Decision Support System for Selection of Outstanding Students at
Angkasa Maros High School Using the TOPSIS Method

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Abstract

This study aims to develop a Decision Support System (DSS) to aid in the selection of outstanding students at Angkasa Maros High School. The TOPSIS method was selected for its capability to handle diverse criteria, enabling assessments based on academic and non-academic achievements, leadership qualities, and positive attitudes. Data were collected through observational and documentary methods, gathering student achievement data and other relevant factors, which were then inputted into the system to compute relative scores for each student based on predetermined criteria weights. This process resulted in a ranking of students according to their performance against these criteria. The research findings indicated that the DSS achieved an overall percentage score of 90.3% in selecting outstanding students using the TOPSIS method, demonstrating effective system implementation and significant benefits in the student selection process. The study's outcomes are expected to provide objective and accurate recommendations for selecting outstanding students at Angkasa Maros High School, serving as a guide for the school in identifying students with high potential and facilitating more effective and efficient decision-making. Additionally, the research offers valuable insights for Angkasa Maros High School to enhance educational quality, maximize student potential development, and produce graduates capable of competing at national and international levels.

Keywords: Decision support system; Student selection criteria; TOPSIS Method; Effective system implementation

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Introduction

In the world of education, selecting outstanding students is a very important element (Syafi'i et al., 2018; Sunarti Rahman, 2021). This process aims to identify and select students who have superior potential and abilities in various fields, both academic and non-academic (Rahman, 2023; Arsara & others, 2023). Thus, selecting outstanding students not only rewards extraordinary individuals but also serves as motivation for other students to continue improving their abilities (Mufasirah & others, 2021; Abduloh et al., 2022). Therefore, selecting outstanding students is an effective way to encourage a healthy competitive culture and improve the overall quality of education (Octaviana, 2021; Syah & Pertiwi, 2024).

The main aim of selecting outstanding students is to ensure that the selected students truly have the ability and potential to be proud of (Adit, 2020; Sugianto, 2010; Prasatyra, 2024). They are individuals who demonstrate extraordinary achievements in various aspects, including academics, sports, arts, and other skills. These outstanding students have a very significant role in improving the school's image and helping the school achieve high academic achievements (Thabroni & Riadi, 2022; Studynews.co.id, 2024). Apart from that, they also become role models for other students and motivate the entire school community to try harder to achieve success (Wikipedia, 2023).

However, in the process of selecting outstanding students at Angkasa Maros High School, there are often complex obstacles and challenges. One of the main obstacles is the existence of subjectivity in assessing outstanding students. This subjectivity can arise from the preferences or subjective views of parties involved in the assessment process, such as teachers and school staff (Pettifor & Saklofske, 2011; Brown, 2004; Scott et al., 2014). When assessments are based on a subjective point of view, the decisions taken can be non-objective and unfair (Kusumah, 2015). This is of course detrimental to students who actually have the same or even better abilities but do not get the recognition they deserve.

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(Dahlan, 2015; Rabudin, 2020; Setiawan, 2023). To overcome this obstacle, it is important for SMA Angkasa Maros to develop a more objective and transparent assessment system. This system must include clear and measurable assessment criteria, and involve various parties in the evaluation process to reduce bias. Apart from that, training for teachers and school staff regarding the importance of objectivity in assessment can also be an important step to ensure that the process of selecting outstanding students runs fairly and in line with the expected goals. Thus, it is hoped that the selection of outstanding students can provide maximum benefits for all students and improve the quality of education at Angkasa Maros High School.

Therefore, an organized, unbiased and effective system is needed to help recruit outstanding students at Angkasa Maros High School. The TOPSIS methodology allows taking better decisions. The TOPSIS method allows decision makers to evaluate alternatives based on several important criteria. By implementing a decision support system based on the TOPSIS method in the case of selecting outstanding students at Angkasa Maros High School, it is hoped that the selection process can become more transparent, structured and accurate. This system will help decision makers, such as teachers, school staff in making more objective decisions based on the criteria that have been selected. And also, use can also increase efficiency in the process of selecting outstanding students so that the time and resources required can be optimized.

With the existence of a decision support system for selecting outstanding students at Angkasa Maros High School using the TOPSIS method, it is hoped that it can improve the quality of selecting outstanding students, create a fair and objective environment, and encourage students to develop their best potential and achievements.

**Method**

The method used in this research is the TOPSIS method. The TOPSIS method, or Technique for Order Preference by Similarity to Ideal Solution, is one of the methods used in multi-criteria decision-making. TOPSIS was first introduced by Yoon and Hwang in 1981 as a multi-criteria decision-making technique (Kantinit, 2022; Eliyana et al., 2020; Rahmawati, 2020; Syafnidawaty, 2020). The principle used in TOPSIS is that the alternative chosen must be closest to the positive ideal solution and farthest from the negative ideal solution from a geometric point of view (Ardiansyah, 2017; Darmawan et al., 2021). To measure the relative closeness of an alternative, the geometric distance is calculated using Euclidean distance (Munthe, 2019; Limbong, 2011; Sipayung, 2016). Good solutions are essential for every product, while bad solutions are not so important. The TOPSIS method uses these two distances to measure the closeness between alternative solutions and the best solution and considers how close the alternative is to the best solution (Sundari, 2015). Alternative priorities can then be determined based on the relative distance comparison. This method is widely used to make practical decisions because the concept is easy to understand, computationally effective, and capable of measuring the relative performance of various decision alternatives (Code, 2022; Kompasiana, 2024; Wicaksono, 2023). The steps for completing the TOPSIS method are as follows.

1. The first step is that we have to Create a normalized decision matrix.
2. Next we have to create a weighted normalized decision matrix.
3. After that we determine the positive ideal solution matrix & negative ideal solution matrix.
4. After that we determine the distance between the value of each alternative and the positive ideal solution matrix & negative ideal solution matrix.
5. Then we will determine the preference value for each alternative.

The formula used in the TOPSIS method is:

<table>
<thead>
<tr>
<th>Step</th>
<th>Formula</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a decision matrix</td>
<td>( r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} )</td>
<td>Normalize the decision matrix with ( i = 1, 2, \ldots, m ) and ( j = 1, 2, \ldots, n ).</td>
</tr>
</tbody>
</table>
Create a weighted normalized decision matrix

\[ y_{ij} = w_i x_{ij} \]

The normalized decision matrix is multiplied by weights, with \(i = 1, 2, ..., m\) and \(j = 1, 2, ..., n\).

Determine the positive ideal solution matrix and the negative ideal solution matrix. And determine values \(y_i^+\) and \(y_i^-\).

Determine the distance between the value of each alternative and the positive and negative ideal solution matrices.

\[ D_i^+ = \sqrt{\sum_{j=1}^{n} (y_{ij}^+ - y_{ij})^2} \quad \text{And} \quad D_i^- = \sqrt{\sum_{j=1}^{n} (y_{ij}^- - y_{ij})^2} \]

Calculate the distance between the value of each alternative and the positive and negative ideal solutions.

Preference value for each alternative.

\[ V_i = \frac{D_i^-}{D_i^- + D_i^+} \]

Brief Explanation:

**Normalize the Decision Matrix:** The decision matrix is normalized to convert the attribute values to a comparable scale.

**Create Weighted Normalized Decision Matrix:** The normalized decision matrix is multiplied by the weights of each criterion.

**Determine Positive and Negative Ideal Solutions:** Positive and negative ideal solutions are identified based on benefit and cost attributes.

**Calculate Distance to Ideal Solutions:** The distance between each alternative and the positive and negative ideal solutions is calculated.

**Preference Value:** The preference value for each alternative is calculated based on the distance to the positive and negative ideal solutions.

In this research, the author designed a comprehensive and systematic arrangement of research stages for the selection of outstanding students at Angkasa Maros High School. The stages expected in this research include analysis of student academic and non-academic achievement data, identification of key factors that contribute to student success, development of objective assessment criteria, preparation of student assessment matrices, normalization of assessment matrices, calculation of the distance between each student with an ideal solution matrix, and finally, decision making based on the resulting student rankings. The stages of this research can be seen in Figure 1.

![Figure 1. Research stages](image)

In this system, procedures are explained using UML (Unified Modeling Language). UML (Unified Modeling Language) is a standard modeling language used to describe, define, design and document components in software systems. UML allows developers and analysts to create visual models that cover various aspects of a system, such as structure, behavior, and interactions between components (Booch et al., 1997; Jacobson & Booch, 2021). UML is used to describe systems in the form of use-case diagrams that describe interactions between actors and systems (Booch et al., 1996; Quatrani & Evangelist, 2003). A use case diagram is a visual representation that shows how users (or actors) interact with a system (Bittner & Spence, 2003; Setiyani, 2021). These diagrams depict various system usage scenarios, including the actions users can take and how the system responds. Next, every process that occurs in the system will be explained using an activity diagram that visualizes the workflow and steps taken. The system use case can be seen in Figure 2.
In designing this system, class diagrams are also used, which are a type of structural diagram in UML that are used to describe the structure and relationships between classes, attributes and methods in a system.(Ali et al., 2007; Berardi et al., 2005; Evans, 1998). This class diagram is static, which means it does not describe the interactions between the classes directly, but provides an overview of how the classes interact in the system.(Dennis et al., 2015; Fowler, 2018).

The following is the Class Diagram of the Decision Support System for Selection of Outstanding Students at Angkasa Maros High School, in Figure 3.

![Figure 2. Use case diagram](image)

### Results and Discussion

#### Results

The results of research on the Decision Support System for Selection of Outstanding Students at Angkasa Maros High School Using the TOPSIS Method are as follows:

System testing results using the Black Box Texting method. Testing is carried out to observe how the software behaves without requiring an understanding of the code structure used. This trial is carried out after software development is complete, with the aim of verifying that the software functions properly and as expected. The results of the black box test can be seen in Table 2.

![Figure 3. Class diagram](image)

<table>
<thead>
<tr>
<th>Testing</th>
<th>Test</th>
<th>Which are expected</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login menu</td>
<td>Enter the correct username and password</td>
<td>Admin is visible in the text, username and pass are</td>
<td>Success</td>
</tr>
<tr>
<td></td>
<td>data</td>
<td>listed as well</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entering incorrect username and</td>
<td>Admin data is not visible and is rejected</td>
<td>Success</td>
</tr>
<tr>
<td></td>
<td>password data</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select the login button</td>
<td>The button can function as desired</td>
<td>Success</td>
</tr>
</tbody>
</table>

Table 2. Results of black box testing
In Figure 4, the login menu page is the first page that appears after the system is accessed. To access this page, both admin and user must fill in their username and password correctly to be able to enter the system.

In Figure 5, the dashboard page is the page that appears after successfully logging in as admin. The user will be directed to the Dashboard page which displays various main menus, including home, criteria data, alternative data, analysis and results.

In Figure 6, the criteria page contains criteria description data. This data is needed before starting calculations in the decision support system. Users need to pay attention to the importance of inputting data in accordance with approved specifications.
In Figure 7, the alternative data page is where users can use alternative data or student data and use score values in the decision support calculation process.

In Figure 8, the calculation results page is a page where users can see the analysis results of each alternative choice. Users can easily draw conclusions from the results.

In figure 9, the calculation and ranking results page, this page will display the results of the alternative rankings that have been calculated previously. These results are presented in rank order based on highest to lowest scores, providing users with clear and detailed information regarding the most superior alternatives in selecting high-achieving students.

Table 3. Alternative data

<table>
<thead>
<tr>
<th>Alternative Code</th>
<th>Alternative name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Batto</td>
</tr>
<tr>
<td>A2</td>
<td>Rika</td>
</tr>
<tr>
<td>A3</td>
<td>Moli</td>
</tr>
<tr>
<td>A4</td>
<td>Bobo</td>
</tr>
<tr>
<td>A5</td>
<td>Maggie</td>
</tr>
</tbody>
</table>
After obtaining all the necessary data, the next step is to weigh the criteria to fill in the values obtained from the alternatives.

Table 5. C1 – C4 weighting

<table>
<thead>
<tr>
<th>Price</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>1</td>
</tr>
<tr>
<td>51 - 65</td>
<td>2</td>
</tr>
<tr>
<td>66 - 75</td>
<td>3</td>
</tr>
<tr>
<td>76 - 85</td>
<td>4</td>
</tr>
<tr>
<td>86 - 100</td>
<td>5</td>
</tr>
</tbody>
</table>

The first stage is to create a normalized decision matrix

Table 6. Alternative values for each criterion

<table>
<thead>
<tr>
<th>Alternative</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batto</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Rika</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Moli</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bobo</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Maggie</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Rocky</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Sarni</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Anthony</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Next, we will create a normalized decision matrix first.

\[ X = \begin{bmatrix} 4 & 3 & 4 & 5 \\ 4 & 5 & 4 & 3 \\ 3 & 3 & 5 & 4 \\ 5 & 5 & 4 & 1 \\ 3 & 3 & 3 & 5 \\ 4 & 4 & 2 & 2 \\ 4 & 3 & 4 & 4 \\ 4 & 3 & 2 & 5 \end{bmatrix} \]

Calculating the normalized matrix, before looking for the value, we will look for the value with the following formula:

\[ |X_n| = \sqrt{\sum_{i=1}^{m} x_{ij}^2} \]
After getting the value of $X_n$, then complete the formula as follows: $r_{ij}$

\[
\begin{align*}
r_{11} &= \frac{x_{11}}{|x_1|} = \frac{4}{11.091} = 0.361 \\
r_{12} &= \frac{x_{12}}{|x_2|} = \frac{3}{10.536} = 0.285 \\
r_{21} &= \frac{x_{21}}{|x_1|} = \frac{4}{11.091} = 0.361 \\
r_{22} &= \frac{x_{22}}{|x_2|} = \frac{5}{10.536} = 0.475 \\
r_{31} &= \frac{x_{31}}{|x_1|} = \frac{3}{11.091} = 0.271 \\
r_{32} &= \frac{x_{32}}{|x_2|} = \frac{5}{10.536} = 0.475 \\
r_{41} &= \frac{x_{41}}{|x_1|} = \frac{5}{11.091} = 0.451 \\
r_{42} &= \frac{x_{42}}{|x_2|} = \frac{3}{10.536} = 0.285 \\
r_{51} &= \frac{x_{51}}{|x_1|} = \frac{3}{11.091} = 0.271 \\
r_{52} &= \frac{x_{52}}{|x_2|} = \frac{4}{10.536} = 0.380 \\
r_{61} &= \frac{x_{61}}{|x_1|} = \frac{4}{11.091} = 0.361 \\
r_{62} &= \frac{x_{62}}{|x_2|} = \frac{3}{10.536} = 0.285 \\
r_{71} &= \frac{x_{71}}{|x_1|} = \frac{4}{11.091} = 0.361 \\
r_{72} &= \frac{x_{72}}{|x_2|} = \frac{3}{10.536} = 0.285 \\
r_{81} &= \frac{x_{81}}{|x_1|} = \frac{4}{11.091} = 0.361 \\
r_{82} &= \frac{x_{82}}{|x_2|} = \frac{3}{10.536} = 0.285 \\
r_{13} &= \frac{x_{13}}{|x_3|} = \frac{4}{10.296} = 0.389 \\
r_{14} &= \frac{x_{14}}{|x_4|} = \frac{5}{11.000} = 0.455 \\
r_{23} &= \frac{x_{23}}{|x_3|} = \frac{4}{10.296} = 0.389 \\
r_{24} &= \frac{x_{24}}{|x_4|} = \frac{5}{11.000} = 0.373 \\
r_{33} &= \frac{x_{33}}{|x_3|} = \frac{5}{10.296} = 0.486 \\
r_{34} &= \frac{x_{34}}{|x_4|} = \frac{4}{11.000} = 0.364 \\
r_{43} &= \frac{x_{43}}{|x_3|} = \frac{4}{10.296} = 0.389 \\
r_{44} &= \frac{x_{44}}{|x_4|} = \frac{1}{11.000} = 0.091 \\
r_{53} &= \frac{x_{53}}{|x_3|} = \frac{3}{10.296} = 0.291 \\
r_{54} &= \frac{x_{54}}{|x_4|} = \frac{5}{11.000} = 0.455 \\
r_{63} &= \frac{x_{63}}{|x_3|} = \frac{2}{10.296} = 0.194 \\
r_{64} &= \frac{x_{64}}{|x_4|} = \frac{2}{11.000} = 0.182 \\
r_{73} &= \frac{x_{73}}{|x_3|} = \frac{4}{10.296} = 0.389 \\
r_{74} &= \frac{x_{74}}{|x_4|} = \frac{4}{11.000} = 0.364 \\
r_{83} &= \frac{x_{83}}{|x_3|} = \frac{2}{10.296} = 0.194 \\
r_{84} &= \frac{x_{84}}{|x_4|} = \frac{5}{11.000} = 0.455
\end{align*}
\]

So the normalized decision matrix ($R$) is obtained as follows:

\[
R = \begin{bmatrix}
0.361 & 0.285 & 0.389 & 0.455 \\
0.361 & 0.475 & 0.389 & 0.273 \\
0.271 & 0.285 & 0.486 & 0.364 \\
0.451 & 0.475 & 0.389 & 0.091 \\
0.271 & 0.285 & 0.291 & 0.455 \\
0.361 & 0.380 & 0.194 & 0.182 \\
0.361 & 0.285 & 0.389 & 0.364 \\
0.361 & 0.285 & 0.194 & 0.455
\end{bmatrix}
\]

Calculates the weighted normalized matrix ($Y$), for the specified weights ($W$) = [5,3,3,4].

Formula: $y_{ij} = w_i * r_{ij}$
Multiplying the preference weights with the normalized matrix, the matrix (Y) is obtained as follows:

\[
Y = \begin{bmatrix}
1,803 & 0,854 & 1,166 & 1,818 \\
1,803 & 1,424 & 1,166 & 1,091 \\
1,353 & 0,854 & 1,457 & 1,455 \\
2,254 & 1,424 & 1,166 & 0,364 \\
1,353 & 0,854 & 0,874 & 1,818 \\
1,803 & 1,139 & 0,583 & 0,727 \\
1,803 & 0,854 & 1,166 & 1,455 \\
1,803 & 0,854 & 0,583 & 1,818
\end{bmatrix}
\]

Next, determine the Positive Ideal Solution (A+) and Negative Ideal Matrix (A-).

A+ = MAX value from the results of the weighted criteria values (MAX=largest value) Positive = Max on benefits, Min on costs

A- = MIN value from the results of the weighted criteria values (MIN=smallest value) Negative = Min on benefits, Max on costs

By using the formula: A+ = max (y1+, y2+, ..., yn+) and A- = min (y1-, y2-, ..., yn-)

<table>
<thead>
<tr>
<th>y1</th>
<th>Ideal Solution</th>
<th>Y+</th>
<th>Y-</th>
</tr>
</thead>
<tbody>
<tr>
<td>y1</td>
<td>1,803; 1,803; 1,353; 2,254; 1,353; 1,803; 1,803</td>
<td>max = 2,254</td>
<td>min = 1,353</td>
</tr>
<tr>
<td>y2</td>
<td>0,854; 1,424; 0,854; 1,424; 0,854; 1,353; 0,854; 0,854</td>
<td>max = 1,424</td>
<td>min = 0,854</td>
</tr>
<tr>
<td>y3</td>
<td>1,166; 1,166; 1,457; 1,166; 0,874; 0,583; 1,166; 0,583</td>
<td>max = 1,457</td>
<td>min = 0,583</td>
</tr>
<tr>
<td>y4</td>
<td>1,818; 1,091; 1,455; 0,364; 1,818; 0,727; 1,455; 1,818</td>
<td>min = 0,364</td>
<td>max = 1,818</td>
</tr>
</tbody>
</table>

After determining the positive and negative values, the results will be as follows:

| A+ | 2,254 | 1,424 | 1,457 | 0,364 |
| A- | 1,353 | 0,854 | 0,583 | 1,818 |

Next, calculate the distance between the positive ideal solution (D+) and the negative ideal solution (D-). Formula to calculate it:
The distance between alternative AI and the ideal solution is positive

\[ D_i^+ = \sqrt{\sum_{j=1}^{n} (y_{ij}^+ - y_{ij})} \]

\[ D1^+ = \sqrt{(2.254 - 1.803)^2 + (1.424 - 0.854)^2 + (1.457 - 1.166)^2 + (0.364 - 1.818)^2} = 1.652 \]

\[ D2^+ = \sqrt{(2.254 - 1.803)^2 + (1.424 - 1.424)^2 + (1.457 - 1.166)^2 + (0.364 - 1.091)^2} = 0.904 \]

\[ D3^+ = \sqrt{(2.254 - 1.353)^2 + (0.854 - 0.854)^2 + (1.457 - 1.457)^2 + (0.364 - 1.455)^2} = 1.526 \]

\[ D4^+ = \sqrt{(2.254 - 2.254)^2 + (1.424 - 1.424)^2 + (1.457 - 1.166)^2 + (0.364 - 0.364)^2} = 0.291 \]

\[ D5^+ = \sqrt{(2.254 - 1.353)^2 + (1.424 - 0.854)^2 + (1.457 - 0.874)^2 + (0.364 - 1.818)^2} = 1.895 \]

\[ D6^+ = \sqrt{(2.254 - 1.803)^2 + (1.424 - 1.139)^2 + (1.457 - 0.583)^2 + (0.364 - 0.727)^2} = 1.087 \]

\[ D7^+ = \sqrt{(2.254 - 1.803)^2 + (1.424 - 0.854)^2 + (1.457 - 1.166)^2 + (0.364 - 1.455)^2} = 1.343 \]

\[ D8^+ = \sqrt{(2.254 - 1.803)^2 + (1.424 - 0.854)^2 + (1.457 - 0.583)^2 + (0.364 - 1.818)^2} = 1.846 \]

The distance between alternative Ai and the ideal solution is negative

\[ D_i^- = \sqrt{\sum_{j=1}^{n} (y_{ij}^- - y_{ij})} \]

\[ D1^- = \sqrt{(1.353 - 1.803)^2 + (0.854 - 0.854)^2 + (0.583 - 1.166)^2 + (1.818 - 1.818)^2} = 0.737 \]

\[ D2^- = \sqrt{(1.353 - 1.803)^2 + (0.854 - 1.424)^2 + (0.583 - 1.166)^2 + (1.818 - 1.091)^2} = 1.182 \]

\[ D3^- = \sqrt{(1.353 - 1.353)^2 + (0.854 - 0.854)^2 + (0.583 - 1.457)^2 + (1.818 - 1.455)^2} = 0.947 \]

\[ D4^- = \sqrt{(1.353 - 2.254)^2 + (0.854 - 1.424)^2 + (0.583 - 1.166)^2 + (1.818 - 0.364)^2} = 1.095 \]

\[ D5^- = \sqrt{(1.353 - 1.353)^2 + (0.854 - 0.854)^2 + (0.583 - 0.874)^2 + (1.818 - 1.818)^2} = 0.291 \]

\[ D6^- = \sqrt{(1.353 - 1.803)^2 + (0.854 - 1.139)^2 + (0.583 - 0.583)^2 + (1.818 - 0.727)^2} = 1.214 \]

\[ D7^- = \sqrt{(1.353 - 1.803)^2 + (0.854 - 0.854)^2 + (0.583 - 1.166)^2 + (1.818 - 1.455)^2} = 0.822 \]

\[ D8^- = \sqrt{(1.353 - 1.803)^2 + (0.854 - 0.854)^2 + (0.583 - 0.583)^2 + (1.818 - 1.818)^2} = 0.451 \]

The final step is to determine the preference value for each alternative using the following formula:

\[ V_i = \frac{D_i^+}{D_i^- + D_i^+} \]
From the results of calculating the preference value for each alternative above, below is the ranking of the vector values (V) from largest to smallest:

- Rank 1 = V4 = 0.867
- Rank 2 = V2 = 0.567
- Rank 3 = V6 = 0.528
- Rank 4 = V3 = 0.383
- Rank 5 = V7 = 0.380
- Rank 6 = V1 = 0.308
- Rank 7 = V8 = 0.196
- Rank 8 = V5 = 0.133

From the preference values above, the rankings of 8 students were obtained, as for the students who were entitled to be used as Outstanding Students based on the 4th alternative ranking, namely: Bobo.

Testing the respondent assessment system. The following is the respondent’s assessment regarding the decision support system (DSS) for selecting outstanding students at Angkasa Maros High School using the TOPSIS method with 6 selected questions: academic achievement, non-academic achievement, leadership, attitude. Each criterion is weighted according to its importance. This question table includes 30 respondents.

Table 7. Respondents' questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Mark</th>
<th>SS</th>
<th>S</th>
<th>N</th>
<th>T.S</th>
<th>STS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to use?</td>
<td>23</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Speed up the selection process?</td>
<td>18</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Display quality and features?</td>
<td>20</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Complete explanation on the web?</td>
<td>24</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Help select outstanding students?</td>
<td>16</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Exploring and measuring student creativity?</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total value</td>
<td>113</td>
<td>47</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

From the final percentage value of the questionnaire in table 6, it can be concluded that the decision support system for selecting outstanding students at Angkasa Maros High School using the TOPSIS method has a total percentage value of 90.3%. This shows that the system is implemented and provides significant benefits in the selection process for outstanding students.

Discussion

This discussion section aims to evaluate the results of research that has been carried out and relate them to relevant literature as well as the basic concepts underlying the use of the TOPSIS method in the Decision Support System (DSS)
to select outstanding students at Angkasa Maros High School. Based on the results obtained from system testing, the following is an analysis and interpretation of the findings of this research. This research shows that the use of the TOPSIS method in DSS provides reliable and objective results in selecting outstanding students. The selection process involves several important steps such as determining student alternatives, establishing relevant criteria, and assigning weight to each criterion. The end result is a preference score that allows ranking students based on their level of success in meeting established criteria. For example, a student with the name "Bobo" obtained the highest score of 0.867 and was ranked first as an outstanding student.

This finding is very important because it shows that the TOPSIS method is able to handle various criteria effectively and produce accurate rankings. In the context of Angkasa Maros High School, the results of this research provide practical solutions to simplify the decision-making process in selecting outstanding students. With this DSS, schools can identify students with superior potential more efficiently and objectively, which in the end can improve the quality of education and optimize the development of student potential. This research is consistent with previous studies such as research Agung & Ricky (2016) which states that the TOPSIS method is effective in making multi-criteria decisions. On research Fitriana et al. (2015) And Lesmana, (2021) said that the use of the TOPSIS method was considered effective. Next on research Sikumbang & Muhammad (2021) TOPSIS method in the decision support system for selecting outstanding students, the test results use the Topsis alternative method with 66 alternatives and 3 criteria, namely normative value, adaptive value, and productive value. The results obtained support the existing literature, which shows that TOPSIS can provide appropriate solutions in situations where multiple factors must be considered simultaneously.

From a theoretical point of view, this research confirms the validity and reliability of the TOPSIS method in an educational context. In terms of application, this DSS can be used as a reliable tool for schools in the selection process for outstanding students. Apart from that, the results of this research can be a reference for the development of similar DSS in other educational institutions that have similar needs. This research has clear relevance in the educational context, particularly in terms of better and more efficient decision-making in selecting high-achieving students. However, the limitation of this research lies in the scope of the data used, which only covers Angkasa Maros High School. For broader generalizations, further studies are needed involving other schools. Thus, this research not only provides a practical contribution to Angkasa Maros High School in selecting outstanding students but also adds to the literature on the application of the TOPSIS method in the field of education.

**Conclusions and Suggestions**

**Conclusions**

Based on the analysis of the decision support system for selecting outstanding students using the TOPSIS method, it can be concluded that this system provides reliable results in the process of selecting outstanding students:

1. Selection of outstanding students using the TOPSIS method involves steps such as determining student alternatives, relevant criteria, and criteria weights. The process involves analyzing student scores, matrix weighting, and preference calculations. This system produces information about outstanding students based on the assessment results obtained.

2. The Decision Support System for Selection of Outstanding Students at Angkasa Maros High School using the TOPSIS Method can function well because it is able to facilitate and support decision making for the selection of outstanding students at Angkasa Maros High School by obtaining a valid level of accuracy for testing alternative criteria. The results of the TOPSIS method show that the 4th alternative, namely the student with the name "Bobo," obtained a score of 0.867 and was ranked first as the selected outstanding student.

**Suggestions**

Suggestions from this research are:

1. In the future, you can Update and develop the system regularly: To maintain the effectiveness of the system, it is important to carry out regular updates and development. Update assessment criteria, add relevant features, and adapt to evolving school needs and student assessment standards.
2. Can provide training and technical support: Provide training to school staff on the use of the system and ensure they properly understand how to manage and utilize it. Also, provide adequate technical support so that users can resolve technical issues that may arise during use of the system.

By implementing these suggestions, it is hoped that the system for selecting outstanding students at Angkasa High School can run more effectively, improve the quality of selecting outstanding students, and support educational success at the school.

References


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