 = = \frac{2}{57} 0.035088$
$r43 = \frac{2}{57} = 0.052632$
$r53 = \frac{2}{57} = 0.017544$
$r63 = \frac{2}{57} = 0.052632$
$r73 = \frac{2}{57} = 0.035088$
$r83 = \frac{2}{57} = 0.035088$
$r93 = \frac{2}{57} = 0.052632$
$r103 = = \frac{2}{57} 0.035088$

So that the value (R) is obtained as follows:

$$R = \begin{pmatrix} 0{,}0013267 & 0{,}001129 & 0{,}035088 \\ 0{,}001160862 & 0{,}001452 & 0{,}052632 \\ 0{,}000995025 & 0{,}00129 & 0{,}035088 \\ 0{,}001492537 & 0{,}001129 & 0{,}052632 \\ 0{,}001160862 & 0{,}001452 & 0{,}017544 \\ 0{,}001492537 & 0{,}001129 & 0{,}052632 \\ 0{,}0013267 & 0{,}000968 & 0{,}035088 \\ 0{,}001160862 & 0{,}001452 & 0{,}035088 \\ 0{,}001492537 & 0{,}001129 & 0{,}052632 \\ 0{,}001160862 & 0{,}001452 & 0{,}035088 \end{pmatrix}$$

From the results of forming a weighted normalized decision matrix (R) using the formula (2.5) above, the normalized decision matrix is obtained as shown in the table below.

Table. 9 Normalized Decision Matrix

Applicant's name	Criteria		
	K1	K2	K3
Helen Sinaga	0.0013267	0.001129	0.035088
Shadow princess	0.001160862	0.001452	0.052632
André swandana	0.000995025	0.00129	0.035088
Kesuma Irwansyah	0.001492537	0.001129	0.052632
Denis Sidabutar	0.001160862	0.001452	0.017544
Lina Simarmata	0.001492537	0.001129	0.052632
Novayanti manalu	0.0013267	0.000968	0.035088
Rijal Abidin	0.001160862	0.001452	0.035088
Tedy Rezadian	0.001492537	0.001129	0.052632
Angga Firmansyah	0.001160862	0.001452	0.035088

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2. After obtaining the normalized matrix, then look for the value in the normalized matrix multiplied by. The preference value on each criterion, namely the weight value of the criteria used in determining the. acceptance of new employees at company can be seen as below.

Table 10 Priority Preference Values

Sub Criteria	Reference Weight	Priority
K1	0.623	1
K2	0.239	2
K3	0.137	3

Y_{11} = w1 X r11 =0.623x0.0013267=0.000826534
Y_{21} = w1 X r21 =0.623x0.001160862=0.000723217
Y_{31} = w1 X r31 =0.623x0.000995025=0.000619901
Y_{41} = w1 X r41 =0.623x0.001492537=0.000929851
Y_{51} = w1 X r51 =0.623x0.001160862=0.000723217
Y_{61} = w1 X r61 =0.623x0.001492537=0.000929851
Y_{71} = w1 X r71 =0.623x0.0013267 = 0.000826534
Y_{81} = w1 X r81 =0.623x0.001160862=0.000723217
Y_{91} = w1 X r91 =0.623x0.001492537=0.000929851
Y_{101}= w1 X r101 =0.623x0.001160862=0.000723217
Y_{12} = w2 X r12 =0.239x0.001129=0.00026983

Y_{22} = w2 X r22 =0.239x0.001452=0.00034703
Y_{32} = w2 X r32 =0.239x0.00129=0.00030831
Y_{42} = w2 X r42 =0.239x0.001129=0.00026983
Y_{52}= w2 X r52 =0.239x0.001452=0.00034703
Y_{62} = w2 X r62 =0.239x0.001129=0.00026983
Y_{72} = w2 X r72 =0.239x0.000968 = 0.00023135
Y_{82} = w2 X r82 =0.239x0.001452=0.00034703
Y_{92} = w2 X r92 =0.239x0.001129=0.00026983
Y_{102}= w2 X r102 =0.239x0.001452=0.00034703

Y_{13} = w3 X r13 =0.137x0.035088 =0.00480706
Y_{23} = w3 X r23 =0.137x0.052632 =0.00721058
Y_{33} = w3 X r33 =0.137x0.035088 =0.00480706
Y_{43} = w3 X r43 =0.137x0.052632 =0.00721058
Y_{53} = w3 X r53 =0.137x0.017544 =0.00240353
Y_{63} = w3 X r63 =0.137x0.052632 =0.00721058
Y_{73} = w3 X r73 =0.137x0.035088 = 0.00480706
Y_{83} = w3 X r83 =0.137x0.035088 =0.00480706
Y_{93} = w3 X r93 =0.137x0.052632 =0.00721058
Y_{10} = w3 X r103 =0.137x0.035088 =0.00480706

So that the Y matrix is obtained:

$$Y = \begin{pmatrix} 0{,}000826534 & 0{,}00026983 & 0{,}00480706 \\ 0{,}000723217 & 0{,}00034703 & 0{,}00721058 \\ 0{,}000619901 & 0{,}00030831 & 0{,}00480706 \\ 0{,}000929851 & 0{,}00026983 & 0{,}00721058 \\ 0{,}000723217 & 0{,}00034703 & 0{,}00240353 \\ 0{,}000929851 & 0{,}00026983 & 0{,}00721058 \\ 0{,}000826534 & 0{,}00023135 & 0{,}00480706 \\ 0{,}000723217 & 0{,}00034703 & 0{,}00480706 \\ 0{,}000929851 & 0{,}00026983 & 0{,}00721058 \\ 0{,}000723217 & 0{,}00034703 & 0{,}00480706 \end{pmatrix}$$

From the results of the values in the normalization matrix multiplied by the preference values for each criterion, it can be seen that the weighted normalized decision matrix can be seen in the table below.

*name of corresponding author

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Table. 11 Weighted Normalized Decision Matrix

Applicant's name	Criteria		
	K1	K2	K3
Helen Sinaga	0.000826534	0.00026983	0.00480706
Shadow princess	0.000723217	0.00034703	0.00721058
André swandana	0.000619901	0.00030831	0.00480706
Kesuma Irwansyah	0.000929851	0.00026983	0.00721058
Denis Sidabutar	0.000723217	0.00034703	0.00240353
Lina Simarmata	0.000929851	0.00026983	0.00721058
Novayanti manalu	0.000826534	0.00023135	0.00480706
Rijal Abidin	0.000723217	0.00034703	0.00480706
Tedy Rezadian	0.000929851	0.00026983	0.00721058
Angga Firmansyah	0.000723217	0.00034703	0.00480706

3. Determining the ideal negative matrix A+ and Negative Matrix A- can be calculated below. Determine the negative ideal matrix A+

Y+ Max = {0.000826534 ; 0.000723217 ; 0.000619901 ; 0.000929851 ; 0.000929851 ; 0.000826534 ; 0.000723217 ; 0.000929851 ; 0.000723217}
=0.000929851

Y+ Max ={0.00026983 ; 0.00034703 ; 0.00030831 ; 0.00026983 ; 0.00034703 ; 0.00026983 ; 0.00023135 ; 0.00034703 ; 0.00026983 ; 0.00034703}
=0.00034703

Y+ Max = {0.00480706 ; 0.00721058 ; 0.00480706 ; 0.00721058 ; 0.00240353 ; 0.00721058 ; 0.00480706 ; 0.00480706 ; 0.00721058 ; 0.00480706}
=0.00721058

From the results of the information above, a positive ideal solution is obtained for each criterion as shown in the table below, namely:

Table. 12 Positive Ideal Solutions

Criteria	SJ+
K1	0.000929851
K2	0.00034703
K3	0.00721058

Determine the negative ideal matrix A-

Y- Min = {0.000826534 ; 0.000723217 ; 0.000619901 ; 0.000929851 ; 0.000929851 ; 0.000826534 ; 0.000723217 ; 0.000929851 ; 0.000723217}
=0.000619901

Y- Min = {0.00026983 ; 0.00034703 ; 0.00030831 ; 0.00026983 ; 0.00034703 ; 0.00026983 ; 0.00023135 ; 0.00034703 ; 0.00026983 ; 0.00034703}
=0.00023135

Y- Min = {0.00480706 ; 0.00721058 ; 0.00480706 ; 0.00721058 ; 0.00240353 ; 0.00721058 ; 0.00480706 ; 0.00480706 ; 0.00721058 ; 0.00480706}
=0.00240353

From the results of the information above, a positive ideal solution is obtained for each criterion as shown in the table below, namely:

Table. 13 negative ideal solutions

Criteria	SJ-
K1	0.000619901
K2	0.00023135
K3	0.00240353

4. Determine. the distance. between. the. weighted. value. of. each. alternative. to. the. positive. ideal. solution, namely:

$D_1^+\sqrt{(0{,}000826534-0{,}000929851)^2+(0{,}00026983-0{,}00034703)^2+(0{,}00480706-0{,}00721058)^2}$
=0.002406978

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$D_2^+\sqrt{(0{,}000723217-0{,}000929851)^2+(0{,}00034703-0{,}00034703)^2+(0{,}00721058-0{,}00721058)^2}$
=0.00020663
$D_3^+\sqrt{(0{,}000619901-0{,}000929851)^2+(0{,}00030831-0{,}00034703)^2+(0{,}00480706-0{,}00721058)^2}$
=0.00242373
$D_4^+\sqrt{(0{,}000929851-0{,}000929851)^2+(0{,}00026983-0{,}00034703)^2+(0{,}00721058-0{,}00721058)^2}$
=0.000772
$D_5^+\sqrt{(0{,}000723217-0{,}000929851)^2+(0{,}00034703-0{,}00034703)^2+(0{,}00240353-0{,}00721058)^2}$
=0.00481149
$D_6^+\sqrt{(0{,}000929851-0{,}000929851)^2+(0{,}00026983-0{,}00034703)^2+(0{,}00721058-0{,}00721058)^2}$
= 0.00721058
$D_7^+\sqrt{(0{,}000826534-0{,}000929851)^2+(0{,}00023135-0{,}00034703)^2+(0{,}00480706-0{,}00721058)^2}$
=0.00240852
$D_8^+\sqrt{(0{,}000723217-0{,}000929851)^2+(0{,}00034703-0{,}00034703)^2+(0{,}00480706-0{,}00721058)^2}$
=0.00241239
$D_9^+\sqrt{(0{,}000929851-0{,}000929851)^2+(0{,}00026983-0{,}00034703)^2+(,00721058-0{,}00721058)^2}$
=0.000772
$D_{10}^+\sqrt{(0{,}000723217-0{,}000929851)^2+(0{,}00034703-0{,}00034703)^2+(0{,}00480706-0{,}00721058)^2}$
=0.00241239

5. Determine. the. distance. between. the. weighted. value. of. each. alternative. to. the. negative. ideal. solution.

$D_1^-\sqrt{(0{,}000826534-0{,}000619901)^2+(0{,}00026983-0{,}00023135)^2+(0{,}00480706-0{,}00240353)^2}$
=0.002412703
$D_2^-\sqrt{(0{,}000723217-0{,}000619901)^2+(0{,}00034703-0{,}00023135)^2+(0{,}00721058-0{,}00240353)^2}$
=0.00480955
$D_3^-\sqrt{(0{,}000619901-0{,}000619901)^2+(0{,}00030831-0{,}00023135)^2+(0{,}00480706-0{,}00240353)^2}$
=0.00240476
$D_4^-\sqrt{(0{,}000929851-0{,}000619901)^2+(0{,}00026983-0{,}00023135)^2+(0{,}00721058-0{,}00240353)^2}$
=0.00481719
$D_5^-\sqrt{(0{,}000723217-0{,}000619901)^2+(0{,}00034703-0{,}00023135)^2+(0{,}00240353-0{,}00240353)^2}$
=0.0001551
$D_6^-\sqrt{(0{,}000929851-0{,}000619901)^2+(0{,}00026983-0{,}00023135)^2+(0{,}00721058-0{,}00240353)^2}$
=0.004817186
$D_7^-\sqrt{(0{,}000826534-0{,}000619901)^2+(0{,}00023135-0{,}00023135)^2+(0{,}00480706-0{,}00240353)^2}$
=0.0024124
$D_8^-\sqrt{(0{,}000723217-0{,}000619901)^2+(0{,}00034703-0{,}00023135)^2+(0{,}00480706-0{,}00240353)^2}$
=0.00240853
$D_9^-\sqrt{(0{,}000929851-0{,}000619901)^2+(0{,}00026983-0{,}00023135)^2+(,00721058-0{,}00240353)^2}$
=0.00481719
$D_{10}^-\sqrt{(0{,}000723217-0{,}000619901)^2+(0{,}00034703-0{,}00023135)^2+(0{,}00480706-0{,}00240353)^2}$
=0.00240853

From the results of the above calculations, the distance between each of the alternatives obtained can be seen as shown in the table below.

Table. 14 Distance Between Each Alternative

Applicant Name	Vi	
	S_I^+	S_I^-
Helen Sinaga	0.002406978	0.002412703
Shadow princess	0.00020663	0.00480955
André swandana	0.00242373	0.00240476
Kesuma Irwansyah	0.000772	0.00481719
Denis Sidabutar	0.00481149	0.0001551
Lina Simarmata	0.00721058	0.004817186
Novayanti manalu	0.00240852	0.0024124

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Rijal Abidin	0.00241239	0.00240853
Tedy Rezadian	0.000772	0.00481719
Angga Firmansyah	0.00241239	0.0024085

6. Determine the preference value for each alternative

$$V1 = \frac{0{,}002412703}{0{,}002406978 + 0{,}002412703} = 0.50594$$
$$V2 = \frac{0{,}00480955}{0{,}00020663 + 0{,}00480955} = 0.958807$$
$$V3 = \frac{0{,}00240476}{0{,}00242373 + 0{,}00240476} = 0.498036$$
$$V4 = \frac{0{,}00481719}{0{,}0000772 + 0{,}00481719} = 0.984227$$
$$V5 = \frac{0{,}0001551}{0{,}00481149 + 0{,}0001551} = 0.031229$$
$$V6 = \frac{0{,}004817186}{0{,}00721058 + 0{,}004817186} = 0.40505$$
$$V7 = \frac{0{,}0024124}{0{,}00240852 + 0{,}0024124} = 0.500402$$
$$V8 = \frac{0{,}00240853}{0{,}00241239 + 0{,}00240853} = 0.4996$$
$$V9 = \frac{0{,}00481719}{0{,}0000772 + 0{,}00481719} = 0.984224$$
$$V10 = \frac{0{,}0024085}{0{,}00241239 + 0{,}0024085} = 0.499597$$

Based on the results of the ranking calculations obtained using the ANP-TOPSIS combination method, it can be seen in the following table:

Table. 15 Relative proximity values

Applicant Name	Relative proximity value
Helen Sinaga	0.50594
Shadow princess	0.958807
André swandana	0.498036
Kesuma Irwansyah	0.984227
Denis Sidabutar	0.031229
Lina Simarmata	0.40505
Novayanti manalu	0.500402
Rijal Abidin	0.4996
Tedy Rezadian	0.984224
Angga Firmansyah	0.499597

DISCUSSIONS

From the results of the above calculations, the highest value obtained is based on alternative criteria and data, showing the highest preference value is Kesuma Irwansyah with an average value0.996227as the 1st rank, Lina simarmatawith an average value of 0.649657as the 2nd rank, and the Shadow Princess with an average value of 0.646257as the 3rd rank. So it can be concluded from the calculation results of the combination of the two ANP-TOPSIS methods that Kesuma Irwansyah is ranked first with the highest score based on the weighting results of the ANP method and then calculated by the TOPSIS method for ranking. The ranking can be seen in the table below.

Table. 16 Ranking

Applicant Name	**Relative proximity value**	**Rangking**
Kesuma Irwansyah	0.984227	1
Tedy Rezadian	0.984224	2
Shadow princess	0.958807	3
Helen Sinaga	0.50594	4
Novayanti manalu	0.500402	5
Rijal Abidin	0.4996	6

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Angga Firmansyah	0.499597	7
André swandana	0.498036	8
Lina Simarmata	0.40505	9
Denis Sidabutar	0.031229	10

From the results of the above calculations, the highest value obtained is based on alternative criteria and data, showing the highest preference value is Kesuma Irwansyah with an average value0.996227as the 1st rank, Lina simarmatawith an average value of 0.649657as the 2nd rank, and the Shadow Princess with an average value of 0.646257as the 3rd rank. So it can be concluded from the results of the calculation of the combination of the two ANP-TOPSIS methods that Kesuma Irwansyah is ranked first with the highest score based on the weighting results of the ANP method and then calculated by the TOPSIS method.

CONCLUSION

With the combination of the ANP-TOPSIS method in the selection of new employee selection where the method easily performs calculations because the tasks of each method are accurate. The results obtained are very suitable based on the criteria and weights on the method used. fast, precise and accurate.

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